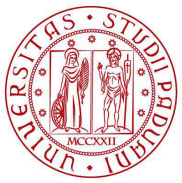

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CORSO DI DOTTORATO DI RICERCA IN SCIENZE PSICOLOGICHE
CICLO XXIX

UNDERSTANDING HOUSEHOLD RECYCLING FOR THE SUSTAINABLE MANAGEMENT OF URBAN WASTE: A MIXED-METHOD INVESTIGATION

Tesi redatta con il contributo finanziario di Veritas S.P.A.

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Dottorando: Alessandra Varotto

AL MIO AMATO PAPÀ.

TO MY BELOVED FATHER.

VOGLIO PERÒ RICORDARTI COM'ERI
PENSARE CHE ANCORA VIVI,
VOGLIO PENSARE CHE ANCORA MI ASCOLTI
E CHE COME ALLORA SORRIDI, CHE COME ALLORA SORRIDI.

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SUMMARY

In recent years, the ever-increasing generation of urban waste is posing serious problems to developed countries and cities, highlighting the pressing need to transform their current recycling practices into more efficient and sustainable ones. This is not possible, however, without the involvement and active cooperation of citizens as key initiators and sustainers of the entire recycling process. During the last decades, the question of what makes people recycle or not has occupied researchers and practitioners seeking to understand and influence this behavior, resulting in a great number of publications examining recycling from a range of perspectives including psychology, economics, sociology, geography and marketing. Yet the comprehension of this phenomenon and of the most effective ways to promote its adoption among people is still far from being exhaustive.

The aim of the research presented here is thus to examine household recycling using a mixed-method approach, in order to overcome the limitations that characterize both quantitative and qualitative research and to provide new penetrating insights to comprehend this phenomenon and promote its adoption. The research work is composed of two main parts. The first, theoretical, consists of a systematic review of the existing recycling literature, offering an in-depth overview of the identified socio-psychological and situational determinants of

household recycling (Chapter 1), as well as of the intervention strategies used to promote it, including a meta-analysis of their effectiveness (Chapter 2). Starting from here, the second part concerns the investigation in the Italian context of household recycling drivers and dynamics, as well as of the mechanisms underlying its adoption and maintenance over time. The mixed-method approach adopted to undertake the research is discussed in Chapter 3, pointing at the flexible use of quantitative and qualitative methods to gather different but complementary types of data. Study 1 consists indeed of an extensive online survey allowing to collect data across a large population sample, while Study 2 relies on qualitative and ethnographic methods, such as interviews, observations and home tours, to achieve a deeper comprehension of recycling dynamics in the setting of the home, exploring the experiences of participants and the meanings they attribute to them. Altogether the pieces of evidence obtained from the present thesis point at the relational and habitual nature of recycling, evidencing that various factors, such as knowledge and the perceived value of waste (Chapter 4), motivations to recycle and those used to justify defective episodes (Chapter 5), cooperation and distribution of tasks between family members, the organization of domestic spaces, as well as the responsibilities for recycling attributed to external actors (Chapter 6) interact with each other and become locally important in influencing recycling behavior.

A general discussion synthetizing the theoretical findings and the results obtained by the studies presented in this thesis is then offered in Chapter 7, with the twofold aim to extend the results of previous research on recycling and to

delineate a set of practical recommendations for implementing effective interventions.

PART I
STATE OF THE ART

HE WHO LOVES PRACTICE WITHOUT THEORY IS LIKE THE SAILOR WHO BOARDS SHIP WITHOUT A RUDDER AND COMPASS AND NEVER KNOWS WHERE HE MAY CAST. PRACTICE MUST ALWAYS BE BUILT UPON GOOD THEORY.

Leonardo da Vinci

CHAPTER 1

HOUSEHOLD RECYCLING: WHO RECYCLES AND WHY

In recent years, the issues connected to sustainable development and to the management of natural resources are becoming more relevant, receiving increasing attention by both the scholars and the public. Numerous global-scale environmental problems, such as climate changes, pollution of air, water and soil, and the difficult management of waste and toxic substances, are posing indeed a serious threat to the «quality and quantity of all life, including human life» (Osbaldiston & Schott, 2012, p. 258).

In industrialized countries, one of the most pressing environmental issues is connected to the management of urban waste. Urban waste has indeed high environmental costs in terms of greenhouse gas emissions from landfill, water and soil pollution, as well as air pollution due to the incineration process (EPA, 2009; see Figure 1.1). Yet, as a consequence of population expansion, urbanization, higher incomes, consumerism and intensive use of packaged goods, the generation of urban waste continues to increase. The European Commission estimates that «today in the EU, each person consumes 16 tons of

materials annually, of which 6 tons are wasted, with half going to landfill»[1]. According to the Global Waste Management Outlook (UNEP, 2015), total urban waste generation is around 2 billion tons per year globally, and per-capita generation is expected to increase by approximatively 20% until the year 2100 (Moss, Edmonds, Hibbard, Manning, Rose, et al., 2010). The handling of waste remains thus a major issue for society, highlighting the pressing need to transform the current waste management practices into more efficient and sustainable ones.

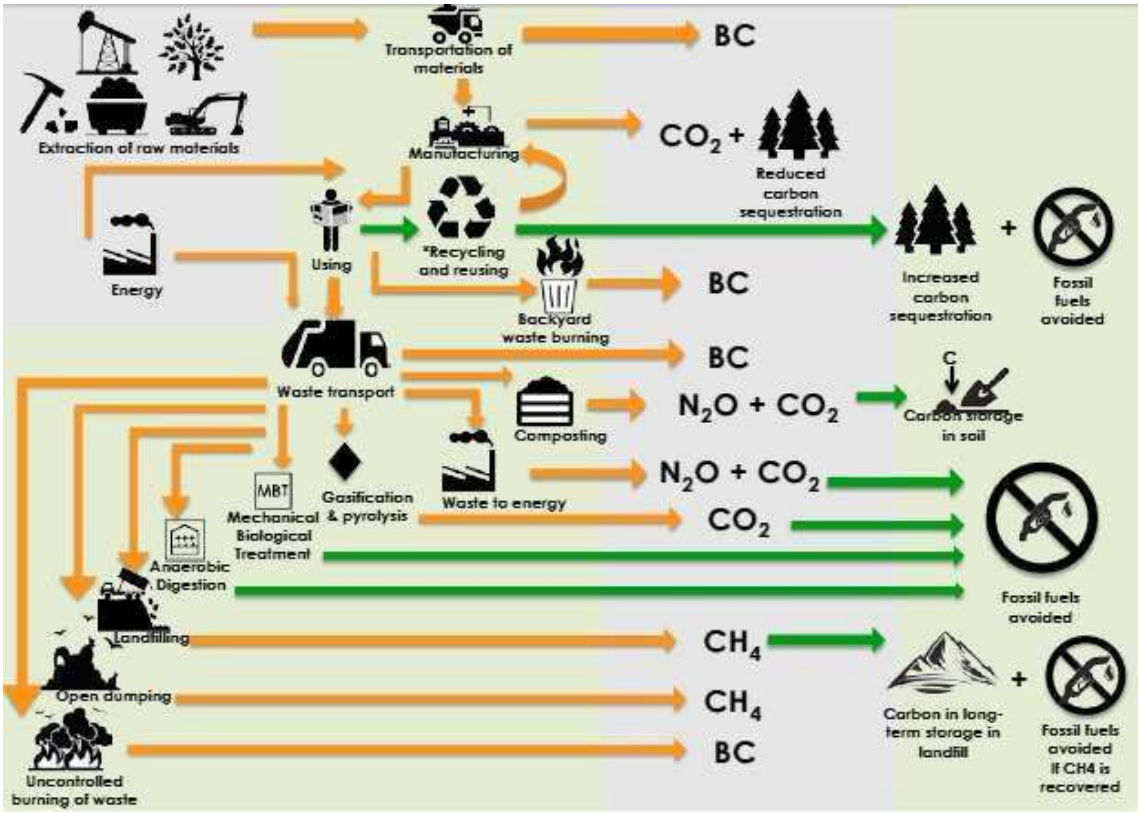


FIGURE 1.1. *Schematic illustration of the potential contribution of waste management to climate change mitigation (adapted from UNEP, 2015).*

[1] Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions, *Roadmap to a Resource Efficient Europe*, COM(2011) 571 final, Brussels, 20 September 2011.

One of the strategies to reduce the impact of waste on environment is recycling. Recycling is a very broad term referring to the process of conversion through which materials previously used (i.e., waste) are collected, processed, remanufactured and then transformed into resources with an economic value. It produces important environmental, economic and societal benefits, by both preserving natural resources and energy through the reuse of existing materials, and by reducing pollution decreasing the need of conventional waste disposal in landfills and incinerators (Vencatasawmy, Öhman & Brännström, 2000). For example, each ton of recycled paper can save 17 trees, 380 gallons of oil, three cubic yards of landfill space, 4,000 kilowatts of energy, and 700 gallons of water. This represent a 64% energy saving, a 58% water saving, and 60 pounds less of air pollution compared to the production of a ton of paper from raw materials (UNEP, 2015).

Recycling rates in high-income countries have progressively increased over the last 30 years, driven by legislative instruments such as the EU revised Waste Framework Directive of 2008, which has the long-term goal of turning Europe into a recycling society, reducing the amount of waste generated and using unavoidable waste as a resource whenever possible. It sets the target for EU Member States to recycle 50% of their urban waste by 2020, considering recycling as a key element in ensuring resource efficiency and the sustainable growth of European economies. As pointed by Dai, Gordon, Ye, Xu, Lin et al. (2015), «for recycling to become successfully established it is necessary to have processing facilities, demand for products, commercial possibilities, collection infrastructure

and appropriate legislation and enforcement. However, even the sum of those will not be sufficient if residents do not cooperate and separate their waste» (p. 9). Individuals are indeed responsible for carrying out primary separation of waste at home, distinguishing recyclables from the rest of the refuse, adequately preparing items for collection, throwing them in the right bin and then bringing waste to the curb or the nearest drop-off collection center. That is, recycling is a social challenge that entails, on the one hand, the improvement of existing infrastructures and services, and, on the other, a change in the individuals' lifestyles and behavior, to make them recycle more and better. According to Miranda and Blanco (2009), the participation of households is the key to achieve higher recovery of recyclables of good quality with little, if any, need for further sorting them, thus enhancing the efficiency and lowering the costs of the entire waste recycling process.

From the individual's point of view, recycling can be described as a form of voluntary contribution to a public good (Brekke, Kipperberg & Nyborg, 2010), as it «is costly to the individual because it demands time and energy to save, sort and deliver recycle materials. There are no immediate or individual rewards for recycling, yet surely it will benefit society as a whole» (Hopper & Nielsen, 1991, p. 199). That is, the individual engages in an inconvenient behavior that is costly to the self in the short run to benefit the collective good in the long run. In addition, it can be defined as habitual, since it occurs at high frequency, in the same context (the home), and involving regular sets of activities often carried out at the same time of the week (Cotterill, John, Liu & Nomura, 2009; Comber &

Thieme, 2012). Given the essential role played by individuals and households as key initiators and sustainers of the entire recycling process, scholars have devoted significant and increasing attention in the past few decades to identify and describe major socio-psychological and situational determinants and barriers of household recycling, such as age, gender, economic and cultural background, attitudes, knowledge, motivation, social influence and recycling service characteristics. In parallel, field interventions have been designed to improve households' participation applying a wide array of behavior-change techniques, which range from information provision and educational campaigns to incentive or disincentive schemes, from distribution of feedback and bins to behavior modeling.

In the next sections of the present Chapter, the main research findings regarding the determinants of household recycling will be described and discussed, while in Chapter 2 the different types of intervention used to promote it will be reviewed, using a meta-analytical approach to compare the effectiveness of interventions inspired by different persuasive strategies. Finally, the two research perspectives, which have usually remained disconnected, will be merged in the assumption that they can be mutually inspiring, and that this can be a useful starting point for the design of more effective intervention strategies.

1.1. THE DETERMINANTS OF RECYCLING: A LITERATURE REVIEW

In order to collect the relevant literature on determinants of household recycling, a systematic literature search has been conducted, adopting the following inclusion criteria. The analyzed articles: **(a)** had to focus on recycling in the home environment. It has been indeed demonstrated that sustainable behaviors such as recycling are driven by different motivations when performed at home or in different contexts (Barr, Shaw, Coles & Prillwitz, 2010; McDonald, 2011; Ryan & Bernard, 2006). For this reason, studies on littering and recycling in public settings and work environments were not of interest here and were thus not included in the analysis; **(b)** had to be published from 1990 to 2016, in order to update existing reviews on recycling. Most of them have been published indeed in the 90s, synthetizing relevant studies on the topic conducted in the '70s and '80s. Since then, however, recycling has turned from a voluntary, infrequent behavior, to a widely diffused and accepted standard (often mandatory) for managing urban waste, and this might have affected the role played by some possible determinants; and **(c)** had to be conducted in industrialized countries, due to the different and specific issues arising from waste disposal and management in many developing contexts, as a consequence of the frequent lack of adequate infrastructures and level of provision of services, inefficient institutional set-up and limited financial and technical resources (Banga, 2011). The search was for both empirical studies and descriptive/meta-analytical reviews.

To find this literature, a multiple-strategy, three-step process has been followed (Figure 1.2):

(i) first, a systematic keyword search in scientific databases (PsychInfo, Google Scholar and ACM Digital Library) and in websites of journals dealing with recycling (e.g., Environment and Behavior, Resources, Conservation and Recycling, Journal of Environmental Psychology, etc.) has been carried out, looking for publications containing a combination of the terms *waste*, *recycling*, *disposal practices*, *intervention*, *household* in the title and abstract. In addition, leading authors/research groups have been contacted in order to obtain indications of further published or unpublished studies, as well as of relevant grey literature (as recommended by Campbell Collaboration, 2014, and the Centre for Reviews and Dissemination, 2009). This returned 274 works;

(ii) second, the references contained in the articles as well as the list of studies citing the collected articles have been examined searching for further relevant papers. This resulted in additional 77 works;

(iii) third, the collected works were examined to check their relevance according to the inclusion criteria mentioned above. A total of 258 papers survived this third step, divided as follows: 211 papers on the determinants of household recycling; 47 papers describing the interventions used to promote it, and 3 papers regarding both topics.

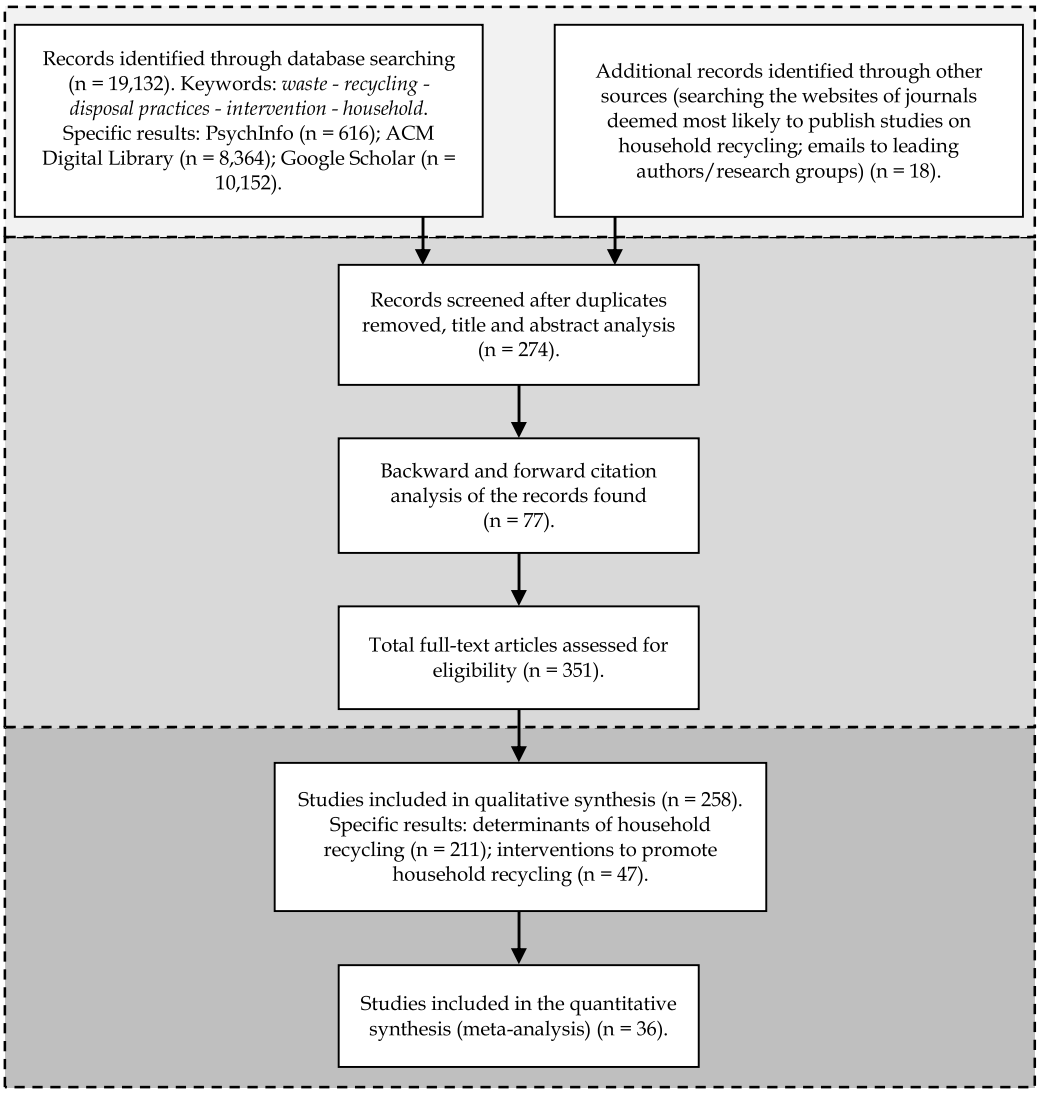


FIGURE 1.2. *Steps in the literature search process. The diagram is adapted from the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) flow diagram (Moher, Liberati, Tetzlaff, Altman, and The PRISMA Group, 2009).*

The determinants of recycling have been variably categorized in the examined literature. For the present synthesis, they have been grouped according to a taxonomy partly based on Iyer and Kashyap (2007), and consisting of three categories: (a) socio-demographic factors, such as age, gender and education level; (b) psychological factors, comprising factors that pertain to the individual's attitudes, motivations, knowledge, personal traits, as well as to the relations between individuals; and (c) contextual factors, containing a set of factors

referring to diverse environmental and infrastructural resources and constraints. The findings regarding each of the abovementioned categories are synthetized and discussed below, while detailed study-by-study results are reported in Tables A.1, A.2 and A.3 (Appendix A), respectively.

1.1.1. SOCIO-DEMOGRAPHIC FACTORS

AGE. The relationship between age and household recycling has been investigated in a large number of publications, the majority of which found a connection between the two factors. Contrary to common expectations that younger people are more likely to be involved in recycling due to a greater environmental awareness and to the consequent willingness to alter their consumption lifestyle (Hamburg, Haque & Everitt, 1997), empirical findings consistently suggest that middle aged and older people are more likely to recycle than younger ones. In particular, most of the studies highlight a positive relation between age and recycling, while others evidence a non-linear, reversed U-shaped relationship, indicating that middle-aged adults are more likely to recycle than their younger and older counterparts. This can be explained by middle-aged and older adults having a greater availability of time and space (Garces, Lafuente, Pedraja & Rivera, 2002) with respect to the youngers, as well as by the lack of information and interest about recycling often displayed by the latters (Boulay, Metcalfe, Barr & Shaw, 2014; Ojala, 2008).

EDUCATION LEVEL. Another frequently investigated socio-demographic factor is education level. Various authors hypothesized that people who have a higher education level tend to recycle more than those with a lower education, having a better knowledge about proper recycling procedures and the importance of recycling as a solution to environmental problems (Hamburg et al., 1997). The empirical findings, however, do not support this hypothesis: despite some studies actually found a positive relationship between education level and recycling behavior - De Feo and De Gisi (2010), for example, show that the percentage of people who adhere to a separate collection program increases with the education level, and that the higher the education level, the lower the frequency of declared difficulties with recycling -, most of them did not find any significant relation.

INCOME. A socio-demographic factor that is generally expected to positively correlate with household recycling is income. In particular, it has been hypothesized that individuals or families with higher income are more likely to have the means to deliver goods to the depot or to pay for the convenience of a curbside recycling service, and to have better access to information about recycling (Halvorsen, 2012; Vining & Ebreo, 1990), as well as more space at home to store recyclables. Results are however inconsistent. Most studies confirm indeed the initial hypothesis, finding that participation in recycling scheme is higher in high-income areas compared with medium and low income ones. Two studies instead highlight a negative relationship, indicating that wealthier people

tend to recycle less, while Bell, Huber and Viscusi (2016) found that those with high annual incomes are more likely to recycle, but at very high incomes the effect declines. Some authors suggest that these negative results could be due to the fact that households with greater income levels are also those composed by working people, which have less time to dedicate to recycling, that is, they have a higher opportunity cost of time that acts to reduce their recycling rates (Abbott, Nandeibam & O'Shea, 2011; Garces et al., 2002). Finally, a number of other studies found no significant relationship between the two factors, with some authors ascribing this result to the use of samples composed mainly by middle-class households with a fairly homogeneous income (do Valle, Reis, Menezes, & Rebelo, 2004; Oskamp, Burkhardt, Schultz, Hurin, & Zelezny, 1998).

GENDER. Even if some researchers have hypothesized that recycling is taken care of more often by women than by men (Meneses & Palacio, 2005), the literature shows a consistent, non-significant relationship between gender and household recycling, with only a few studies evidencing the existence of a significant relationship and concluding that frequent recyclers are more likely to be female. A recent ethnographic work of Wheeler and Glucksmann (2014) might help in shedding light on both the significant and non-significant results evidenced by the literature analysis, as well as on the relationship between recycling and the domestic division of labor. In particular, the study demonstrates that recycling is not a single action, but it is composed by a set of different sub-tasks (that is, preparing the materials, sorting them and

transporting waste to the collection point), which are generally carried out by different household members: women usually sort and store waste, while men tend to take responsibility for the less regular task of delivering it to the curbside/recycling center. As pointed out by Oates and McDonald (2006), women can thus be considered as the key initiators and sustainers of recycling activity within the household, but high proportions of men also participate in recycling activity alongside their female partners. The fact that only recycling-related sub-tasks (and not recycling *per se*) show a clearly gendered connotation may thus help to explain the failure of traditional measures, which attempt to correlate gender with recycling as a whole, to pick up clear trends.

HOUSEHOLD SIZE AND COMPOSITION. Regarding household size, only few studies found a positive, significant relationship with recycling, while most studies found no relationship. As stated by Ferrara and Missios (2005), this could be due to the fact that larger households have more people who can potentially recycle, tending to increase recycling rates; at the same time, however, they result in more consumption and hence in the generation of more waste, which in turn requires greater effort to recycle a given proportion. With regard to household composition, results are not conclusive since some studies found that married couples and families with children tend to recycle more than other types of household, but others found no significant relationship.

EMPLOYMENT STATUS. Most of the analyzed studies did not find a significant relationship between employment status (i.e., whether the individual is currently employed or not) and household recycling, and, even among the studies that found such a relationship, findings are not consistent. Arbués and Villanúa (2016), as well as Tilikidou and Delistavrou (2001), found indeed a positive relationship (i.e., employed people are likely to recycle more than unemployed ones), while Ando and Gosselin (2005) and Sidique, Lupi and Joshi (2010) found that people who are employed full-time are likely to spend less time on recycling activities when compared to people who are unemployed or employed part-time.

ETHNICITY. Finally, the majority of the studies investigating the relationship between ethnic differences and household recycling found that recycling is less likely among minorities. Some authors, however, point out that significant differences are observable between first generation ethnic minorities and second and third ones. In particular, the latter are likely to be more aware of environmental problems and to view recycling more favorably, as well as to report higher levels of recycling participation (Lakhan, 2015a; Perry & Williams, 2007). According to Lakhan (2015a), this may be due to the fact that often recycling is not a common waste management practice in first generation respondents' countries of origin, and the lack of past participation may serve as a barrier to their current recycling behavior.

1.1.2. PSYCHOLOGICAL FACTORS

SOCIAL INFLUENCE. A psychological factor that has often been investigated and is expected to have a positive impact on recycling is social influence, which refers to the influence produced by recycling-related expectations, support and perceived behavior of significant others such as family, friends and neighbors. The great majority of studies found a positive relationship between social influence and household recycling. In other words, people who have the impression that the members of their social network recycle regularly, approve recycling and support it, actually recycle more.

According to Smeesters, Warlop, Cornelissen, & Abeele (2003), other people in the individual's social environment can influence him/her in a number of ways. First, they can serve as examples to be imitated. Second, they can act as observers who activate social norms and accountability considerations. In this sense, the high visibility of the curbside recycling schemes, where neighbors can actually see each other's waste on the street, seems to exert higher social pressure on the individual (Santi & Rodic, 2010; Vining & Ebreo, 1990). As stated by Bucciol, Montinari and Piovesan (2014), the visibility of actions could lead people to increase their effort and attention in sorting by inducting in them a feeling of shame and/or fear of punishment if they do not recycle. Third, the development of a sense of group membership may increase the propensity to act according to what is believed being the dominant behavioral norms of the group, either in a positive way, encouraging people to recycle in their turn, or in a negative one. It

has been indeed demonstrated that low and non-recyclers tend to have the perception that few other people in their area are recycling, and affirm that they would recycle more if others do so as well (Thomas, Slater, Yoxon, Leaman & Downing, 2003; Thomas, Yoxon, Slater & Leaman, 2004).

In numerous studies, social influence has been proxied by other variables such as homeownership, city size, housing density and presence of tourism. With regard to homeownership, most studies highlight that owing the house in which one lives increases his/her likelihood to recycle, ascribing this to the fact that homeowners are usually more involved in the political and social issues of their community (Mainieri, Barnett, Valdero, Unipan, & Oskamp, 1997), and thus more willing to participate in waste recycling programs. On the other hand, various authors suggest that social influence might lack in urban areas, high density environments and touristic places, where local communities are less tightly connected, as well as for individuals who have recently moved and do not have developed yet strong ties with their neighborhood (Briguglio, Delaney & Wood, 2015; De Young, Boerschig, Carney, Dillenbeck, Elster et al., 1995; Halvorsen, 2012). That is, the stronger the individual's attachment to his/her community, the greater the likelihood s/he will recycle.

INFORMATION AND KNOWLEDGE. Information and knowledge regarding how to properly recycle are assumed to be important preconditions of household recycling. All but two of the analyzed studies support this assumption, highlighting the existence of a positive relationship between the individuals'

information and knowledge about recycling (i.e., knowledge about what can be recycled, how and where) and their recycling behavior. Lack of information and knowledge is indeed recognized as one of the main barrier to: **(a**) participation in the recycling scheme (Alexander, Smaje, Timlett, & Williams, 2009; Perrin & Burton, 2001; Thomas et al., 2003); **(b)** the quantity of recycled items, since it has been demonstrated that when in doubt, people tend to discard rather than recycle waste (Boulay et al., 2014); and **(c)** the quality of recycling activity, since «knowledge gaps that are not salient to the individual may lead to persistent sorting failures, especially because participants often do not know and never learn that they are making mistakes» (Smeesters et al., 2003, p. 458). In addition, lack of recycling knowledge is often used as a motivation to explain defective episodes, as respondents justify violation of recycling rules by arguing that they do not know what to do exactly of a certain garbage item.

ATTITUDES TOWARD ENVIRONMENT AND RECYCLING. With regard to pro-environmental attitudes, it is commonly believed that people who are more concerned with general environmental issues are also more likely to recycle. Empirical results, however, do not always support this hypothesis, since two-third of the analyzed studies actually found a positive, significant relationship with household recycling, whereas the remaining ones found no relationship. Various authors have attempted to explain these unexpected findings. According to Scott and Willits (1994), for example, «given the amount of media coverage devoted to environmental problems, it could be that many people have learned

the language of environmentalism without developing a simultaneous behavioral commitment» (p. 255). This appears to be true especially for young adults (Werder, 2006). Another reason why pro-environmental attitudes may not correspond to actual recycling may be the presence of internal barriers (such as laziness, lack of interest or knowledge) and/or external ones (e.g., lack of time or storage space), which can outweigh environmental concern. In addition to that, Schultz and Oskamp (1996) found that the individual's pro-environmental attitudes are stronger predictors of recycling behavior under conditions that require a high degree of effort. In particular, «when the amount of effort required to recycle is high, only people with strong pro-environmental attitudes are likely to do so. When the amount of effort required to recycle is low, however, a small or moderate environmental concern may provide enough impetus to produce the behavior» (pp. 380-381). In this second case, the possession of attitudes in favor of the environment appears thus to be of little predictive value in determining whether people will actually recycle. Finally, among the authors finding no relationship, some have argued that general pro-environmental attitudes would have only an indirect effect on recycling by influencing recycling-specific attitudes, which in turn would affect recycling behavior (Elgaaied, 2012; Best & Mayerl, 2013). Research findings regarding recycling-specific attitudes seem to confirm this fact, as the great majority of the analyzed studies found a positive relationship between the individuals' specific, positive attitudes toward recycling and their recycling behavior.

BELIEFS/PERCEPTIONS OF RECYCLING CONSEQUENCES. A psychological factor that has been demonstrated having a positive relation with household recycling is beliefs/perceptions of recycling consequences, namely the individuals' perceptions of the positive impact of recycling on environment and other people and the negative consequences of non-recycling. As evidenced by Cobern, Porter, Leeming and Dwyer (1995), however, consequences of recycling may be not immediately apparent to the individual for different reasons. First, the benefits of recycling are not immediate but instead only presumed for some time in the future. Second, they are in the form of avoidance of aversive environmental effects instead of positive gains. Third, they are distributed over the entire population rather than pertain exclusively to the individual performing the behavior.

In addition to that, for most people recycling simply means separating waste and putting it outside for collection, with little sense of how this action interacts with the overall recycling process and the larger waste flow (De Coverly, O'Malley & Patterson, 2008). Poor knowledge about how the recycling process proceeds once waste has been collected, which is often compounded by contradictory information and negative media stories, can generate a certain degree of skepticism toward recycling and its presumed consequences (Boulay et al., 2014; Davies, Foxall & Pallister, 2003). This, in turn, is often used by people as an excuse to abdicate their personal responsibility to recycle (Bowman, Goodwin, Jones & Weaver, 1998; Davies et al., 2003).

RESPONSIBILITY. A factor that is conceptually related to perceptions of recycling consequences is responsibility. Research findings highlight that individuals who feel a personal responsibility to recycle are more likely to actually perform the behavior. The concept of responsibility is strictly connected with those of personal duty and internal locus of control. Numerous studies found indeed that most recyclers feel that it is their duty to recycle (e.g., Halvorsen, 2012; Smeesters et al., 2003), and that they are more likely to have an internal locus of control, believing that they are able to affect change through their own behavior, rather than change being outside their control (external locus of control) (Hornik, Cherian, Madanski & Narayana, 1995; Schultz, Oskamp & Mainieri, 1995; Werder, 2006). In addition to that, the work of Andersson and von Borgstede (2010) revealed that responsibility appears to be strongly related to high-cost recycling: that is, when recycling implies effort and self-sacrifices, experiencing a sense of personal responsibility helps the individual overcoming the barriers and adopting the behavior.

In summary, it appears that people who are aware of the implications associated with (non) recycling, and who feel, at the same time, that their actions can effect real changes (i.e., who assume personal responsibility for them, seeing a relationship between the choice to recycle on the one hand and the consequences of the behavior on the other), are more likely to recycle.

MOTIVATION. The individual's level of motivation has been recognized as a critical component to engage in and maintain recycling behavior over time (Seacat & Northrup, 2010). According to Johansson (2016), motivation to recycle can be both internal and external. Environment protection (e.g., the desire to avoid filling up landfills, reduce waste, save resources, curtail pollution, etc.) has been cited by numerous authors as the main underlying internal motivation of household recycling. People tend indeed to view recycling as one of the most tangible actions that can be undertaken to contribute to a healthier environment (Eurobarometer, 2014). In addition to environmental ones, altruistic motivations (Barile, Cullis & Jones, 2015; Izagirre-Olaizola, Fernandez-Sainz & Vicente-Molina, 2015) and the "feel good" factor (i.e., the positive feelings connected to perform recycling as it is considered the right thing to do; Bagozzi & Dabholkar, 1994; Thomas et al., 2003) have been indicated as further internal motivators of household recycling. External motivations appears to be connected to the desire of the individuals to save money and/or avoid fines through participation in recycling (Johansson, 2016; Smeesters et al., 2003), and to the perception of recycling as a mandatory activity (Bruvoll, Halvorsen & Nyborg, 2002).

On the contrary, one of the most frequently cited motivation for not recycling is laziness. As stated by Ojala (2008), referring to laziness appears to be a strategy to avoid feelings of cognitive dissonance between attitudes and behavior (i.e., one thinks it is important to recycle but s/he does not behave accordingly). In this sense, «by characterizing oneself as a lazy person, it becomes

logical that one does not recycle, and hence one does not feel any discomfort» (p. 789).

PAST RECYCLING EXPERIENCE. Research results are consistent in indicating the existence of a positive relationship between past experience and current recycling, with the only exception of three studies. Past experience with household recycling has been demonstrated indeed to influence both current behavior and future intentions to recycle through the formation of strong, positive attitudes toward recycling, which in turn reduce the individual's perceived costs involved to perform it (Davies et al., 2003; Tonglet, Phillips & Bates, 2004). In addition, other studies suggest that repeated experiences with recycling lead to the formation of a recycling habit, fitted in the individuals' everyday routines and maintained over time once acquired (Nixon & Saphores, 2009; Thomas et al., 2004).

SELF-ORGANIZATION SKILLS. This factor refers to the use of self-organizing strategies (such as the arrangement of separate storage spaces for different recyclables, or the combination of recycling tasks with other household activities) to organize the household's waste disposal system in order to make recycling easier and more efficient.

According to Werner and Makela (1998), the adoption of these strategies is positively associated with participation in and persistence of household recycling, as well as with more favorable attitudes toward it. In other words, it

seems that the ability to plan and organize the activities connected to recycling, making them more manageable and interesting (e.g., involving the children, treating recycling as a learning experience, etc.), can actually improve the individuals' willingness to recycle. Conversely, disorganization emerged as an important barrier to household recycling.

Despite the apparent importance of self-organization in recycling adoption and maintenance, the role of this factor remains somewhat underrepresented in determinant-based research.

EMOTIONS. Research results indicate that the individual's feelings of pride and perceived satisfaction connected with carrying out recycling (Diaz, 2010; Hornik et al., 1995; Sun & Trudel, 2016), as well as the feeling of anticipated guilt associated with non-recycling (Elgaaied, 2012; Graham-Rowe, Jessop & Sparks, 2015; Macy & Thompson, 2003) are positively related to participation in household recycling.

PERSONALITY CHARACTERISTICS. To conclude, a psychological factor that is considered only by a small number of studies is personality characteristics, which refers to a set of personality traits, such as conscientiousness, materialism and collectivism, which could be connected to household recycling (Crociata, Agovino & Sacco, 2015; Swami, Chamorro-Premuzic, Snelgar & Furnham, 2011; Tilikidou & Delistavrou, 2001; White & Hyde, 2012). However, too few studies

have examined the relation between these traits and recycling to reach any meaningful conclusion.

1.1.3. CONTEXTUAL FACTORS

SERVICE CHARACTERISTICS. The first (and most important) contextual factor that is assumed to affect household recycling is service characteristics, referring to the design features that contribute to distinguish different types of recycling schemes (e.g., type and frequency of collection, provision of recycling bins, etc.). Research results consistently indicate the existence of a positive relationship between service characteristics and household recycling, suggesting that easy and user-friendly systems would encourage people to use them in a proper way, and thus to recycle more. In particular, the factors that seem to have the stronger impact on recycling are:

(a) the adoption of a curbside collection scheme, instead of a drop-off one: as stated by Guagnano, Stern and Dietz (1995), curbside collection makes recycling more convenient, by means of decreasing its perceived personal cost (time spent and effort exerted). This is a very important element in assuring the effectiveness of a collection scheme, as its inconvenience is perceived by users as a major reason for not recycling (Martin, Williams & Clark, 2006). However, as pointed out by González-Torre and Adenso-Díaz (2005), the relative advantage of curbside collection compared to drop-off one tends to decrease when residents have bins near enough to their homes. Numerous studies found indeed that there

is a positive and strong relationship between the availability and accessibility of public recycling containers and recycling behavior;

(b) a frequent (i.e., weekly) collection of recyclables, accompanied by fewer residual waste collections: according to research results, a frequent collection of recyclables is at the basis of habit formation and permits to relieve the space required to store recyclables inside the home, with the consequences of higher material capture and participation rates. Lowering at the same time the frequency of residual waste collection is considered to be a further incentive to household recycling, leading people to exert more effort in separating more recyclables from residual, non-recyclable items (Abbott et al., 2011; Woodard, Bench and Harder, 2005);

(c) a mandatory program, instead of a voluntary one: various studies show that mandatory recycling schemes tend to produce higher levels of participation than voluntary ones, probably due to their ability to issue sanctions or warnings for noncompliance (Folz & Hazlett, 1991);

(d) a single-stream (co-mingled) program, instead of a multi-material one: single-stream recycling enables households to recycle an unsorted mix of cans, plastic, glass and paper. Research findings highlight that this type of recycling program yields greater success that those requiring to separately collect each material, because it makes the task of recycling for people less time, space and effort consuming (Bell et al., 2016; Tucker, 2003);

(e) free provision of recycling bins: numerous studies highlight that recycling programs that supply residents with one or more free bins capture

more recyclables than those that do not (or that provide only plastic sacks instead of rigid bins), and the participation rate is higher. According to Woodard et al. (2005), reasons for this may be increased convenience, the fact that the bin can act as a visual reminder to recycle, and additional peer pressure, since the absence of a recycling bin placed out for collection clearly identifies non-recyclers;

(f) educational campaigns: the studies analyzing the relationship between educational campaigns and household recycling provide evidence that education, publicity and regular promotion are essential for the success of any recycling scheme. Well designed campaigns on recycling have been indeed demonstrated to increase recycling rate and participation, in particular among highly educated people (Martinez & Scicchitano, 1998) and younger ones (Saladié & Santos-Lacueva, 2016). Among the most common communication channels used to promote recycling there are: newspapers, mailings and posters; radio, web and television advertisement; bin advertisements; door to door campaigns, and school education (Lakhan, 2014; Nixon & Saphores, 2009).

Finally, another important factor for the success of the recycling scheme is the consumers' perception of the quality and reliability of the service. Research findings demonstrate that the presence of a robust and mutual relationship with the waste management company (Koda, 2012; Ordonez, Harder, Nikitas & Rahe, 2015), supported by the possibility to directly contact it and receive communications and information (Davies, Fahy & Taylor, 2005), increases the satisfaction and trust of people in the service, and this in turn improves their willingness to recycle. On the contrary, the belief that the service provider is not

doing enough forcing people to work in its place (Jesson, Pocock & Stone, 2014) and skepticism about what happens to recyclables once they are collected (Boulay et al., 2014; Jesson & Stone, 2009; Milford, Øvrum & Helgesen, 2015) have a negative impact on people's motivations and attitude toward recycling.

RECYCLING BINS. The bin is an important element of the recycling service, as it represents the primary interface between the household and the service itself (Chappells & Shove, 1999; Tucker & Speirs, 2002), and has the capacity to affect people's recycling practices by making them reflect on what is "the right thing to do" (Metcalfe, Riley, Barr, Tudor, Robinson et al., 2013). Research results consistently demonstrate that the recycling bins' aesthetics and structure (e.g., color, shape, presence of specialized lids with holes of different shape, etc.) can increase recycling accuracy (Andrews, Gregoire, Rasmussen, & Witowich, 2013; Duffy & Verges, 2009) and participation rate (Durugbo, 2013; Montazeri, Gonzalez, Yoon, & Papalambros, 2012). At the same time, the absence of practicality (e.g., slots too high for recycling banks, impractical bins' holes, etc.) is likely to constitute a primary physical barrier for elderly and disabled people, who often do not participate in recycling programs because they are physically unable to manage bins due to their reduced strength, dexterity and mobility (Jesson & Stone, 2009; Langley, 2012; McDonald & Oates, 2003). A further, important characteristic is the bin's capacity. Despite larger bins have been shown to have the potential to increase the amount of recyclables collected (Lakhan, 2015b; Woodard et al., 2005), they may require too much storage space

(McDonald & Oates, 2003) and can discourage some low waste producers from recycling, as they perceive the amount to be recycled as insignificant and not worth setting out for collection. On the contrary, smaller bins can lead some households filling them completely and putting their excess of recyclables away with the garbage (Abbott et al., 2011; Tucker, 2003; Tucker & Speirs, 2002). To conclude, it seem possible to affirm that no single recycling bin capacity appears to be ideal, and it is thus preferable to permit residents to choose between different capacities depending upon their waste habits and home storage space (Willman, 2015).

INCENTIVES. Previous research investigated whether household recycling can be encouraged by incentives such as differentiated disposal fees and bring-back schemes. In differentiated disposal fee systems, residents are charged a fee based upon the quantity of waste that they generate; in bring-back schemes, they are rewarded with cash, vouchers or other prizes when a product or its package (e.g., beverage containers, batteries, electronics, etc.) is returned for recycling. Whilst some authors claimed that these strategies could be highly effective in increasing households' participation in recycling (Jenkins, Martinez, Palmer, & Podolsky, 2003; Thøgersen, 2003), others hypothesized, on the contrary, low or none effect, as the value of the incentives would be negligible on an individual household basis (Scott, 1999). In addition to that, it is expected that non-recyclers would perceive monetary incentives and rewards as more important reasons for

recycling than recyclers would (Schultz & Oskamp, 1996; Vining & Ebreo, 1990). Results are not uniform. The majority of the studies found indeed a positive, significant relationship between incentives and recycling, indicating that differentiated disposal fees and bring-back schemes are effective in improving sorting and recycling behavior, in particular of non-recyclers (Macy & Thompson, 2003), older people (Ashenmiller, 2011; Yuan & Abe, 2015) and low-income households (Ashenmiller, 2011; Usui & Takeuchi, 2014), with a reported reduction of waste ranging from 15 to 90% (Dahlen & Langerkvist, 2014). On the contrary, other studies found that weight, frequency or volume-based disposal fees systems have no differential effects (compared to fixed-fee ones) in increasing recycling. According to Bernstad (2014), it seems thus possible to conclude that incentives are an interesting but not always effective strategy to increase household recycling. In particular, differentiated disposal fees schemes suffer from some relevant drawbacks. First, attitudes toward a differentiated garbage fee would be strongly influenced by perceptions about its equity compared to flat fees (Thøgersen, 1994), especially when the system tends to deviate from the theoretical ideal based on weight-based unit pricing (Nestor & Podolski, 1998). Second, such a scheme appears costly and difficult to apply in some contexts such as multi-family dwellings. Finally, there is the risk that it could encourage 'waste tourism' (i.e., waste is moved to neighboring communities where common bins are available in the streets) or could result in illegal dumping by individuals trying to avoid paying the fee (Ashenmiller, 2011; Bucciol, Montinari & Piovesan, 2015; Dahlen & Langerkvist, 2014).

CONVENIENCE. Although several psychological and contextual factors indirectly contribute to the convenience of recycling, previous research works have also dealt with convenience straightforwardly, by measuring how the presence or absence of different types of resources (e.g., storage space, time, information, etc.) could facilitate or inhibit household recycling. Among these studies, there is a broad consensus in indicating the existence of a positive, significant relationship between the two factors. Inconvenience (e.g., no time, storage problems, recycling facilities too far away, too much effort required to clean, separate and sort recyclables, etc.) emerges indeed as one of the largest barriers to recycling, probably because most people tend to consider it as a low-priority task, to be performed only if it is perceived as convenient (Johansson, 2016).

Numerous studies have analyzed convenience considering it as an external, objective factor, and finding that the existence of a proper infrastructure (e.g., a convenient recycling service, a larger house[2], etc.) is a prerequisite of people's participation in household recycling. At the same, however, convenience can be considered also a subjective construct (Wagner, 2013): it is indeed highly dependent on the individual, since the factors that concur to define recycling as convenient or inconvenient often represent perceptions rather than objective measures (Scott, Oates & Young, 2015). Lange, Bruckner, Kroger, Beller and

[2] Among the studies analyzing the effect of convenience on household recycling, a conspicuous number investigated the relationship between dwelling type and recycling, finding that the larger the house (reflecting the ease with which recyclables can be properly stored within it), the more people are prone to recycle.

Eggert (2014), for example, demonstrated that the perceived distance to the nearest recycling facility is a better predictor of household recycling than the actual one. Similarly, other studies highlight that the higher the perceived personal effort required by recycling (e.g., in case of products that necessitate cleaning or some other preparations before disposal), the less likely it is that people would actually recycle (Davies et al., 2003; Langley, Turner and Yoxall, 2011; Tucker, 2003; Wheeler & Glucksmann, 2014).

As pointed out by Smeesters and colleagues (2003), «perceived external constraints are "real" in the sense that they are reasons why people might deviate from their recycling routines, which may lead to the formation of new, less desirable habits» (p. 458). Findings indicating that non-recyclers tend to have a stronger perception of inconvenience-related issues than recyclers are thus not surprising. Thomas and colleagues (2004), for example, found that low and non-recycler are more likely to consider recycling as difficult, a hassle or a too much time-consuming activity compared to high recyclers. Similarly, the issue of storage space emerged as a barrier to recycling for low and non-recyclers, but not for high recyclers.

To conclude, it seems possible to affirm that without a convenient infrastructure, household recycling cannot occur properly, as numerous people are deterred from participating, and those who participate tend to collect less quantities and types of materials (Alexander et al., 2009; Jesson, 2009). At the same time, the perceptions developed by people regarding recycling are equally

important. That is, the more difficult the individual's perception of recycling, the less likely s/he is actually to recycle.

PRODUCT CHARACTERISTICS. Finally, a few studies examined the relationship between the characteristics of products that have to be discarded and household recycling, finding some interesting results. It has been demonstrated that the easiness with which it is possible to empty and clean a product, as well as to separate it into different fractions, affects the likelihood that the product is actually recycled (Langley et al., 2011; Wikström, Williams & Venkatesh, 2016). Products that are experienced by people as too time-consuming to prepare for recycling are indeed more likely to be thrown in the garbage. Similarly, when a product is perceived as dirty or smelly, people tend to throw it into the garbage bin instead of washing and recycle it, eliminating in this way the need to handle it.

Another factor that affects recycling is the perceived residual value of the product. It depends on the material that composes it (e.g., thin plastic films have lower perceived worth than other materials such as glass), its dimension (bigger items and packages are more likely to be recycled that little ones), and the extent to which the product has been distorted during the consumption process and is thus perceived by people as no more useful (Langley et al., 2011; Trudel & Argo, 2013; Trudel, Argo & Meng, 2015; Wikström et al., 2016).

1.2. CONCLUSIVE REMARKS AND SUGGESTIONS FOR FUTURE RESEARCH

In recent years, recycling has become a hot topic within waste management discourses and policies, in view of the negative impact that urban waste and its disposal in landfills or incinerators have on environment, individuals and society in general. The entire recycling process, however, is not possible without the cooperation of citizens through primary separation of waste at home. It is thus important to understand who recycles, why and under what conditions. Over years, an increasing number of scholars have examined recycling in the home environment, its dynamics and determinants, identifying a number of factors that concur to promote or prevent the participation of individuals and households in recycling activities. This growing interest is reflected by the great number of relevant articles published on this topic in the past few decades.

The review presented in this Chapter summarizes this large corpus of literature on determinants of recycling, grouping the main findings in three broad categories, referring to socio-demographic, psychological and contextual factors, respectively. With regard to socio-demographic factors, results suggest the existence of a positive relationship between age and recycling (that is, older people tend to recycle more). In addition, it seems possible that women actually participate in recycling more than men, but that traditional methods of inquiry, which correlate gender with recycling considered as a single activity (and not as a complex one composed by different sub-tasks, often carried out by different

family members), fail to capture the role of gender. The remaining factors (i.e., education level, income, household size and composition, employment status and ethnicity) tend to display a low influence on recycling, showing non-uniform results. In general, socio-demographic factors appear thus to be weakly related to household recycling. This means that it is difficult to differentiate recyclers and non-recyclers on the basis of their socio-demographic characteristics. According to Hornik and colleagues (1995) and do Valle et al. (2004), the loss of predictive power of socio-demographic factors is possibly due to the fact that recycling is changed deeply from its first introduction a few decades ago, moving from a voluntary activity to «a solid part of our contemporary culture, i.e. a routine without any radical connotations» (Meneses, 2009, p. 667)

Conversely, research results evidence that numerous psychological factors concur to determine the participation of the individual in household recycling, in particular: the possession of positive attitudes toward recycling; knowledge about what, how and where to recycle, as well as about the negative consequences of non-recycling (and the assumption of personal responsibility for such consequences); past experience with recycling and motivation to act the behavior; the existence of a surrounding social network composed by people who recycle and encourage the individual to do so. Further, less investigated psychological factors that could play an interesting role in influencing recycling are self-organization skills and emotions connected to perform (or not) the behavior.

Finally, with regard to contextual factors, it seems possible to affirm that they play an important role in influencing household recycling. In particular, an easy, convenient and affordable service is required in order to assure the individuals' participation in the recycling scheme. The practicality of recycling bins is also important, as well as the characteristics of the products being recycled. Conversely, the effectiveness of incentives such as differentiated disposal fees and bring-back schemes is less clear, as results suggest that they could be effective in supporting recycling, but could also have possible counter-effects and rebounds.

Notwithstanding the extent of the existing literature regarding the determinants of household recycling, further research continues to be necessary to fill some identified gaps. First, under-explored factors merit further investigation, as well as factors leading to inconclusive or conflicting results. Second, from a methodological point of view, the great majority of the analyzed studies relies on self-reported data. Questionnaires and interviews are largely employed in recycling research due to their inexpensiveness and the easiness with which it is possible to collect a wide range of information regarding the individual's behavior. However, the recourse to observational data, or the triangulation of self-reported and observational data[3], are preferable to study recycling, since self-reported data need to be treated with caution, because they often lack of precision and can be subjected to social desirability. Third, a final

[3] A review of these methods will be presented in Chapter 3 of the present thesis.

note is about the conceptual framework underlying this research domain. The findings about factors affecting recycling point at its relational, local and habitual nature, evidencing that consumers' recycling practices cannot be tracked back to one factor but to an intersection of factors that become locally important. This would call for more qualitative investigations of the phenomenon.

CHAPTER 2

PROMOTING HOUSEHOLD RECYCLING: WHAT WORKS

Along with government policies, international agreements, corporate measures and technological innovations, behavioral choices that take place daily in the home environment play an important role in enhancing sustainability. According to OECD (2013), making the environment a priority starts at home, since «all people consume materials and energy in their daily lives, and as such, each person can choose to adopt behaviors that are comparatively better for the environment» (Osbaldiston & Schott, 2012, p. 258). For example, it has been estimated that it would possible to reduce total US CO_2 emissions by 7.4% over the next ten years by applying programs targeting residential energy use and nonbusiness travel (Dietz, Gardner, Gilligan, Stern & Vandenbergh, 2009). Similarly, in the field of household recycling, Milford and colleagues (2015) demonstrated that a seven-month program involving a population of 9,000 households permitted to decrease residual waste of 76.5 tons, saving the environment of 213 tons of CO_2 emissions.

In recent years, motivating people to engage in sustainable behaviors within the setting of the home as a means to address environmental challenges has thus become a priority for national and local governments, not-for-profit

environmental organizations and researchers, resulting in the application of a wide array of behavior change techniques.

In the next sections of this Chapter, interventions applied to promote household recycling will be described classifying them based on six types of persuasive strategies. Their effectiveness will be then compared via a meta-analysis. Finally, the extent to which behavioral determinants described in the literature (and discussed in Chapter 1) are covered in such interventions will be examined.

2.1. INTERVENTIONS USED TO PROMOTE RECYCLING: CATEGORIZATION AND DESCRIPTION

The systematic literature search described in Chapter 1 permitted to collect 47 articles on field interventions implemented to promote recycling. In addition to the inclusion criteria specified in Chapter 1, the identified articles, to be included in the analysis, had to describe field trial(s) using between-group experimental design (comparison between experimental and control group), across time design (ABA, pre/post-test, baseline-intervention design) or implementing a combination of them. As the focus here was on field interventions in real domestic settings, laboratory studies (e.g., those regarding social dilemmas, discrete choice experiments, or simulated recycling behavior), as well as studies on littering and recycling in public settings and work environments were not of interest and were thus not included in the analysis.

The field intervention strategies described in the identified articles have been grouped based on their underlying persuasive strategy. Following (and partly adapting) the recent categorization proposed by Osbaldiston and Schott (2012), such strategies are divided into: prompts and information (27 treatments); feedback (14 treatments); commitment (11 treatments); incentives (11 treatments); environmental alterations (4 treatments) and social modeling (6 treatments). Some studies (8) rely on a combination of strategies. Below each strategy is presented and discussed.

PROMPTS AND INFORMATION. This strategy consists of providing information on recycling (factual, persuasive, or merely reminders) to targeted individuals to encourage recycling behavior. Information can be written or delivered face-to-face. Written information represents perhaps the most common type of intervention to promote recycling, allowing to reach a considerable number of people with low effort and costs (Everett, Jacobs & Peirce, 1991; Miranda & Blanco, 2009; Schultz et al., 1995). Written information includes: **(a) informative fliers and brochures** that advocate recycling and explain how/why to carry it out (Bowman et al., 1998; Burn, 1991; Chong, Karlan, Shapiro & Zinman, 2015; Dupré, 2014; Hopper & Nielsen, 1991; Lord, 1994; Mee, 2005; Rhodes, Beuchamp, Conner, Brujin, Kaushal et al., 2014; Schultz, 1999; White, MacDonnell & Dahl, 2011). In recent years, these traditional methods have been complemented with the use of internet and social networking sites (Eberl, Flannery, Queen, McGrath, Guyer et al., 2009; Mee, 2005); **(b) signs/posters** hung

over the recycling bins in public areas that prompt the correct disposal of items and/or describe the benefits and importance of recycling (Goldenhar & Connell, 1991; Moreland & Melsop, 2014; Schultz, 2011); **(c) reminders** that focus on when to perform the target action, both in the form of colored fliers (Hopper & Nielsen, 1991) and SMS (Buil, Roger-Loppacher & Marimon, 2014; Chong et al., 2015).

Alternatively, information can be delivered face-to-face, by means of: **(a) door-stepping campaigns**, in which people are informed about recycling (e.g., on the existence of a local recycling scheme, on how to correctly sort materials, etc.) during door-to-door visits (Bernstad, 2014; Bernstad, la Cour Jansen & Aspegren 2013; Cotterill et al., 2009; Dai et al., 2015; Grodzińska-Jurczak, Tomal, Tarabuła-Fiertak, Nieszporek & Read, 2006; Read, 1999; Timlett & Williams, 2008; Willman, 2015); and **(b) in-person demonstration activities**, with the distribution of recycling bins, bags and educational resources (e.g., pamphlets specifying the location of recycling facilities and listing the materials accepted for recycling) (Chase, Dominick, Trepal, Bailey, & Friedman, 2009; Iyer & Kashyap, 2007; Mee, 2005). Door-stepping campaigns are often considered to be more effective than fliers and brochures, but they are costly and contact rates are usually low (30% on average) (Dupré, Dangeard & Meineri, 2014; Timlett & Williams, 2008). It seems thereby preferable to use them only under specific conditions (e.g., low participation, low awareness), and to carefully select the areas targeted by the intervention.

As pointed by Schultz (2002), interventions based on information dissemination rest on the assumption that people who are more aware of the

consequences of poor recycling are more likely to engage in sustainable waste disposal. Indeed, lack of information and knowledge is recognized as one of the main barriers to both participation in recycling schemes (Alexander et al., 2009; Perrin & Burton, 2001) and the quality of recycling activity (Smeesters et al., 2003). In other words, it is believed that increasing the individuals' knowledge, it will translate into a behavioral change. Knowledge in itself, however, is not sufficient to trigger recycling. That is, simply giving information to the individuals about how to correctly perform recycling does not assure that they will change their behavior accordingly. Consumers may indeed not understand the information received, as it is too vague, general or not useful (Refsgaard & Magnussen, 2009), or they may refrain from getting familiar with the information made available to them (Ojala, 2008). In addition, it is unlikely that information in itself can lead people to use recycling services that are difficult to use, inappropriate or badly run (Pocock, Stone, Clive, Smith, Jesson et al., 2008). Two factors in particular appear to be critical in enhancing the effectiveness of interventions based on information provision:

(a) timing: according to McKenzie-Mohr (2013), disseminating information can lead to changes in recycling behavior when lack of knowledge is the main barrier to action, namely when people are motivated to recycle, but they do not know exactly how to do it (i.e., at the start of a new recycling program or when the existing program changes or is particularly complex; Schultz, 2002);

(b) content of the message: to enhance the strength of an information campaign, information provided has to be calibrated on the specific

characteristics of the group targeted by the intervention (Pocock et al., 2008; Thomas et al., 2003). Low/non recyclers, for example, are generally more interested on having a clearer understanding about how to practically carry out recycling; mid/high recyclers, on the other hand, appear to be more interested in the outcomes of recycling and in what happens to recycled materials.

FEEDBACK. This intervention strategy consists of providing either individuals or groups with information regarding their recycling behavior along with a comparison with a predefined standard, so as to show the difference with the standard and motivating them filling the gap. According to Dupré and colleagues (2014), different feedback characteristics concur to determine its effectiveness:

(a) the nature of the comparison: feedback can provide the individual with information regarding the effects of his/her current recycling behavior compared to past behavior. The interventions using this type of comparison proved to be effective in increasing participation rate, the amount of recyclables collected, and in decreasing contamination (De Young et al., 1995; Perrin & Burton, 2001; Schultz, 1999; Timlett & Williams, 2008). As evidenced by Abrahamse and Steg (2013), feedback about individual performance may work by enhancing the recycler's perceived self-efficacy, namely his/her feeling of being capable of engaging in recycling behavior.

Alternatively, the standard used for comparison can be the behavior of other individuals/social groups. In this case, feedback consists of providing

people with information regarding their own performance (e.g., "*last month you recycled X kg of paper*"), compared directly to the performance of other people (e.g., "*last month your neighbors recycled Y kg of paper*"), evoking social comparison mechanisms that activate upward/downward comparisons (Festinger, 1954). Similar to feedback based on social comparison is group feedback, namely feedback based on the recycling performance of an entire group (neighborhood, residential complex, etc.) instead of the performance of a single individual/household. In this case, the mechanism underlying feedback effectiveness is the evocation of a feeling of collective efficacy, since people are more likely to change their behavior when engaged as part of a group (Abrahamse & Steg, 2013; Phillips & Rowley, 2011). Various studies used group feedback and feedback based on social comparison, finding that these two types of feedback are generally effective in improving recycling (Bowman et al., 1998; De Leon & Fuqua, 1995; De Young et al., 1995; Goldenhar & Connell, 1991; Milford et al., 2015; Nomura, John & Cotterill, 2010; Schultz, 1999). It is important to note that, according to social comparison theory (Festinger, 1954), people tend to compare themselves to others considered similar. The effect of feedback based on social comparison and group feedback is thereby enhanced when conveying information about the performance of a group of similar others (e.g., the households living in the same neighborhood), that is, when it provides a meaningful standard against which the individual can actually compare his/her behavior (Abrahamse & Steg, 2013; Nomura et al., 2010; Schultz, 2002). In addition to that, feedback that conveys messages about recycling behavior being

'normal' and 'what most other people do' can inform people about an existing recycling social norm, and thus encourage them to recycle (Phillips & Rowley, 2011; Thomas & Sharp, 2013);

(b) data visualization: data regarding the individual's recycling behavior can be presented in a textual or graphical format, as well as using a combination of the two. According to Bosch and Kanis (2013), «it seems important to present the positive effects of the desired sustainable behavior in ways that are meaningful, transparent and easy to relate to» (p. 50). Data regarding the individual's performance (and its consequences) have thereby to be translated into readily understandable and actionable information. This can motivate behavior change by counteracting what is referred by Dourish (2010) as the scalability problem, namely the difficulty experienced by people in visualizing the consequences of their own contribution to the overall environment;

(c) the channel through which feedback is provided: alongside more traditional means (e.g., newsletters, mails, leaflets, door-hangers, etc.), in recent years new communication channels have been employed to convey feedback on pro-environmental behaviors, such as web sites and social networking sites. Moreland and Melsop (2014), for example, provided a group feedback to the students living in a US university residence hall through the Facebook page of the recycling program. In the same page, information on how to improve recycling performance as a group was posted if students were doing poorly.

Furthermore, the pervasive diffusion of the Internet and the potentialities offered by new mobile technologies have led to the development of eco-feedback

technology, namely computer-based feedback systems aimed at reducing the environmental impact of consumption behavior. Differently from paper-based feedback, these systems can automatically sense the consumers' activity (e.g., the amount of recyclables collected in a certain period of time) and send timely and tailored feedback on the consumers' personal mobile device or on ambient displays (Froehlich, Findlater, & Landay, 2010). In the domain of recycling, some prototypes have been designed, developed and tested with promising results (Berengueres, Alsuwairi, Zaki & Ng, 2013; Bosch & Kanis, 2013; Casado-Mansilla, Foster, Lawson, Garaizar & López-de-Ipiña, 2015; Centieiro, Romão & Dias, 2011; de Kruyff, Steentjes & Shahid, 2011; Gartland & Piasek, 2009; Hasan, Medland, Foth & Curry, 2013; Paulos & Jenkins, 2006; Reif, Alt, Hincapié Ramos, Poteriaykina & Wagner, 2010; Thieme, Comber, Miebach, Weeden, Krämer et al., 2012; Yalvaç, Lim, Hu, Funk & Rauterberg, 2014). According to Boulay et al. (2014), communication channels based on the internet and eco-feedback technologies appear to be particularly effective amongst people who are already engaged or enthusiastic about recycling;

(d) feedback frequency: as highlighted by Nomura and colleagues (2010), feedback appears to be most effective when reiterated over time.

For Katzev and Mishima (1992), feedback is successful in fostering household recycling because it can overcome the lack of information about the consequences of waste disposal. On the other hand, feedback interventions can be impractical (especially when they refer to the performance of single individuals/households), since they require continuous monitoring of recycling

behavior. In addition to that, some authors argue that simply informing people about the consequences of their behavior does not automatically imply a behavioral change (Tabanico, 2013).

COMMITMENT. In the interventions using commitment, individuals commit to produce a certain behavior or reach a certain goal. This technique is believed to work due to the motivation of the individuals to appear consistent, since inconsistency (e.g., a person says s/he will do something and then does not do it) is commonly viewed as a social undesirable trait (Cialdini, 1988). Eight studies (reporting 11 different interventions) have investigated the effects of commitment on household recycling, including private versus public, individual versus group, and written versus oral commitment, obtaining variable results.

Written individual commitment has been found to be effective in enhancing both actual and self-reported recycling participation (Dupré, 2014; Wang & Katzev, 1990; Werner, Turner, Shipman, Shawn Twitchell, Dickson et al., 1995), as well as in decreasing the use of grass bags (Cobern et al., 1995) and contamination rate (De Young et al., 1995). Similar results were found by Wang and Katzev (1990) using group commitment in two different field trials. In another study, participants signed a letter making a public commitment to recycle and giving permission to publish their names in a local newspaper, but the group recycling performance did not improve after the intervention (De Leon & Fuqua, 1995). In addition to that, Bryce, Day and Olney (1997) evidence that financial commitment (i.e., participants were requested to pay for their recycling

bins) was less effective than making an explicit verbal commitment to participate in a curbside recycling program, but that even in this latter case differences in participation rate were slight with respect to a control group.

Some of the studies highlight that commitment is more effective in changing recycling behavior than information provision via fliers and brochures (Dupré, 2014; Werner et al., 1995) and incentives (Wang & Katzev, 1990). Wang and Katzev (1990) evidence also that individual commitment appears to be more effective than group commitment. Despite these results, the number of studies applying commitment to promote household recycling has been declining since the 1990s. According to Dupré (2014), this may be due to the difficulties in measuring the effect of the different independent variables and by the absence of homogeneity in the adopted experimental procedures, which vary considerably among studies and do not always allow for accurate comparisons between results. In addition to that, commitment appears to be a strategy difficult to be applied to society at large.

INCENTIVES. Incentives refer to any kind of benefit (e.g., monetary rewards, refund and unit pricing programs, gifts, prizes, lottery tickets, discount coupons, etc.) received by consumers as a result of their participation in a recycling program. According to Bell, McGeevor, Mocca and Shaw (2013), incentives are assumed to provide the extrinsic motivation needed to encourage behavioral change among those whose intrinsic motivation is low, by means of overcoming monetary, time or effort-related personal costs. In addition, incentives they can

have a 'signalling' effect, raising awareness about the importance of recycling. One of the analyzed studies (Fullerton & Kinnaman, 1996) examined the effects of the introduction of a unit pricing recycling program, finding that it produced a 16% increase in the weight of recyclables collected, but also that it resulted in a certain amount of illegal dumping. The remaining studies analyzed the effectiveness of lotteries, gift and discount vouchers, highlighting that:

(a) interventions providing incentives on an individual basis seem to be more effective than those awarding the users based on the performance of the whole group (Diamond & Loewy, 1991; Harder & Woodard, 2007);

(b) the possibility of an immediate large payoff from the winning of a lottery (probabilistic reward) seems to induce a greater level of participation in recycling than receiving a certain reward (e.g., a cash payment) (Diamond & Loewy, 1991). To maximize the long-term effectiveness of lotteries, there should be many small prizes in order to increase the number of people who win, since winners show the greater and more persistent behavioral and attitudinal change;

(c) the effectiveness of the incentives is the same in areas with different affluence levels, but it varies depending on the initial participation rate in the recycling scheme: that is, the lower the initial participation rate, the higher the increase achieved (Harder & Woodard, 2007).

Despite the potential of increasing recycling, incentives demonstrate three major disadvantages. First, they may be impractical, as they require continuous monitoring of recycling behavior. Second, often they are not cost-effective, since their cost can outweigh the economic benefits of recycling (Burn, 1991; Schultz et

al., 1995). The third issue concerns the long-term effectiveness of this type of intervention, since, according to Schultz et al. (1995), after the termination of a reward program recycling typically tends to return to baseline levels. This may be explained by the so-called over justification effect (Burn, 1991), that is «the tendency for external rewards to reduce intrinsic motivation because individuals come to believe that the reason they are performing an activity is for the extrinsic reward. Therefore, when the reward is withdrawn so is the reason for performing the behavior» (p. 612).

ENVIRONMENTAL ALTERATIONS. This type of intervention consists of making recycling more convenient and easy to perform by modifying the physical environment, for instance by increasing bins proximity or number, changing their appearance, or providing home equipment for sorting waste. The interventions based on changing situational conditions proved to be highly effective in increasing household recycling. With regard to curbside recycling, Chong et al. (2015) found that the provision of personal recycling bins increased the amount of recyclables collected and the frequency with which they were turned out to the curb. They found also that providing personal bins was a more effective technique than using informative fliers. Phillips and Rowley (2011) affirm that the provision of recycling bins to households is a good example of nudge: the presence of recycling bins in homes would serve as a cue, prompting people to recycle by changing the context in which recycling decisions take place. The remaining studies demonstrated that adding new bins to public collection

points or moving them to a more convenient location (i.e., augmenting their proximity to recyclers) positively affected drop-off recycling behavior, increasing both the amount of recyclables collected and their quality (i.e., decreasing contamination) (Boonrod, Towprayoon, Bonnet & Tripetchkul, 2015; Lin, Wang, Li, Gordon & Harder, 2015; Rousta et al., 2015). According to Schultz et al. (1995), this is due to the fact that this intervention technique reduces recycling costs by minimizing the amount of effort required to perform it. The study of Lin and colleagues (2015) highlighted also the benefits of using brightly colored recycling bins in public setting, in order to make them more salient to potential recyclers, and increasing their awareness of the existence of the recycling program.

SOCIAL MODELING. Interventions based on social modeling include «any kind of passing of information via demonstration or discussion in which the initiators indicate that they personally engage in the behavior, also» (Osbaldiston & Schott, 2012, p. 272). The effectiveness of this type of intervention rests on Bandura's learning theory (1977), which assumes that people learn through observation of the behavior of others, imitating this behavior especially when it is relevant, easily understandable and permits to the individual to reach meaningful and positive outcomes.

The first of the social modeling strategies adopted in the examined studies consists of recruiting community members who already participated in a recycling program to act as block leaders, i.e., to model recycling behavior and to inform and convince the non-recycling members to participate in their turn. The

three studies that analyzed the effect of block leaders on household recycling found that the intervention increased participation and positively affected norms and attitudes toward recycling (Burn, 1991; Dupré, 2014; Hopper & Nielsen, 1991). In addition, these studies highlight that using block leaders was more effective than the sole information provision. Similar results on recycling accuracy (but not on amount of recyclables collected) were found by Moreland and Melsop (2014), who employed students volunteered to be "Zero Waste Agents" and to disseminate recycling practices among their suitemates in the campus of a big US University. Another study (Lin et al., 2015) examined the use of volunteer advisers standing beside the communal waste collection points for some hours a day for three consecutive weeks, after the launch of a new recycling program. The advisors reminded and encouraged residents to recycle, physically demonstrated them how to do it correctly, and answered questions. Results highlight that after the intervention the amount of food waste correctly disposed of increased significantly with respect to a control group, with low level of contamination. The use of volunteers, however, did not outperform another intervention, i.e., the introduction of new colored bins to communal waste collection points. Finally, Maddox, Doran, Williams and Kus (2011) investigated the effect of an educational school-based campaign in which children acted as social models to improve their parents' recycling behavior; the intervention was effective in increasing both participation rate and the amount of recyclables collected, as well as children's and families' knowledge of recycling procedures. It seems thus possible that children may act as a catalyst for the change of their

parents' recycling behavior, by means of taking home from school recycling-related messages and knowledge (Scott et al., 2015).

According to Burn (1991), the use of social modeling techniques is effective as it communicates to the individuals that other people are recycling, engendering a social recycling norm. Awareness that other similar people are recycling may not only suggest that the individual's action can make a real difference (since others are performing it also), but may also lead him/her to perform the behavior due to a desire for social approval. In addition, models can act as an interactive source of information, tailored to the needs of each individual (Lin et al., 2015). An advantage of interventions based on social modeling is their cost-effectiveness. A possible weakness depends on being contingent upon the extent to which residents see themselves as part of the community (Schultz et al., 1995).

2.2. META-ANALYSIS OF INTERVENTIONS EFFECTIVENESS

2.2.1. METHOD

Following Crocetti (2016), the 47 collected studies on field interventions were analyzed in order to extract relevant information related to publication type, study type and effect sizes:

(a) publication-related information: authors; publication year; publication type (journal, conference paper);

(b) study-related information: type of study (empirical, review); purpose and hypotheses; participants (number and type); type of intervention; duration and phases of the intervention; type of activity under examination (curbside vs. drop-off recycling); outcome variable(s);

(c) data for effect sizes computation, such as means, *SD*s, sample size, counts/frequencies, *F* and *t* statistics, Chi square, *p*-values.

From the original 47 articles, four studies were excluded because they were descriptive reviews not reporting any statistical data on the effectiveness of the various types of intervention, six studies were excluded because they reported only survey data as a measure of the intervention effectiveness, and one final study was excluded because insufficient statistical information was provided to enable the computation of an overall effect size. 36 studies were thereby included in the meta-analysis, describing a total of 70 interventions. The details of the interventions are illustrated in Appendix B by reporting type of recycling, number of participants, dependent variable(s), intervention phases and duration, short and long-term effectiveness, as well as the computed effect sizes. For each of the considered interventions, Comprehensive Meta-Analysis (CMA) 2.0 (Borenstein, Hedges, Higgins & Rothstein, 2005) was used to calculate the overall effect size (Hedge's *g*, which indicates the standardized mean difference between the intervention group and a comparison group - or between pre and post-intervention measures - on a certain outcome variable). When non-significant results were reported without any supporting statistics, $p = .50$ was assumed (Rosenthal, 1991). When more than one outcome measure was reported for the

same intervention (e.g., participation rate and the amount of recyclables collected), the average effect size was computed to avoid double counting of participants. In order to account for the non-independence of data originated from the same study, the average effect size was computed controlling for the correlation among outcome measures (Borenstein, Hedges, Higgins & Rothstein, 2009). Both interventions using two-group posttest-only designs and pretest-posttest designs were included in the analysis, following the instructions provided by Morris and DeSchon (2002) for computing the different effect sizes.

CMA was used also to pool effect sizes across studies and estimate the overall effect size, using a random-effects model. This model assumes that the average effect size in the population varies randomly from study to study. It thus considers not only the sampling error as the unique source of variability in the observed effect sizes (as the fixed-effects model), but also the between-study variability. This is a more conservative approach that permits to generalize results beyond the studies included in the meta-analysis (Borenstein et al., 2009; Crocetti, 2016; Field & Gillett, 2010).

Q and I^2 statistics have been calculated to assess homogeneity between studies, while the potential publication bias was assessed using various indices, that is two tests for asymmetry of the funnel plot (Begg & Mazumdar, 1994; Egger, Smith, Schneider & Minder, 1997), a trim and fill analysis (Duval & Tweedie, 2000) and the Rosenthal's fail-safe *N* (Rosenthal, 1991). Publication bias refers to the situation that occurs when published studies (which can be more

easily retrieved) differ from unpublished ones (e.g., grey literature), and can be a threat for the conclusion of a meta-analysis (Crocetti, 2016).

2.2.2. RESULTS

The forest plot depicting the computed effect size (and the associated 95% CI) for each of the interventions is reported in Figure 2.1, while the summary of meta-analytic results is reported in Table 2.1. The overall Hedge's g is .29 (95% CI [.24, .33], $p < .001$), which indicates a statistically significant, small-to-medium effect (Cohen, 1988). The test of homogeneity reveals that this result was characterized by significant (as indicated by $Q = 10{,}742.04$, $p < .001$) and large (as indicated by $I^2 = 99.36\%$) heterogeneity, highlighting the need to conduct a moderator analysis to test whether the use of different types of intervention can explain the heterogeneity of findings.

Type of intervention emerged as a significant moderator ($Q(6) = 112.21$, $p < .001$). As illustrated in Table 2.2, social modeling proved to be the most effective intervention technique, followed by environmental alterations, combined interventions, prompt and information, incentives, commitment and feedback.

Egger's linear regression method ($t(68) = 1.96$, $p = .05$) and Begg and Mazumdar's rank correlation method ($T = .23$, $p < .01$) were used to test the asymmetry of the funnel plot, highlighting the presence of a possible publication bias. A trim and fill analysis was thus conducted to assess its severity and to estimate the adjusted effect size when publication bias is taking into account. A

total of 27 studies were trimmed, and the adjusted Hedge's g was equal to .09 (95% CI [.04, .14], Q = 20,620.95). The impact of the publication bias was thus moderate (i.e., including in the meta-analysis more studies reporting interventions with non-significant results, the estimated effect size would lower from a small-to-medium to a small one). Rosenthal's fail-safe N indicated, however, that 3,815 further studies with an effect size equal to zero would be included in the meta-analysis to make the overall effect size non-significant. According to Rosenthal (1979), a fail-safe N higher than $5k + 10$ (where k = number of studies included in the meta-analysis) support findings' robustness. It is indeed likely that some existing studies have been not located, possibly because they were never published due to their non-significant results, failing to being included in the meta-analysis. However, it seems highly unlikely that there exist 3,815 further studies all having null results.

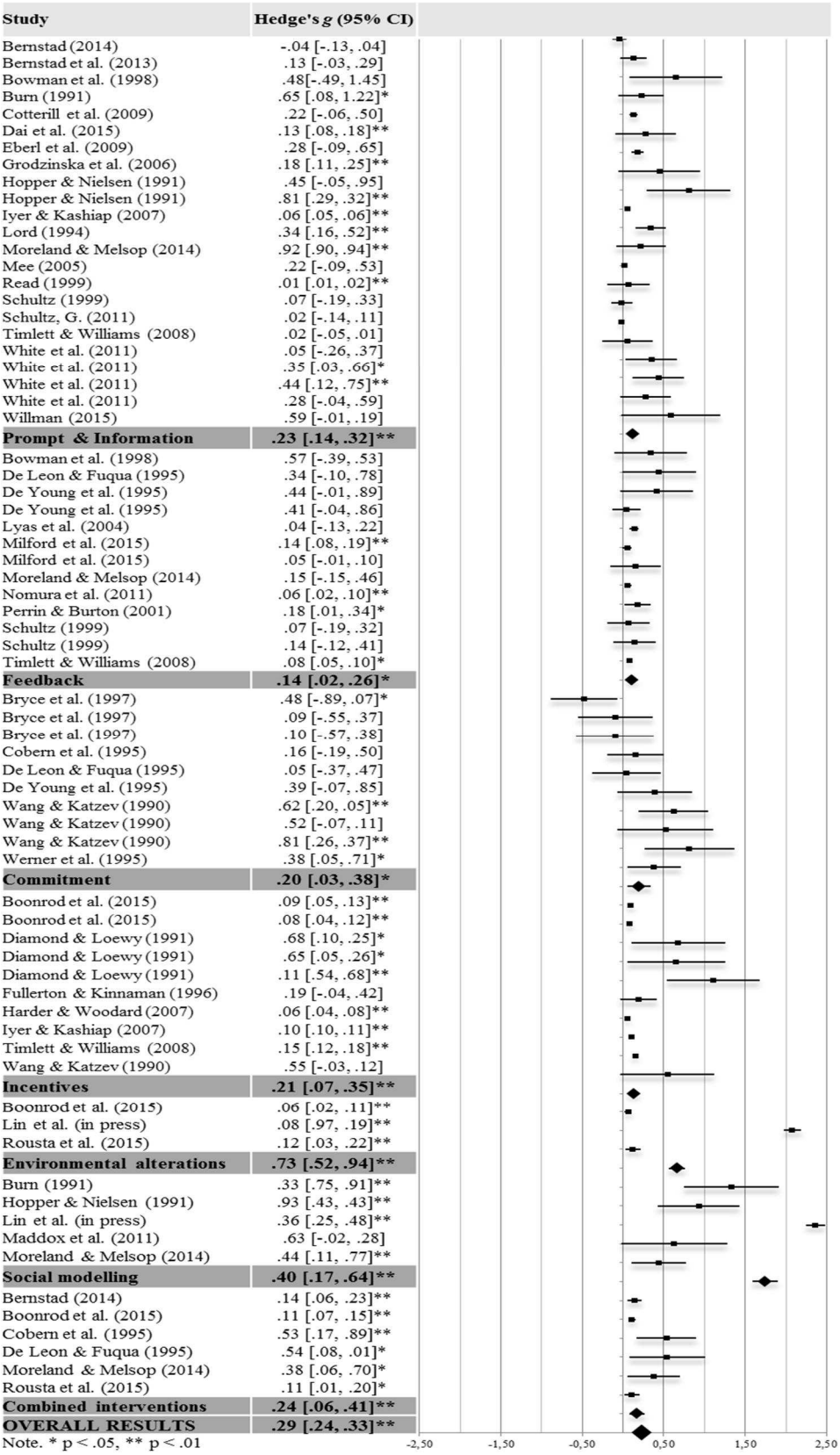


FIGURE 1.1. *The forest plot depicting the computed effect size (and the associated 95% CI) for each of the interventions included in the meta-analysis. The diagram was elaborated using the Excel spreadsheet provided in Neyeloff, Fuchs & Moreira (2012).*

TABLE 2.1. *Summary of meta-analytic results for differences in interventions effectiveness to foster household recycling.*

			Heterogeneity		Moderator analysis	Publication bias			
	k	Hedge's *g* [95% CI]	*Q*	I^2	*Type of intervention* *Q* (6)	Egger's Test	Begg & Mazumdar's Test	Fail-Safe *N*	Trim and Fill
Overall results	70	.29* [.24, .33]	10,742.04*	99.36	112.21*	1.96	.23	3,815	27

Note. *k* = number of interventions; Hedge's *g* = standardized mean difference; * $p < .001$.

TABLE 2.2. *Comparison between the effectiveness of the different types of intervention used to promote household recycling. In addition to the general effectiveness, the results differentiated for curbside and drop-off recycling are reported.*

	Total	Prompts & information	Feedback	Commitment	Incentives	Environmental alterations	Social modelling	Combined interventions
Overall results	70	23	13	10	10	3	5	6
	.29 [.24, .33]	.23 [.14, .32]	.14 [.02, .26]	.20 [.03, .38]	.21 [.08, .35]	.73 [.52, .94]	1.40 [1.17, 1.64]	.24 [.06, .41]

Note. The upper values in each cell indicate the number of interventions described in the analyzed literature; the lower values correspond to the average effect sizes [95% CI].

2.3. INTERVENTION STRATEGIES AND DETERMINANTS OF HOUSEHOLD RECYCLING

Finally, the relationship between determinants and interventions has been investigated, in order to analyze the extent to which the persuasive strategies adopted during field interventions cover the determinants of household recycling highlighted by the psychological literature. Generally, intervention-based research and research on underlying determinants of recycling are only weakly connected. That is, the great majority of studies outlining the

determinants of recycling gives little or no indications regarding effective methods to change the individuals' behavior accordingly. Conversely, the interventions used to promote recycling rarely have a clear reference to theory and to precise underlying determinants. The aim here is thus to try establishing a stronger connection than it exists now between intervention-based research and determinants-based research, so that the design of future interventions can benefit from the results and advances of both perspectives. Merging these results is useful also for evidencing existing gaps of the interventions implemented until now, helping to delineate possible strategies to overcome them and increase this way interventions effectiveness.

As described in Chapter 1, 211 articles investigating factors that can explain why people recycle or not when at home were found during the literature search. Through the analysis of this literature, 24 factors have been extracted, named after existing analytical reviews (Miafodzyeva & Brandt, 2013; Schultz et al., 1995) and grouped according to a taxonomy partly based on Iyer and Kashyap (2007), consisting of three categories of factors: socio-demographic, psychological and contextual (Table 2.3; for a complete review of this literature, see Chapter 1).

TABLE **2.3.** *The determinants of household recycling identified through the analysis of the relevant scientific literature and grouped according to Iyer and Kashyap (2007). For each factor, a brief description is reported.*

SOCIO-DEMOGRAPHIC FACTORS	AGE, EDUCATION LEVEL, INCOME, GENDER, HOUSEHOLD SIZE, HOUSEHOLD TYPE, EMPLOYMENT STATUS and ETHNICITY
PSYCHOLOGICAL FACTORS	INFORMATION AND KNOWLEDGE - information that a recycling scheme exist; knowledge about what, where, when and how to recycle CONVENIENCE - perceived difficulty in carrying out recycling, perceived lack of time/space, perceived effort SOCIAL INFLUENCE - perceived support/pressure, beliefs about the behavior of others, social comparisons RESPONSIBILITY - moral obligation (perceptions about personal responsibility for recycling/internal locus of control) GENERAL ENVIRONMENTAL ATTITUDES - general positive/negative attitudes toward the environment BELIEFS/PERCEPTIONS OF RECYCLING CONSEQUENCES - information and beliefs about the consequences of (not) recycling (why-information) SPECIFIC RECYCLING ATTITUDES - specific positive/negative attitudes toward recycling MOTIVATION - intrinsic/extrinsic motivation(s) to recycle PAST EXPERIENCE - habits, past recycling behavior SELF-ORGANIZATION SKILLS – behavioral skills EMOTIONS - positive/negative emotions connected to recycling PERSONALITY CHARACTERISTICS - personality traits connected to recycling (e.g., conscientiousness, collectivism, etc.)
CONTEXTUAL FACTORS	SERVICE CHARACTERISTICS - type of collection system, waste collection frequency, provision of free recycling bins/bags, whether recycling program is mandatory or not INCENTIVES - unit pricing, rewards, refund programs RECYCLING BINS - bins' color, shape, practicality and capacity PRODUCT CHARACTERISTICS - the shape of the product that has to be recycled, the material(s) composing it, its cleanliness/dirtiness

All the interventions were examined in order to analyze which of the identified determinants they targeted. The results are illustrated in Figure 2.2. As a first remark, it emerged that such determinants were often not clearly identified in the method. Furthermore, only five studies reported a pre-trial qualitative or

quantitative analysis aimed at enlightening the needs of people involved in the intervention campaign, as well as the barriers that obstacle/reduce the adoption of the desired behavior. As noted by Tabanico and Schultz (2007) commenting on recycling campaigns conducted in US, «it is surprising that so little attention is paid to the 'people' aspect of recycling programs» (p. 41), and that so many campaigns seem to be based only on the perceptions of the designers or on the priorities of the service provider, instead of on any identified need of the recipients (Tucker & Speirs, 2002; Jesson, 2009).

Figure 2.2 also points at the determinants that are neglected by most interventions. Motivation, information and knowledge, beliefs/perception of recycling consequences and social influence are widely covered. Instead, individual background factors (such as age, personality traits, recipients' general attitudes toward environment and specific attitudes toward recycling, emotions, past experience with recycling, self-organization skills) as well as contextual factors (the role played by the different service characteristics) are seldom considered. These missing factors are to be discovered through a preliminary investigation of the targeted population. Despite it might be considered time-consuming and/or expensive in the economics of a field intervention, it is instead important to connect the planning of the intervention with a deeper knowledge of the recipients and their characteristics, especially when the effectiveness of the intervention is based on personalization of contents (e.g., information, feedback, recommendations, etc.). Different intervention strategies or communication channels may be indeed appropriate for different groups of individuals.

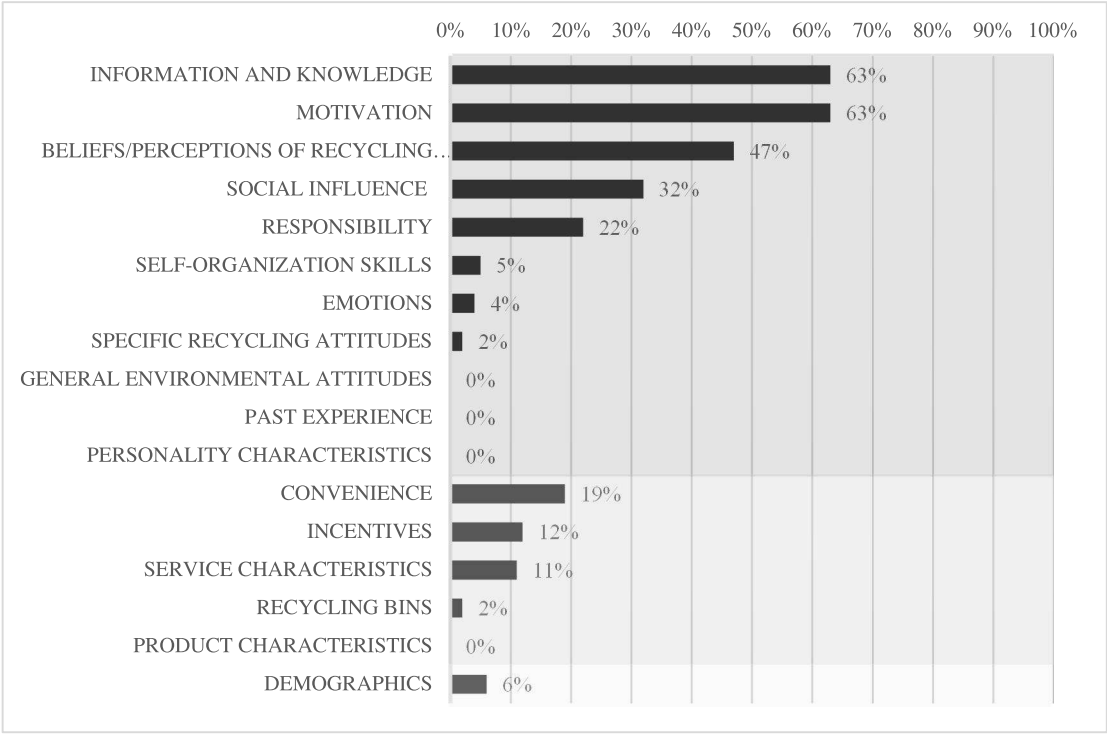


***FIGURE* 2.2.** *The percentage of interventions taking into consideration each of the identified determinants of recycling behavior. The different shades of grey on the background indicate different types of underlying determinants (psychological, contextual and socio-demographic).*

2.4. CONCLUSIVE REMARKS AND SUGGESTION FOR FUTURE RESEARCH

The review presented in this Chapter illustrates the different rationales at the basis of persuasive strategies informing field interventions to promote household recycling. The most effective ones, according to the meta-analysis conducted here, are social modeling and environmental alterations. Smaller effect sizes were observed for the provision of prompt and information, incentives, commitment and feedback. Coherently with previous research, it appears thus that simply providing people with information about how to

recycle is useful, but it is not the most effective strategy in order to encourage behavior change, since people do not behave in a certain manner only because they have been made more knowledgeable about how to perform the behavior in question (Tabanico, 2013). Interventions based on social modeling techniques result more effective probably because face-to-face interaction allows the passage of personalized information, that is, information tailored on the individuals' actual needs instead of general ones, and the use of a person who also models the desired behavior permits people to acquire some practical skills to correctly manage waste, due to the observation (and subsequent reproduction) of the behavior performed by the model. Making recycling more convenient by means of different types of environmental alterations (e.g., by providing people with personal recycling bins or by moving public recycling containers to a nearer location) is useful in enhancing recycling levels due to the fact that the more convenient the behavior, the greater the number of people who will adopt it, since less required effort is perceived. In addition, environmental alterations have been demonstrated to be particularly effective in changing habitual behaviors such as recycling, since they disrupt the environmental cues that trigger automatically the habitual performance of the behavior (Verplanken & Wood, 2006). Interventions combining sinergically different strategies also appear to be particularly effective since they permit to act simultaneously on different behavioral barriers, as noted also by other authors (Tucker & Speirs, 2002; Nixon & Saphores, 2009; McKenzie-Mohr, 2013). The advantages are particularly evident in the case of commitment, the efficacy of which is increased

when it is applied in combination with other techniques such as feedback or block-leaders. On the contrary, an explanation for the findings highlighting the lower effectiveness of incentive-based methods (compared to other techniques) could be that most people cite as primary reasons for recycling cooperative and social motives, such as civic duty, fairness, morality and preserving the environment (Smeesters et al., 2003), not considering extrinsic drivers (such as prizes or money) as valid reasons as the intrinsic ones. Finally, with regard to feedback, the main problem could be related to the way it is provided (the channel used, its frequency, etc.) and/or to poor design of its contents, perhaps making the vehicled messages less persuasive.

The examination of the underlying factors considered in each intervention showed that some of them are severely underrepresented, namely those that would make such interventions better tailored to the targeted recipients and context. Those factors are addressed by the psychological literature on household recycling (see Chapter 1), but are rarely included in the design of the intervention strategies. However, as noted by Southerton, McMeekin and Evans (2011, p. 4), «simple imitation of an apparently successful initiative is unlikely to be effective. Attempts to transfer initiatives need to be sensitive to local factors: natural endowments, social norms, existing material infrastructure, and institutional arrangements». This underlines the urge to conduct preliminary in-depth research aiming to uncover the underlying determinants and barriers of household recycling in the context under examination, and to design the interventions accordingly, using the strategy (or combination of strategies) that

permits to better address the emerging behavioral barrier(s) (McKenzie-Mohr, 2013). On the basis of such a preliminary analysis, it might also be possible to segment people, in order to tailor the intervention strategy to the needs of specific audiences (Jesson, 2009; McKenzie-Mohr, 2013; Tucker & Speirs, 2002). Xu, Lin, Gordon, Robinson and Harder (in press), for example, found that the planned publicity and awareness-rising events often occurred during the time of the day in which younger people (which turned out to be the segment of population recycling less) were at work, evidencing the need to design in future some events better targeted for them. Similarly, other studies demonstrate that segmenting audience is important, since different communication channels are needed for reaching different types of recipients. For example, it has been shown that ethnic minorities are more sensitive to recycling messages provided by cultural or religious authorities (Perry & Williams, 2007), while social media and websites are more useful to reach and inform committed recyclers than low and non-recyclers, since committed recyclers appear to be more prone to actively search for environmental and recycling-related information (Andersson & von Borgstede, 2010; Boulay et al., 2014). Preliminary qualitative research able to highlight existing habits, norms and values would also make the intervention more convincing to its recipients. This point has been made clear strongly in the neighbor field of energy conservation, where it is recommended to empower users instead of conditioning them to adopt predefined routines, offering them sustainable behavioral alternatives that are at the same time able to preserve the

values served by old, unsustainable habits (Brynjarsdottir, Håkansson, Pierce, Baumer, DiSalvo et al., 2012).

The results of the meta-analysis highlight that various types of interventions are successful in increasing recycling behavior for the duration of the intervention itself. However, long-lasting effects of these treatments remain largely untested, with obvious negative implications for policy-makers and community leaders. Methodologically, it is thus recommended to provide more, well-documented information on the long-term effectiveness of the implemented interventions. Some methodological recommendations could also relate to the method used to evaluate the interventions. Using more than a single indicator to reflect the success of the intervention might increase the reliability of the results, since interventions may have differential effects in relation to different indicators, and focusing on just one of them could lead to misleading conclusions (Bernstad et al., 2013; Schultz et al., 1995). For instance, only a few studies have assessed the effects of the interventions taking into consideration both quantity and quality (contamination) of waste recycled, though how well people participate in the recycling scheme has been found to be as important as whether they do so or not (Timlett & Williams, 2008). Moreover, it is recommended to reduce the reliance on self-reported data. Several studies reporting a comparison with actual data highlight indeed a significant gap between what people say they would do and what they actually do (Oskamp, 1995; Corral-Verdugo, 1997; Timlett & Williams, 2008). The inaccuracy of self-reported measures can be explained by different factors, such as social desirability of responses (i.e., an exaggeration in reported

recycling due to the belief that it is a morally good behavior and that the respondent should be undertaking it; Tucker, 2003), the effects of time and memory, or the individual's lack of knowledge/willingness to answer correctly (Corral-Verdugo, 1997).

The recourse to ICT-based interventions could facilitate the labor-intensive process of data collection, such as the monitoring of the number of residents participating in the recycling program or the amount and quality of recyclables collected. The recent developments in pervasive trash-tracking technology, in this sense, are particularly promising. This technology is based on the use of barcode and RFID (Radio Frequency IDentification) tags, which permit to track the type and amount of waste collected and can be also exploited by mobile applications to log and track recycling-related activities. The benefits of this technology are several, including the possibility to assess how effectively curbside recycling programs work and to grant incentives based on participation rates (Greengard, 2010; Saar & Thomas, 2002). In Philadelphia, for example, an RFID-based recycling system called RecycleBank was piloted in 2006. A high-tech bin measured the volume of recyclables contained within it. Households received cash awards based on the amount of plastic, glass, and other materials they contributed. Recycling participation rates among the 2,500 residents who initially subscribed to the program rose from 25% to 90%. In addition to that, the average household increased the volume of recyclables from less than 5% to more than 50%. Trash-tracking technology also allows to follow individual items, components and subcomponents during the disposal process to ensure that they

are recycled or disposed of correctly, and to weight trucks as they go to landfills to better understand loads and how to establish more efficient routes and service patterns (Greengard, 2010; Phithakkitnukoon, Wolf, Offenhuber, Lee, Biderman et al., 2013). On the negative side, tracking garbage presents the cost of adding tags and readers to the removal chain, the need to recycle tags, and raises privacy issues (Binder, Quirici, Domnitcheva & Stäubli, 2008).

PART II
INVESTIGATING HOUSEHOLD RECYCLING IN THE ITALIAN CONTEXT

DON'T LET US FORGET THAT THE CAUSES OF HUMAN ACTIONS ARE USUALLY IMMEASURABLY MORE COMPLEX THAN OUR SUBSEQUENT EXPLANATIONS OF THEM.

Fyodor Dostoevsky

CHAPTER 3

RESEARCH QUESTIONS AND METHODS

As discussed in Chapter 1 and 2, household recycling is a prerequisite to enhance the sustainability of waste management practices, given the possibility it offers to reduce pollution and the need for conventional waste disposal in landfills or incinerators. Although in the last few decades a great number of studies analyzed the factors that can promote or prevent household recycling, its comprehension is still far from being exhaustive and a number of relevant questions are still unanswered. Some of these include: (1) Which are the most common sorting errors and informative gaps that can undermine the effectiveness of recycling at the household level? (2) How do people assign a value to objects and products to be discarded? Does it influence the choice to recycle rather than throw them in the garbage? (3) Which are the factors that motivate people to recycle? (4) How do people justify defective recycling episodes? (5) How are recycling habits developed and maintained by people over time? (6) What do people think about the behavior and responsibilities of other social actors involved in recycling process, and how does it influence their own behavior?

The experimental part of this thesis attempts to address these questions by investigating the drivers of recycling (such as knowledge, motivations, beliefs,

etc.), as well as the mechanisms underlying its adoption and maintenance over time. The aim is to gain a comprehensive understanding of household recycling in the Italian context and to delineate a set of practical recommendations useful in implementing interventions that can effectively promote recycling among targeted users. Indeed, according to McKenzie-Mohr (2013), an intervention aimed at fostering a sustainable behavior (e.g., recycling) is effective when the determinants of the behavior are identified and described, and the intervention targets specifically the aspect(s) emerged as behavioral barrier(s) in the situation under examination.

Italy, with an annual production of nearly 30 million tons of urban waste (approximately 412 kg per capita yearly), is one of the largest European producers of waste, along with Spain, UK, Germany and France. These five countries account indeed for approximately 68% of waste produced in the EU-28 (Ispra, 2015). Recyclable materials currently collected are organic waste (42.7% of the total), paper (23.5%), glass (12.8%), plastic (7.4%), metal, (1.9%), wood (5.0%), RAEE (1.6%) and textiles (0.9%). Despite a positive trend in recent years, the current Italian recycling rate of 45.2% (Ispra, 2015) remains below the EU target for Member States to recycle 50% of their urban waste by 2020. In addition, the president of the Italian consortium for the recovery of packaging (CONAI) declared in a recent interview that, although the ongoing increase in recycling rate is appreciable, the quality of collected recyclables is currently decreasing[1]. It

[1] AAVV (2016, October 24). Conai, Facciotto: "Aumenta la quantità ma diminuisce la qualità della raccolta differenziata". *Eco dalle Città.* Retrieved from www.ecodallecitta.it.

appears thus particularly important to understand not only how to engage more Italian citizens in the process, but also how to improve the effectiveness of existing recyclers' behaviors.

In the next sections of the present Chapter, the mixed-method approach used to investigate recycling and answer to the identified research questions will be described, while in Chapters 4, 5 and 6 emerging results will be discussed in detail. Finally, in Chapter 7 the contribution of this thesis to scientific research in the field of household recycling will be reviewed. In addition, the empirical results and the methodological suggestions emerged from the analysis of the existing literature will be merged and used to define a set of practical guidelines for future field interventions.

3.1. A MIXED-METHOD APPROACH

In order to answer to the abovementioned research questions, quantitative and qualitative methodologies have been used in a complementary manner, adopting a mixed-method approach. This approach (also referred to as integrating, multimethod, or mixed methodology; Creswell, 2009) can be formally defined as «the class of research where the researcher mixes or combines quantitative and qualitative research techniques, methods, approaches, concepts or languages into a single study […] in such a way that the resulting mixture or combination is likely to result in complementary strengths and nonoverlapping weaknesses» (Johnson & Onwuegbuzie, 2004, pp. 17-18). It is therefore important

to highlight how different methodologies have been used in the present study in order to collect different types of data, and to outline the conclusions it is possible to draw from them.

Study 1 consists of an extensive online survey aiming at investigating people's procedural knowledge (i.e., knowledge about where, when and how to recycle) and its relationship with other relevant factors, such as the perceived value of waste. This type of quantitative research provides 'hard' data that are statistically representative. This means that it is possible to quantify observations and infer them to the wider population, for example: "*one in three people think that Styrofoam is not a recyclable material*"[2], using the results to identify existing knowledge gaps and determining the most appropriate strategies to overcome them. A preliminary lab investigation was carried out before the main study, with the aim to test the instrument.

Study 2 is a field study based on semi-structured interviews with supplementary activities such as observations, waste diaries and home-tours, conducted with a smaller number of participants. The aim of the study was to access recycling practices in the setting of the home, identifying the factors influencing them, the motives behind the decision to recycle, and the processes of interaction, cooperation and negotiation between family members that permit the establishment and maintenance of recycling as an everyday routine.

[2] Nevertheless, it should be noted that a sample, not the entire population, is surveyed. All results are therefore subjected to sampling tolerance, which means that not all differences are statistically significant.

Changing focus toward practices implies the use of an inductive approach based on gathering information in order to generate knowledge rather than testing hypotheses, and of qualitative techniques capable of capturing what actually happens in the performance of practices, rather than limiting participants to a list of pre-determined responses as in the case of a questionnaire. Qualitative methods permit indeed to address research questions that may not be accessible by quantitative methods, such as people's interpretations, experiences and perspectives. They consist of an interactive process between researcher and participants, which allows respondents' practices, thoughts and opinions to be explored in detail, providing an insight into key reasons underlying their behavior and views and permitting «to understand how people experience and make sense of their own lives» (Flowerdew & Martin, 2005, p. 111). Results in this case are based only on a small cross-section of the population and thus they are illustrative and indicative, not statistically representatives. In other words, it is not possible to quantify findings or suggest that they reflect the practices or attitudes of the wider population. Although this may restrict the ability of the study to make universal generalizations valid across different contexts, «at the same time it leads to richer and more subtle accounts of action in context that, whilst more modest, might also be more valuable» (Hargreaves, 2011, p. 85), revealing a holistic picture of recycling facilitators and barriers.

3.2. SURVEYING PEOPLE KNOWLEDGE ABOUT RECYCLING

3.2.1. DEVELOPING AND TESTING AN INSTRUMENT TO MEASURE PEOPLE'S PROCEDURAL KNOWLEDGE

As discussed in Chapters 1 and 2, proper waste separation at the household level has great advantages in terms of environmental protection (UNEP, 2015) and reduction of costs connected to the need for further sorting collected recyclables. It has been demonstrated indeed that the costs of incorrect waste sorting are very high, since for a pilot area with approximately 500 inhabitants they amount to 10,500€ per year (Rousta & Ekstrom, 2013). Information and knowledge regarding how to properly recycle are assumed to be among the most important preconditions of the quality of recycling activity (Smeesters et al., 2003). Nevertheless, as suggested by various authors, recycling is not always an easy task because the number of bins and rules on what belongs on which of them are numerous and not always univocal, raising uncertainty and making sorting errors quite common (Henriksson, Akesson & Ewert, 2010; Lessel, Altmeyer & Krüger, 2015; Passafaro, Bacciu, Caggianelli, Castaldi, Fucci et al., 2016). Knowing whether citizens have acquired the necessary knowledge to perform recycling properly, or being able to identify whether they have particular difficulties in disposing of specific kind of waste, could be thus useful in order to define, develop and evaluate the most appropriate strategies to overcome identified knowledge gaps and errors, as well as to investigate the existing relationship with other relevant factors (Passafaro et al., 2016). This was the

purpose of Study 1, realizing an extensive online survey aiming at investigating procedural knowledge about recycling possessed by Italian users.

Traditionally, individuals' knowledge about recycling has been measured by asking people how good they think they are in recycling household waste, either in general terms or referring to specific materials (e.g., Andersson & von Borgstede, 2010; Scott, 1999; Seacat & Northrup, 2010). Self-reports are widely used because they have the advantage of being time and cost-effective to gather. Perceived knowledge, however, might differ perhaps substantially from actual knowledge, since people might either underestimate or overestimate it. In addition, self-reports are impacted by reporting errors such as response bias, acquiescent and socially desirable responding (Huffman, Van Der Werff, Henning & Watrous-Rodriguez, 2014).

Alternatively, a few authors used simulation tasks during which respondents had to differentiate a number of real products presented to them by the researcher. Their performance was then evaluated by counting the number of items that were correctly deposited into each bin (Buglione, 2009; Corral-Verdugo, 1997; Huffman et al., 2014). Whilst recycling simulations appear to be more accurate in measuring people's knowledge than self-reports (Corral-Verdugo, 1997), they present the disadvantage of being not practical nor convenient in order to be used on a large scale.

To the best knowledge of the researcher, no instrument capable of assessing individuals' procedural knowledge regarding recycling and usable as a part of

online survey has been developed and tested so far[3]. A questionnaire structured as a simulation task (where products were presented to respondents as colored photos instead of as samples of real products) was thus developed with this purpose. Its ability to assess respondents' knowledge regarding how to properly recycle different types of products was then tested in a preliminary lab investigation, with a twofold aim. First, to evaluate whether the questionnaire is as reliable as a simulation task with real products to investigate the individuals' procedural knowledge regarding recycling. Second, to understand whether self-reported recycling knowledge can be considered an accurate predictor of the individuals' actual recycling knowledge.

PARTICIPANTS AND PROCEDURE. 90 participants (M = 28; SD = 4, 55F) took part in the study. They were recruited through an ad publicizing the experiment posted on the Facebook pages of the University of Padova and the Department of General Psychology. Their participation was voluntary and unpaid.

After the signing of the informed consent, all the participants filled in a brief demographic questionnaire asking their age, gender, education level, membership in environmental groups and the person in charge of recycling

[3] In very recent months, a questionnaire aiming at measuring users' recycling skills according to local rules has been proposed and tested by Passafaro and colleagues (2016) in the Rome area, Italy, with promising results, whilst Lessel et al. (2015) described the implementation of an online tool as part of a larger investigation aiming at developing a feedback system for gamified public trash cans. However, these tools were not yet available when Study 1 was designed and undertaken.

management in their house. In addition, they had to assess their level of recycling knowledge on a 10-point rating scale.

Half of the sample then completed a questionnaire in which they were requested to indicate how to sort a list of 32 common-use products, presented in the form of colored photos projected on the screen of a tablet pc. The remaining participants, on the contrary, had to differentiate real samples of the same 32 products, in the context of a lab simulation. During the task, they were guided by the experimenter, who indicated them the order in which they had to differentiate the products (the same as in the questionnaire). In both the conditions, participants had 15 minutes to complete the task.

MATERIALS AND SETTING. The 32 products have been selected on the basis of the following criteria: **(a)** being well-known, common-use objects, used daily by the individuals; **(b)** being not subject to ambiguous indications regarding their differentiation (for some products indeed these indications may vary depending on the local service provider and the implemented recycling process); and **(c)** they had to cover the whole range of materials normally differentiated in Italy (paper, plastic, glass, metal, organic waste), as well as to include examples of non-recyclable waste. To select items, precise indications concerning how to dispose of different kind of waste were retrieved by consulting official materials on the topic. A pilot test with 12 participants (7 users and 5 managers of waste management and manufacturing companies) was then conducted, permitting to

exclude two items initially included due to their ambiguity. As pointed out by Passafaro and colleagues (2016), piloting is particularly important to identify the most appropriate items to be used in the questionnaire, since if they are selected accurately, the instrument can be more precise in measuring people's actual recycling knowledge, as well as in identifying potential factors related to it.

Both the questionnaire completion and the simulation task took place in one of the laboratories of the Department of General Psychology of the University of Padova. For the simulation task, the lab was equipped with a table, above which the sample materials and four recycling bins (for paper, glass-plastic-tins, organic waste and undifferentiated waste, respectively) had been arranged in advance, and with a camera in order to video-record the experimental sessions (Figure 3.1).

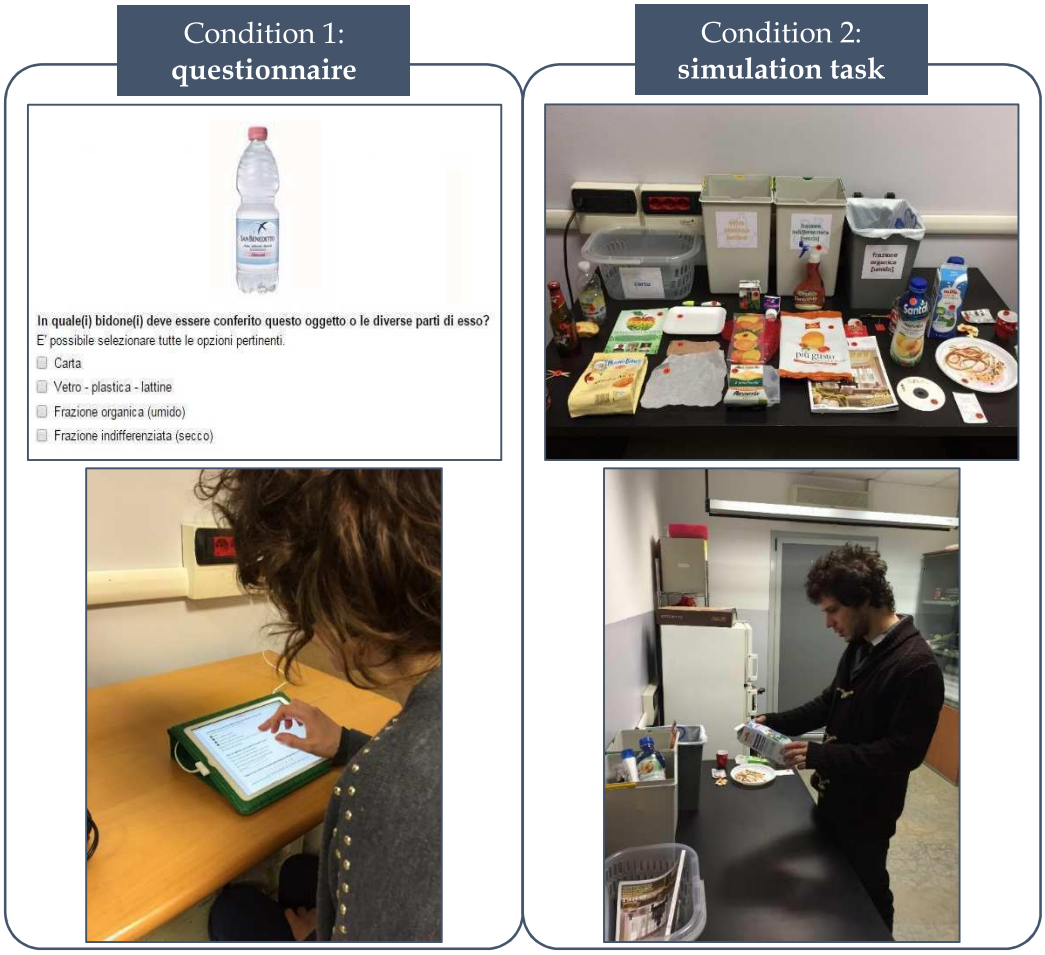


FIGURE 3.1. Experimental setting.

RESULTS. For both the questionnaire and the simulation task, performance scores were calculated as the sum of the points obtained by the participant, attributing one point to each correct answer (i.e., to each object correctly differentiated) and zero to wrong answers. This sum has been then transformed on a 10-point scale base.

In order to investigate whether differences exist in the ability of questionnaire and simulation task to assess the individuals' procedural knowledge regarding recycling, scores obtained by participants in the two experimental conditions were compared, using SPSS v. 22.0 for the analysis. On

average, the difference in questionnaire and simulation task scores was not significant (questionnaire: $M = 6.83$, $SE = .14$; simulation task: $M = 6.72$, $SE = .12$; $t(88) = .60$, $p = .55$). In general, it seems thus possible to affirm that a questionnaire showing to participants photos of the products to be differentiated appears to be as reliable as simulation tasks with real objects in exploring individuals' recycling knowledge.

In addition, a comparison between self-reported knowledge and the scores obtained by participants in the questionnaire was carried out, in order to investigate whether self-reports are accurate predictors of the individuals' actual recycling knowledge. It emerged from data analysis that self-reported recycling expertise did not significantly predict recycling performance in the simulation task, $\beta = .06$, $t(88) = .55$, $p = .58$, not explaining a significant proportion of variance in performance scores, $R^2 = .003$, $F(1,88) = .31$, $p = .58$. Interestingly, differences between self-report and performance scores (calculated for each respondent) showed a high variability, i.e. they were very dispersed above and below zero ($M_{difference} = -.22$, $SD_{difference} = 1.84$). In other words, people tend to overestimate as well as to underestimate their actual knowledge. These findings thus confirm that self-reports are not a reliable tool to measure people's recycling knowledge, since it seems difficult for the individuals to evaluate it in a precise ad accurate manner. This might be due to the fact that they do not have the possibility to receive feedback indicating them if they habitually recycle materials in a proper manner or not.

3.2.2. THE ONLINE SURVEY

INSTRUMENT. The main goal of the survey was to investigate the respondents' procedural knowledge about recycling, existing informative gaps and common sorting errors, as well as people's knowledge regarding recycling process. Furthermore, previous studies revealed that objects that are perceived as more valuable are also more likely to be recycled (Langley et al., 2011; Wikström et al., 2016). However, little is known about the reasons why people assign or not a residual value to waste, as well as the relationship between perceived value and recycling knowledge. In addition to data on procedural and process knowledge, the survey aimed thus to gather data useful to fill this gap.

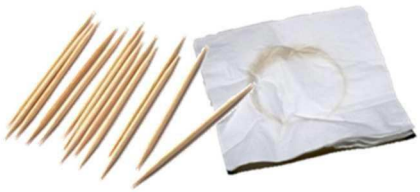
The survey was offered in Italian and it was composed of three sections, preceded by an initial page explaining respondents that answers would be used for research purposes only, in aggregated form, and in accordance with the Italian Privacy and Data Protection Law (D.Lgs. 196/03). All the respondents had to express their informed consent to participate prior to be allowed to proceed to the next sections of the survey. The first section regarding background information included questions on the respondents' age, gender, nationality, education level, employment status, belonging to environmental associations, as well as a filter question regarding whether respondents habitually recycle their domestic waste or not. A question presenting a list of motivations to recycle followed, then recyclers were asked to indicate which materials they usually differentiate at home.

The second section was devoted to investigate respondents' procedural knowledge and their knowledge about recycling process. First, respondents had to assess their level of recycling knowledge (namely, knowledge of recyclable materials, of operations to adequately prepare them for recycling, and of what happens to collected recyclables) filling in three questions structured as 4-point Likert-type scales (from 1 = "strongly disagree" to 4 = "strongly agree"). These questions aimed to ascertain their perceived knowledge gaps. Procedural knowledge was evaluated using a reduced version (from 32 to 14 items) of the questionnaire previously developed and tested. The number of the items was reduced in order to avoid making the completion of the survey too long and fatiguing for respondents, but even in this case the products selected had to satisfy precise requisites. The selection was guided indeed by the goal to include in the survey one easy and one difficult product for each category of recyclables materials (that is, paper, glass, plastic, metal, organic waste) and residual waste. The distinction between easy and difficult objects has been established on the basis of the preliminary lab investigation results. That is, it has been considered difficult to recycle any product that had been properly differentiated from less than 50% of test participants. Two further objects were then added to the initial list of 12 items (namely, toothpaste tube and used napkin), in order to test how people behave in presence of recyclable objects that are perceived as dirty, since it emerged from previous studies (e.g., Langley et al., 2011) and from the lab investigation that people have the tendency to discard recyclables that are perceived as dirty instead of recycling them. For every picture, respondents had

to decide whether the shown product had to be thrown in the paper, glass, plastic, metal, organic waste or residual waste bin, selecting the proper option by clicking on it. Performance score was calculated as the sum of the points obtained by the respondent, attributing one point to each correct answer (i.e., to each object correctly differentiated) and zero to wrong answers. The items used in the simulation task are reported in Table 3.1.

TABLE 3.1. Items used to test respondents' procedural knowledge.

MATERIAL	EASY PRODUCTS	DIFFICULT PRODUCTS
Paper		
Plastic		
Metal		
Glass		

MATERIAL	EASY PRODUCTS	DIFFICULT PRODUCTS
Organic waste		
Residual waste		

The simulation task was followed by two open questions investigating respondents' knowledge of recycling process by asking them to describe what they think it happens to recyclables once the service provider collects them, and to indicate who the beneficiaries of household recycling are, in their opinion.

Finally, the third section contained six questions inquiring respondents about the value they assign to waste. Respondents had to indicate, among a list of 25 objects to be discarded, the three they valued the most and the three they valued the less. An open question "Why?" followed each choice, to be answered by typing text in a comment box.

The survey was implemented using Google Modules. Graphic as well as gamification elements (e.g., scoring, feedback on correct answers) were included in the survey in order to make it more appealing, encouraging people to undertake and complete it to the end. In particular, at the end of the survey participants received an email containing indications about the total score obtained in the second section measuring their procedural knowledge, the

correctness of each response given, and the correct option, in case of a wrong answer. A picture realized by famous Italian cartoonist Silvia Ziche was used as the survey's cover image to attract people attention.

The survey is reported in full (in Italian) in Appendix C.

DATA COLLECTION PROCEDURE. The survey was launched after it was piloted with 10 respondents and then refined, and remained available online from November 2015 to May 2016. In addition to its promotion on the Facebook pages of the University of Padova and the Department of General Psychology, various public and private organizations, e-journals and administrators of blog were contacted and accepted to help in publicizing the survey to their staff, members and readers via various channels (among others, providing a link to the survey from their website, through their mailing lists and newsletters, and publishing posts on their social media pages). Responding to the survey did not involve any form of compensation.

Websites and online social networks such as Facebook appear to be a viable recruitment option for the assessment of a variety of behaviors, since it is possible to reach quickly a great number of potential participants and to reduce measurement error and bias related to answers on sensitive or stigmatizing topics. On the other hand, a drawback is related to the fact that online surveys can be subject to coverage and selection biases (e.g., differences between people with or without Internet access, or between non-respondents and respondents, who may select themselves to the survey because they are particularly interested

or involved in its contents and/or objectives; Khazaal, van Singer, Chatton, Achab, Zullino et al., 2014). Nevertheless, online surveys are of high interest to collect data on subgroups of users who are more involved in the study purpose. This remains important, particularly because of the advantages of collect data on committed recyclers, in light of the importance of the correct differentiation of waste at home and because this group is «a fruitful target for initiatives that further remove barriers to more recycling. Indeed, this sector of the population may produce greater yield, in terms of increased waste diversion per unit of promotional effort than spending the equivalent resources on the relatively small minority of current non-recyclers» (Jesson, 2009, p. 36).

In addition, as evidenced by Khazaan and colleagues (2014), working on the selection of appropriate websites to promote the survey and on the design of the study advertisement (such as graphics, gamified contents, questions phrasing, etc.) can mitigate - at least in part - self-selection problems.

SAMPLE AND DATA ANALYSIS. In total, 1,182 people responded to the survey. Forty-four responses were excluded since they were incomplete, resulting in a sample comprised of 1,138 respondents, 725 of whom were women (63.7%) and 413 were men (36.3%), aged 38 years on average (*SD* = 14). Out of all respondents, 130 (11.4%) belonged to or supported environmental associations. Educational background varied, as well as the employment status of the respondents. The great majority of them recycled habitually their domestic waste, and only 30 respondents (2.6%) affirmed to be non-recyclers.

Data collected were analyzed using both qualitative and quantitative techniques, in order to gain a deeper understanding of the procedural knowledge of respondents regarding recycling, their informative gaps and common errors when differentiating waste, as well as their knowledge of recycling process and perceived value of waste.

Quantitative data were treated statistically with SPSS v. 22.0. Descriptive statistical analyses were carried out on the entire sample. In addition, a two-step cluster analysis was conducted in order to identify, within the dataset, homogeneous groupings (or clusters) of respondents displaying a similar level of knowledge and informative needs. SPSS TwoStep Cluster procedure has been used since it is appropriate for clustering large datasets. In addition, compared to classical methods of cluster analysis, it enables data with both continuous and categorical attributes to be clustered, and can automatically determine the optimal number of clusters. In the first step, cases are grouped into pre-clusters that are then used in place of raw data in the subsequent hierarchical clustering. Based upon its similarity with previously formed pre-clusters, each successive case is added to one of them or it starts a new pre-cluster, using a likelihood distance measure as similarity criterion. Cases are assigned to the pre-cluster that maximizes a log-likelihood function. In the second step, pre-clusters are grouped using the standard agglomerative clustering algorithm, producing a range of solutions, which is then reduced to the best number of clusters on the basis of Schwarz's Bayesian inference criterion (BIC). This has the advantage of being a highly objective selection criterion, permitting to overcome the arbitrariness of

traditional clustering techniques. The auto-clustering algorithm indicated that a three-cluster solution was the best model. The resulting clusters were labeled as GROUP A ('fair knowledge'; 264 cases, 23.8%), GROUP B ('medium knowledge'; 379 cases, 34.2%) and GROUP C ('good knowledge'; 465 cases, 42.0%).

With regard to qualitative data (i.e., answers to open-ended questions), a coding scheme was developed through an inductive process of examining the data, using the same method of analysis described in section 3.3.5.

3.3. EXAMINING EVERYDAY RECYCLING PRACTICES AT THE INDIVIDUAL AND HOUSEHOLD LEVEL

3.3.1. A TURN TO PRACTICES

Practices have been described by Shove and Pantzar (2005) as assemblages of images (meanings, symbols), skills (forms of competence, procedures) and stuff (materials, technology) that are dynamically integrated by skilled practitioners through regular and repeated performance. When they occur frequently, in stable contexts (e.g., the home) and in a relatively repetitive way, they are also called 'habits', a term referring to «the routine accomplishment of what people take to be the 'normal' ways of life» (Shove, 2004, p. 117). Although repetitive, habits do not denote a mechanical, rigid behavior. Conversely, they imply «a flexible disposition which, though pre-reflective, remains commensurate with purposive action and in no way precludes intelligence, understanding, strategy or knowledge on the part of the actor» (Crossley, 2013,

p. 139). They entail competence (intended as acquired ability) and know-how (that is, practical knowledge and understanding that helps the individual to handle and deal with the world). Habits are thus very important, in that they are at the basis of the structure of ordinary life (Garfinkel, 1967), being a form of hidden, embodied knowledge that creates and maintains the recursive nature of social life, and enables individuals to deal with daily life without having to make new decisions every moment (Hobson, 2003).

Changing (i.e., correcting or removing) habitual practices that are considered wrong, irrational, inefficient or wasteful is a common-used strategy in order to improve sustainability of individuals' behavior. However, this strategy does not always succeed, due to the fact that these practices have a value for the individuals within the organization of their everyday life, and they are thus often resistant to modify them. With regard to waste and recycling practices, for example, Boulay and colleagues state that these are extremely important in the economy of the household, as they «are part of the management of everyday life, of getting families fed and households organized» (2014, p. 12). In this sense, if the goal of the intervention is habit change, then the design of the intervention itself should focus on offering new, viable practices, acknowledging at the same time the individuals' purposes and their current organization of activities. Habits change indeed not through exposure to new, counter habitual information conveyed by the intervention, but through individuals making connections between this new information and their own, everyday routines, thus enabling them to see old practices and habits in new ways (Hobson, 2003; Verplanken &

Wood, 2006). It therefore follows that «the contextual setting of everyday living of the household must be the point of departure. This requires the recognition of the complexity of the household system» (Aberg, Dahlman, Shanahan & Säljö, 1996, p. 64).

The aim of Study 2 was then to investigate recycling practices as they are experienced and evaluated by the individuals in the context of their daily routines, gaining an understanding of how people carry out them, what their motivations, beliefs, knowledge and perceived 'barriers to action' (connected to the existing cultural and socio-technical infrastructure) are, and using this knowledge to increase future interventions' effectiveness.

3.3.2. PARTICIPANTS

Participants have been recruited using an opportunistic sampling method (i.e., snowball sampling), starting from a limited number of researcher's acquaintances who are members of the group being studied – in this case residents in the Venice area (see below) - and then enlarging the sample by means of further contacts provided by the initial interviewees. An important factor in the recruitment of participants was to identify households willing to commit taking part in interviews and other activities involving all the family members for a one-week period. Whilst this inevitably originated an element of self-selection, as it is more probable that households already committed to recycle take part in a study targeting recycling practices, this was not a flaw for the

research, as the aim of the study was to learn more about recycling practices in the home environment, and thus there was a need for people who undertake these practices to take part. In addition, today it is very improbable to find people not recycling at all, being recycling a widely diffused and often mandatory activity. Furthermore, according to Pocock et al., it is important to target recyclers as «there are specific barriers that only become apparent to people once they have attained the attitude and behavior status of a committed recycler» (2008, p. 4).

Twenty-two households (i.e., family units) participated in the study, for a total of 52 participants aged 6 to 83 (M = 44, SD = 19). Participation was voluntary and no financial compensation was offered. Whilst the scale of the present study meant that it could not be wholly representative, it was still beneficial to recruit participants that would provide a good cross-section of people, in order to identify how different factors impact upon individual practices. In addition, although information gathered is specific to the participants studied, the results of the study could be relevant on a larger scale, by uncovering recycling-related practices and the role of personal, social and structural factors that could have been missed so far by quantitative inquiries. Selected households thus varied in demographics (age, gender), household composition (single person households, adult-only households, families with children), dwelling type (apartments, detached houses) and waste collection scheme (curbside, curbside with pay-per-weight, drop-off collection[4]). All households participating in the study were

[4] The first collection method (namely, curbside) requires residents to separate recyclables from waste and to store them in their houses until the day designated for the collection of each specific

located near the city of Venice, in the northeastern part of Italy[5]. An overview of the characteristics of the households participating in the study is provided in Table 3.2.

TABLE 3.2. List of the households participating in the study.

NO.	DWELLING TYPE	HOUSEHOLD COMPOSITION	WASTE COLLECTION METHOD	PARTICIPANTS
H01	detached house	family	curbside with pay-per-weight	Paolo, male, 60, manager Paola, female, 55, housewife Maddalena, female, 24, student Alessia, female, 26, trainer
H02	detached house	family	drop-off	Mauro, male, 60, retired Maria Luisa, female, 63, retired Enrico, male, 29, internal auditor
H03	detached house	single	drop-off	Antonietta, female, 83, retired
H04	apartment	couple	drop-off	Ioana, female, 39, part-time clerk Filippo, male, 46, civil engineer
H05	apartment	couple	drop-off	Giuseppe, male, 76, shopkeeper Carla, female, 69, shopkeeper
H06	detached house	single	curbside	Argia, female, 78, retired
H07	detached house	couple	curbside	Lorenzo, male, 61, clerk Daniela, female, 57, massage therapist
H08	apartment	family	curbside	Viviana, female, 41, secretary

material (plastic/glass/metal, paper, organic waste and residual waste), at the doorstep of each house. The service provider makes personal bins of different colors available to the users. Curbside with pay-per-weight collection method is identical to the previous one, with the only difference that the emptyings of the residual waste bin are counted, so that residents can pay the service according to their actual production of undifferentiated waste. The third method (i.e., drop-off) requires residents to bring their waste to the nearest "ecological island". They are placed along the main streets, are continuously accessible and equipped with different bins, according to the types of waste differentiated (the same as in the curbside collection). The residual waste bins can be opened only using a personal electronic key.

[5] The Venice area has been chosen as the location of the study for a threefold reason. First, the researcher had in-depth knowledge of the communities and infrastructures within the area, as well as access to detailed waste management data provided by Veritas (the local service provider) that would facilitate the research. Second, in addition to be a convenient location, the diversity of its various communities, as well of their performance with regard to recycling, made it an ideal location to collect data. Third, given the interest of the service provider in promoting recycling in the area, it would be possible to base future campaigns on an understanding of local practices.

No.	Dwelling type	Household composition	Waste collection method	Participants
				Silvano, male, 56, manager Maria, female, 11, student Bianca, female, 9, student
H09	apartment	family	curbside	Serena, female, 47, teacher Francesco, male, 47, unemployed Matteo, male, 11, student Antonio, male, 6, student
H10	apartment	single	curbside with pay-per-weight	Giacomo, male, 33, air traffic controller
H11	detached house	couple	curbside with pay-per-weight	Antonella, 68, female, retired Giovanni, 70, male, shopkeeper
H12	detached house	family	curbside with pay-per-weight	Sergio, male, 44, shopkeeper Giuliana, female, 47, shopkeeper Tommaso, male, 17, student
H13	apartment	single	drop-off	Andrea, male, 37, graphic designer
H14	detached house	family	curbside with pay-per-weight	Elena, female, 23, student Alberto, male, 54, shopkeeper Marta, female, 53, part-time clerk
H15	detached house	house mates	curbside	Laura, female, 61, teacher Federico, male, 54, teacher
H16	detached house	couple	curbside with pay-per-weight	Ketty, female, 42, housekeeper Roberto, male, 43, salesperson
H17	apartment	couple	curbside	Anna, female, 30, clerk Nicola, male, 33, industrial engineer
H18	apartment	family	drop-off	Adriano, male, 63, retired Alessandro, male, 34, start-upper Annamaria, female, 63, retired
H19	apartment	family	curbside	Diletta, female, 26, student Giampaolo, male, 59, manager Mirca, female, 56, housewife Pietro, male, 24, student
H20	detached house	single	drop-off	Sara, female, 30, research assistant
H21	apartment	family	curbside	Elvira, female, 23, student Gianni, male, 57, manager Beatrice, female, 52, part-time clerk
H22	apartment	couple	drop-off	Elisabetta, female, 30, marketing expert Riccardo, male, 29, controller

Two further households serving as a pilot group were involved in the study a few weeks prior to the other participants, in order to assess the feasibility of the

methodological approach adopted, as well as to test the data collection procedure, its phases and timescale.

3.3.3. DATA COLLECTION PROCEDURE

Data were collected over a 6-month period via semi-structured interviews complemented with additional methods aiming to facilitate the study of recycling practices, such as questionnaires, waste diaries, observations and home-tours.

With regard to the implemented procedure, an initial contact with participants via telephone or email, aiming at inviting them to participate in the research, was followed by three meetings with each household, having different and specific purposes. A schematic representation of the data collection procedure is reported in Figure 3.2.

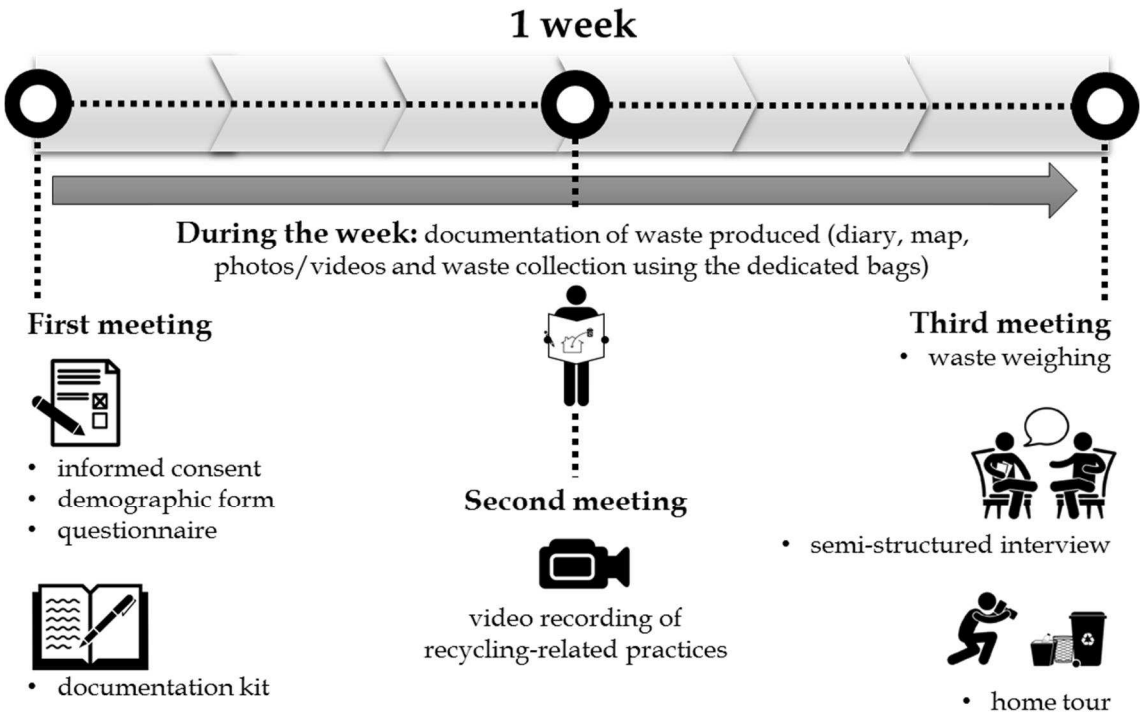


FIGURE 3.2. Schematic representation of the data collection procedure.

FIRST MEETING. During the first meeting, each participant signed the informed consent (see section 3.3.4 for ethical considerations), compiled a brief demographic form (asking for age, gender, nationality, education level, employment status and affiliations with environmental groups), and filled-in a paper version of the questionnaire described in section 3.2.1, consisting of a 32-item simulation task aiming to evaluate the respondent's recycling knowledge by assessing his/her ability to sort household waste correctly according to local rules.

After completing the questionnaire, participants were then given a kit containing a waste diary, instructions on how to compile it during the subsequent

week and a photo camera to take photos and/or videos (Figure 3.3). They had to use the waste diary to record daily for three days their recycling practices, listing the materials disposed, the decisions taken and the household members involved. Participants could also annotate any difficulty they faced, such as not knowing how to dispose of certain items. In addition, they were invited to document their waste-related activities by means of producing photos and videos. This permitted to highlight what participants felt was significant in relation to their recycling practices.

The advantages of the use of waste diaries are numerous. First, they represent a non-invasive means by which participants can continue their involvement in the research through the entire data collection period, thus even while the researcher is absent. Second, they make explicit the way in which waste and recycling practices are seen by participants, reflecting the value they have for the individuals. Third, they enable the researcher and the participants to discuss about them during the subsequent interview, aiding reflection and recall.

Finally, four bags were made available to participants to collect their waste for a one-week period, to be subsequently weighed during the final meeting.

(a) (b) (c)

FIGURE 3.3. **(a)** *The kit given to participants to document their recycling activities during the week following the first meeting with the researcher.* **(b)** *The waste diary.* **(c)** *The questionnaire administered during the first meeting.*

SECOND MEETING. During the second meeting, video recording of recycling-related practices (e.g., meals preparation) were realized by the researcher (Figure 3.4). As for waste diaries, videos were analyzed by the researcher prior to the final interview. During the final interview, any identified point of interest from the diaries and the videos was thus used as a cue to access recycling practices through asking individuals to elaborate and explain it and its underlying

motivations. This permitted to both the researcher and the participants to reflect upon and explore further emerging, interesting themes.

***FIGURE 3.4**. A frame of the video realized with Elena (H14), while she was sorting waste and rearranging the house after lunch.*

THIRD MEETING. During the final meeting, a semi-structured interview involving all the household members (group interview) was carried out, focusing on the individuals' recycling practices and habits, as well as on their motivations and beliefs (Figure 3.5). Semi-structured interviews have a twofold advantage. On the one hand, having some questions prepared is useful for prompting the conversation and keeping it flowing, being sure to discuss each argument of

interest. On the other, they permits to personalize the methodology in order to fit the respondents' circumstances. In addition, it was important to observe the role of the individuals in a group interview situation, in order to gain an understanding of the existing relationships within the household and the way in which they affect each individual, as well as to examine whether recycling practices are transferred between individuals. Each interview was audio or video recorded. In addition, notes were kept by the researcher to record key points to follow up later during the conversation. Table 3.2 provides an overview of the general topics discussed.

TABLE 3.3. *Framework for the semi-structured interview.*

ATTITUDES	• Do you think recycling is useful? Why?
MOTIVATIONS	• What motivates you to recycle?
JUSTIFICATIONS	• Does it happen to you not to recycle some products, even if you know they are recyclable? If yes, why?
INFORMATION	• Do you think that available information on recycling is sufficient, or not? • Would you like to have more information? • Do you ever have doubts regarding where to throw waste? If yes, what do you do? • Do you know what happens to the materials collected – where do they go and what they are turned into?
BARRIERS	• What are the main barriers you face with regard to recycling? • Please think to a product you find difficult to recycle. Why is it difficult to recycle it?
ROLES	• Who is responsible for recycling in your household? Are there different roles and responsibilities?
SOCIAL INFLUENCE	• How do other actors (e.g., other people, local authorities, companies, service provider) behave with regard to recycling, in your opinion? • Does the behavior of these actors influence your own recycling behavior? Why?

Note: Questions have been translated from colloquial Italian into English.

After the interview, waste produced during the week was weighed, and a home-tour guided by a map of the house depicted by the participants was

conducted, with the aim to identify the location of the bins and waste bags/containers arranged inside and outside the home. During the home-tour, participants showed to the researcher where and how they store their waste for recycling, and the researcher took some photos of the bins, as well as of other artifacts connected to the management of recycling (e.g., informative brochures). The aim was to observe and understand the existing interrelationship between the formation and maintenance of recycling practices and routines and the possibilities and barriers offered by physical infrastructure.

***FIGURE 3.5**. The interview with Anna and Nicola (H17).*

All the meetings lasted 1 to 2:30 hours on average.

3.3.4. ETHICAL CONSIDERATIONS

In order to enable participation based on informed consent, during the initial contact and again during the first meeting, the study, its objectives and procedure were described to potential participants, clearly stating that participation was voluntary and not compulsory, that volunteers could leave the study at any time without giving a reason, and that they were not obliged to take part in any aspect of the research with which they felt not comfortable (e.g., video recordings). Permission was also sought from each participant to realize videos and take photos depicting them, and to use these materials in scientific publications and presentations. The involvement of children under the age of 18 was the result of parents being present and providing consent by proxy.

Confidentiality and data protection were also important for the credibility of the research process. Anonymity was thus assured to participants, and as a result data were managed sensitively (e.g., using 'code names' to refer to participants, the key to which was only known and held by the researcher). The names reported in the thesis are thus pseudonyms adopted to ensure the anonymity of participants.

3.3.5. DATA ANALYSIS

The semi-structured interviews were video or audio recorded, transcribed and then coded using ATLAS.ti software. Some descriptive coding themes were pre-determined from the interview questions, but most of them were developed

through an inductive process of reading and re-reading the transcripts, identifying recurrent words and themes within and between interview, and grouping the codes thus generated into collections of similar content, identifying concepts such as 'motivations' and 'beliefs'. This technique developed from grounded theory (Glaser & Strauss, 1967), which permits to answer to questions such as "*what motivates people to recycle?*" starting from the collected data, instead of beginning with hypotheses to be tested.

The photos gathered during the home-tours, as well as the maps depicted by participants, have been analyzed in order to identify, for each household, the location of the bins, the members of the family using them, and the type of waste collected. These descriptions were then compared in order to detect differences, similarities, and possible trends across the twenty-two households observed.

Questionnaires and waste diaries were analyzed using both qualitative and quantitative techniques (for quantitative analyses, it was used SPSS v. 22.0), in order to gain a deeper understanding of the knowledge of the respondents regarding recycling, their informative gaps and common errors when differentiating waste.

Finally, quantitative data were also collected by weighing waste produced by each household during a one-week period.

3.4. SUMMARY OF THE CHAPTER

In this Chapter, the mixed-method approach adopted to undertake the research has been discussed, and the studies conducted in order to address the different research questions have been described in detail pointing at the flexible use of quantitative and qualitative methods to gather different but complementary types of data. While the former allowed indeed to collect data across a relatively large population sample, the latter permitted a longer, more in-depth analysis of recycling dynamics, exploring the experiences of participants and the meanings they attribute to them.

In particular, Study 1 consisted of an extensive online survey aiming at investigating people's procedural knowledge and its relationship with other relevant factors, such as the perceived value of waste. Data gathered with the survey will be discussed in Chapter 4 along with part of those collected during the field study (Study 2, see below) with interviews, questionnaires and waste diaries, in order to address research questions 1 and 2, namely:

RQ1 - Which are the most common sorting errors and informative gaps that can undermine the effectiveness of recycling at the household level?

RQ2 - How do people assign a value to objects and products to be discarded? Does it influence the choice to recycle rather than throw them in the garbage?

Study 2 was a field study based on semi-structured interviews and other supplementary data collection activities (such as observations, waste diaries and

home-tours), aiming to access recycling practices in the setting of the home and to identify the motives behind the decision to recycle, as well as the cultural and social dynamics that permit the establishment and maintenance of recycling as an everyday domestic habit. Results of Study 2 pertaining to research questions 3 and 4, that is:

RQ3 - Which are the factors that motivate people to recycle?

RQ4 - How do people justify defective recycling episodes?

will be discussed in Chapter 5, whilst in Chapter 6 will be presented results addressing research questions 5 and 6, namely:

RQ5 - How are recycling habits developed and maintained by people over time?

RQ6 - What do people think about the behavior and responsibilities of other social actors involved in recycling process, and how does it influence their own behavior?

In presenting the data, direct quotes from both open questions contained in the survey and the interviews will be provided, as suggested by COREQ (consolidated criteria for reporting qualitative research; Tong, Sainsbury & Craig, 2007). They will be translated from colloquial Italian into English (non-translated Italian excerpts will be reported as footnotes to the page).

CHAPTER 4

INFORMATION, KNOWLEDGE AND THE VALUE OF WASTE

4.1. EXPLORING RECYCLING KNOWLEDGE IN CONTEXT

According to Jesson and colleagues (2014), making recycling process more effective means not only increasing participation, but also improving current recyclers' behavior by discouraging contamination and making people recycle all the materials they could. «In other words, effective recycling means people consistently placing all the materials they are able to recycle in their appropriate recycling containers, and not putting out items that are not intended to be collected locally for recycling» (Jesson et al., 2014, p. 4). Evidences show indeed that sorting errors at the household level can undermine both quantity and quality of collected recyclables, and that most current recyclers could still improve their recycling behavior. Thus, the first of the research questions that this thesis aims to respond is:

RQ1 - <u>Which are the most common sorting errors and informative gaps that can undermine the effectiveness of household recycling behavior?</u>

In order to address this question and gain a deeper understanding of people's knowledge regarding recycling, the errors they make when differentiating waste, as well as the presence of underlying informative gaps that can prevent an effective sorting behavior, the present Chapter presents the results of the online survey (Study 1), discussing them along with part of the data collected during the field study (Study 2) using interviews, questionnaires and waste diaries.

The first stage of the analysis consisted in examining whether it was possible to segment survey respondents based on their level of recycling knowledge. This was measured in the second section of the survey through a 14-item simulation task in which respondents had to decide whether each of the shown products had to be thrown in the paper, glass, plastic, metal, organic waste or residual waste bin. Performance score was calculated as the sum of the points obtained by the respondent, attributing one point to each correct answer (i.e., to each object correctly differentiated) and zero to wrong answers. A three-cluster solution emerged as the best model from the analysis, evidencing the presence of three clusters of respondents displaying different levels of knowledge and informative needs. They were labeled as GROUP A ('fair knowledge', 23.8%), GROUP B ('medium knowledge', 34.2%) and GROUP C ('good knowledge', 42.0%). The characteristics of the clusters are synthetized in Table 4.1, and shown in greater detailed in Appendix D (Table D.1).

TABLE 4.1. Summary of respondent profiles for each of the identified clusters.

#	RECYCLING KNOWLEDGE LEVEL (1 TO 3)	PROFILE – TEND TOWARD HAVING ONE OR MORE OF THE CHARACTERISTICS BELOW	DESCRIPTION
GROUP A	1. Fair	**Age**: < 25, > 54 **Education level**: high school diploma **Employment status**: employed, student, retired **Belonging to environmental groups**: no	• Motivated to recycle to protect environment and to obtain personal benefits (e.g., avoid fines, reduced fees). • Recycle correctly basic items but confused about other items. • Confused and often skeptic about recycling process.
GROUP B	2. Medium	**Age**: 25 - 39 **Education level**: university degree **Employment status**: employed **Belonging to environmental groups**: no	• Motivated to recycle to protect environment, human society and future generations. • Knowledgeable about recycling, but may still make sorting errors with regard to specific items/materials. • More knowledgeable than GROUP A regarding recycling process, but often still skeptic about it.
GROUP C	3. Good	**Age**: 40 - 54 **Education level**: university degree **Employment status**: employed, unemployed **Belonging to environmental groups**: one in six belongs on average	• Motivated to recycle to protect environment, to do one's civic duty and because feel good when recycle. • Recycle correctly all items of all materials; make only occasional sorting errors. • Generally knowledgeable about recycling process, occasionally skeptic about it.

As can be seen, group A was composed by respondents displaying the lowest level of procedural knowledge regarding recycling, namely by those people making the highest number of sorting errors referred to the widest array

of products to be discarded. People belonging to this group were also those who declared to be less knowledgeable regarding what happens to waste once the service provider collects it. By contrast, respondents belonging to group C were the most knowledgeable about the correct differentiation of items, the operations needed to properly prepare them for recycling, and recycling process. Between these two groups, group B represented individuals who were generally knowledgeable about the correct differentiation of products for recycling, but still committed some errors when faced with certain types of waste. It is interesting to note that, whilst the most skeptical about recycling process were respondents belonging to group A, as 33% of them were in doubt about the fact that collected recyclables are actually recycled (as opposed to being put all together again and then landfilled or burned), also in the remaining two groups there were relative high percentages of skeptics (around 25% of total respondents in group B and 20% of group C, respectively).

4.1.1. SORTING ERRORS

The second stage of the analysis consisted in exploring in detail the errors committed by people in sorting waste, analyzing the results of the online simulation task in order to categorize the errors, investigate the presence of differences between groups in the quantity and types of error committed, and to unveil the existence of underlying informative gaps that can undermine the effectiveness of people's sorting behavior. Results of the survey are reported in

full in Appendix D (Table D.2 and Figure D.1), and discussed below along with part of those emerged from interviews and waste diaries (Study 2). Merging quantitative data with qualitative ones appears indeed to be useful in order to gain a deeper and more accurate understanding of the reasons why people make certain sorting errors, as well as of the informative gaps underlying them.

Sorting errors committed by respondents can be classified into two main categories: **(a) poor capture**, namely recyclable materials are not recognized as such, and thereby they are thrown by people in the garbage (as opposed to be recycled); and **(b) contamination**, due either to the inclusion of non-recyclable materials in the recycling bins, to recyclables being put in the wrong recycling bin, or to recyclables not being correctly prepared (i.e., washed) before recycling.

Poor capture emerged as the most common error committed by respondents to the online survey belonging to all the three groups. This result is consistent with the findings of Boulay and colleagues (2014) and Buelow, Lewis and Sonneveld (2010), according to which if a consumer is unsure of the recyclability of a certain item, 79% will deposit it in the garbage bin. The results of the field study (Study 2) also indicated poor capture as an error frequently committed by participants, motivated by them with the desire to avoid contaminating collected recyclables when unsure of the recyclability of a certain item, as inclusion of non-recyclable products in the recycling bin would result in the discarding of all the collected materials (recyclable or not). In the words of Ioana:

> **Ioana**: When in doubt, I prefer to throw in the garbage one more product instead of one less, in order to avoid the risk to make a mistake, ruining the quality of collected recyclables and nullifying the efforts of other people. **[H04 – female, 39, part-time clerk]**[1]

As evidenced in the excerpt, poor capture is usually connected with uncertainty regarding the material of which the product is composed. That is, if people are not able to rapidly and easily identify it, there is a high probability that the product will be discarded instead of recycled. Alternatively, poor capture emerges as a consequence of a packaging still containing residuals of food or other products such as toothpaste, shampoo, medicines or gardening products. Consistently with the results of previous studies (Langley et al., 2011; Wikström et al., 2016), it appears indeed that when a recyclable product is perceived as dirty, it is more likely to be thrown in the garbage instead of being recycled. This is the case of the two 'dirty products' included in the simulation task (i.e., toothpaste tube and used napkin), which were among the products most frequently disposed of incorrectly by both respondents to the online survey (Study 1) and participants to the field study (Study 2). Other examples of recyclable products thrown in the garbage as a result of being perceived as dirty

[1] **Ioana**: Nel dubbio, preferisco buttare via una cosa in più nel secco che una in meno, per evitare il rischio di fare un errore che può rovinare un bidone intero di rifiuti che poi magari va buttato, e per non rovinare anche gli sforzi degli altri.

have been found examining the entries reported by participants in their waste diaries, such as those in Figure 4.1.

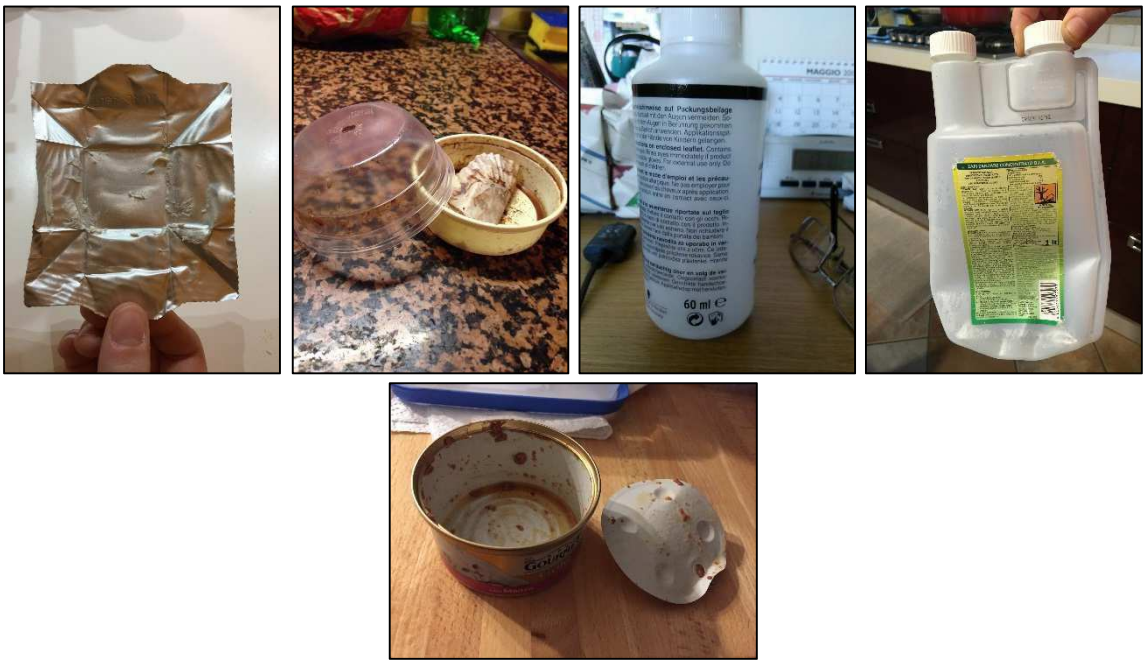


FIGURE 4.1. *Examples from waste diaries [H01, H02, H07, and H16] of recyclable products thrown in the garbage as a consequence of being perceived as dirty.*

> **Maddalena**: *(referring to the product in the upper left – Figure 4.1)* I have thrown the cream cheese wrap in the garbage bin because it was dirty and it was not possible to remove completely all the residuals. Thus, in my opinion, even if it was theoretically composed of a recyclable material, actually it was not possible to recycle it. **[H01 - female, 24, student]**[2]

[2] **Maddalena**: Ho buttato l'involucro del formaggio spalmabile nel secco perché era sporco e non era possibile rimuovere completamente tutti i residui. Per come la penso io quindi, anche se in teoria era composto da un materiale riciclabile, non penso che potesse essere riciclato.

As highlighted by Maddalena, interviewees were generally aware of the norm that imposes to properly prepare items for recycling washing/rinsing them to remove food residuals. However, they appeared to be confused about the extent to which the norm applies to different types of products and contents, as well as regarding the amount of washing/rinsing required for dirty products to be accepted for collection, as pointed out by Antonella:

> **Antonella:** I wash tuna cans, putting them under running water and rinsing with detergent [...]. And it is the same for so many other things, for example paper foils containing minced meat. I do not throw them away as they are, I wash them.
>
> **Giovanni:** Yet one should also consider how much water it is consumed this way...
>
> **Antonella:** Yeah, exactly! I know it, but you cannot put dirty objects in the recycling bins. So, one has to wash them or not? I have never understood this.
>
> **Giovanni:** No, you are allowed to put only clean products. Not dirty ones. **[H11 – A., female, 68, retired; G., male, 70, shopkeeper]**[3]

[3] **Antonella**: Io la scatoletta di tonno la lavo, la metto sotto l'acqua col detersivo e la risciacquo […]. E così ci sono tante altre cose, ad esempio la carta quando prendo la carne macinata. Io non la butto via così, io la lavo la carta.
Giovanni: E dopo però uno dovrebbe valutare anche quanta acqua consuma...
Antonella: Appunto, quello è! Lo so anch'io, però non puoi mettere una cosa sporca. E allora, si deve lasciare la roba sporca sì o no?! Di questo non si è mai capito niente.
Giovanni: No, devi buttare solo roba pulita. La roba sporca no.

Confusion about «how dirty is a dirty packaging» (Langley et al., 2011, p. 174) is not only at the basis of episodes of poor capture, but it is also a source of contamination, in case the individual decides to recycle dirty items without properly washing/rinsing them before putting them in the recycling bins. Contamination emerged as a less common error than poor capture, and one committed more frequently (but not exclusively) by respondents with a lower level of recycling knowledge. Nevertheless, it remains an important type of error to be recognized and addressed, because whilst poor capture diminish the quantity of collected recyclables, contamination affects their quality (Jesson et al., 2014). In addition to inclusion of dirty items in the recycling bins, there are two further sources of contamination, namely inclusion of non-recyclable materials and recyclables being put in the wrong recycling bin. With regard to the inclusion of non-recyclable materials in the recycling bins, it appears to be often connected with poor knowledge or understanding about materials/products targeted as acceptable for recycling. This is the case, for example, of products such as broken glass and receipt, which respondents frequently disposed of incorrectly in the glass and in the paper bin, respectively, as previous studies conducted with Italian consumers also demonstrated[4,5]. Finally, the third source of contamination (i.e., recyclables being put in the wrong recycling bin) is also connected with uncertainty regarding the material of which a product is composed of. In addition, it appears to be associated also with the size of the item to be discarded.

[4] http://www.coreve.it/showPage.php?template=news&id=65.

[5] http://www.comieco.org/regole-d-oro-per-una-raccolta-differenziata-di-qualita.aspx.

Little items such as crown caps and lids, for example, tend to be thrown in the wrong bin as a result of being not removed by people from bottles/jars, as can be noted observing the following pictures (Figure 4.2), taken during the home-tours.

FIGURE 4.2. *Examples of contamination due to recyclables items (lids and caps) being put in the wrong recycling bin (i.e., glass bin instead of the metal one) as a result of being not removed from jars/bottles [H01, H02].*

In addition to poor capture and contamination, it is also possible to recognize different types of sorting error based specifically on the material being recycled. While glass and metal were generally recycled correctly by people, plastic, paper and organic waste generated on the contrary greater problems in people knowing exactly which items are accepted for separate collection,

resulting in a certain degree of confusion and thus in a less effective sorting behavior.

According to data gathered during Studies 1 and 2, the most common sorting errors with regard to plastic concerned thin films and packaging (e.g., packages of snack, pasta, chips, sliced cheese, dishwasher tablets, etc.), which were often thrown in the garbage as opposed of being recycled, since individuals (especially older ones) failed to categorize them as composed of a recyclable plastic material (Figure 4.3). According to Jesson and colleagues (2014), this may be due to the wide range and diversity in plastic waste arising in the home, which makes it one of the most difficult material for people to recycle effectively.

> **Ketty**: I thrown the packages of snacks and pasta in the garbage bin, because I am not sure whether they are composed of recyclable plastic. One expects plastic being solid, rigid, like that of bottles. Thus, this thin plastic seems a little bit strange to me. Who knows where it should be disposed of? **[H16 - female, 42, housekeeper]**[6]

[6] **Ketty**: Gli imballi delle merendine e le confezioni della pasta, quelle in sacchetto, le butto nel secco, perché non sono sicura che siano di plastica che si può riciclare. Uno si aspetta che la plastica sia solida, rigida, come quella delle bottiglie. Quindi questa plastica fine mi sembra un po' strana. Chissà dove va buttata?

FIGURE 4.3. *Thin plastic packages thrown in the garbage bin by Argia [H06 – female, 78, retired], as a result of not being recognized by her as recyclable.*

In addition, interviews revealed that another problem connected with plastic was the frequent inability of people to distinguish between acceptable and inacceptable polymer types, as well as confusion about symbols and alphanumeric acronyms used to indicate their recyclability, as stated by Filippo:

> **Filippo**: There are a lot of symbols... so you cannot understand whether it is polypropylene, polyethylene... […] For us, plastic is plastic. **[H04 – male, 46, civil engineer]**[7]

[7] **Filippo**: Ci sono tutte sigle... quindi non si può capire se è polipropilene, polietilene... […] Per noi plastica è plastica.

This result is in line with those of previous studies highlighting the difficulties often encountered by people when faced with on-product recyclability indications (Buelow et al., 2010; Dolić, Pibernik & Bilušić, 2010; Jesson et al., 2014; Langley et al., 2011; Verghese & Lewis, 2011).

With regard to paper discards, they appeared to generate the greatest uncertainty. This was commented by numerous participants during the interviews and also observed examining the waste diaries and the simulation task results. As in the case of plastic, the primary problem with paper was connected with the wide range and diversity of paper products used in the home, often made by composite materials such as foil-lined cardboard, or by «some special types of paper that you do not know where to dispose of» (Adriano [H18]), for example coated, wax and plasticized paper, which tended to confound people. In addition, they appeared to be confused with regard to the different destinations of paper based on its cleaning conditions. Paolo [H01] clarified effectively these points:

> **Paolo**: The most difficult waste to handle is paper. Paper presents one of the widest array of typologies, there are at least twenty different types of paper. Some of them are very easy to differentiate, such as notebook or printer paper. Other types are more complicated, such as coated paper, plasticized one, Tetrapak [...]. Furthermore, clean carton of pizza goes in the paper bin, but if it is dirty it has to be put in the organic waste one... I mean, there are so

> many different conditions... Paper is actually one of the most complicated materials. **[H01 – male, 60, manager]**[8]

The general difficulty for people to correctly differentiate paper for recycling was testified by the fact that errors connected with disposing of paper were made by respondents belonging to all the three groups, regardless of their level of recycling knowledge.

Finally, sorting errors connected with disposing of organic waste were basically of two types. First, consistently with Jesson and colleagues (2014), people seemed not to recognize non-edible items (such as tea bags, toothpick, used napkins and cartons of take-away pizza) as organic waste. This error was particularly diffused among people displaying a lower level of recycling knowledge (group A), but not among respondents belonging to groups B and C. Second, expired, unopened packaged food was sometimes omitted from separate organic collection and placed instead in the garbage bin as it is (i.e., without separating the package from its content). Some interviewees affirmed this was due to the impracticality of handling and preparing it for recycling, as it was generally perceived as an uncomfortable (and sometime even disgusting) task, especially when expired food has a creamy texture (e.g., yogurt, ricotta, etc.).

[8] **Paolo**: Il rifiuto più difficile di tutti in assoluto è la carta. La carta rappresenta una delle casistiche più ampie in assoluto, le tipologie saranno almeno una ventina. E su alcune hai molta facilità, tipo la carta di quaderno o la carta di stampante, per capirci. Su altre cominci ad andare in crisi, tipo le varie tipologie di carta patinata, plastificata, il Tetrapak […]. Poi il contenitore pulito della pizza va nella carta, il contenitore sporco della pizza va nell'umido… cioè, ci sono talmente tante condizioni... proprio, la carta è uno degli elementi più complicati.

4.1.2. COMMON SENSE AS A PRIMARY STRATEGY TO COPE WITH DOUBTS AND INFORMATIVE GAPS

To complete the exploration of the underlying reasons why people make mistakes when differentiating waste, in this section part of the interviews (Study 2) are analyzed in order to uncover the informative sources and strategies used by people when faced with doubts regarding where/how to dispose of waste.

The majority of them affirmed that their primary sources of information regarding recycling were printed informative brochures provided annually by local service providers and on-product recyclability labels. On a lesser extent, a few respondents searched sometimes for information about recycling on websites and social networking sites. With the exception of two respondents (Sergio [H12] and Sara [H20]), contacting directly the service provider by phone was not deemed as a viable option to gain information on recycling.

Printed informative materials were kept at hand by respondents in order to check scheduled collection days for each material and, occasionally, to control where to dispose of unusual, non-daily waste. The majority of them affirmed indeed not consulting these brochures every time they have to discard a product. As commented by Argia:

> **Argia**: I have read the recycling calendar once, and now I no longer need to read it every time: when I have to dispose of a waste, I already know where to put it. When the new calendar arrives, I take a look to see whether there

is something new and, if there are differences, I try to follow the new sorting rules. **[H06 – female, 78, retired]**[9]

Recyclability labels, on the other hand, were believed to be useful as they permit to overcome the vagueness of information provided by the recycling calendar regarding certain materials, and are easily available in the decision situation itself. Nevertheless, it emerged from the interviews that recyclability labels present also a number of problems. They appears indeed to be incomplete, since products/materials are often not labelled; sometimes difficult to understand, because of the large amount of symbols used; not easily readable (especially older respondents lamented too small text and symbols); sometimes not consistent with the guidelines provided by the service provider, wrong, confusing or deliberately misleading, thus engendering distrust and skepticism.

More in general, only approximately half of the respondents deemed available information regarding recycling adequate, while the remaining ones believed that information on recycling rules is fragmentary, incomplete and sometimes contradictory. Consequently, it was often considered not sufficient in order to help them correctly carrying out proper waste separation, in particular when doubts arise.

[9] **Argia**: Ho letto il calendario all'inizio, e adesso non ho più bisogno di leggerlo ogni volta: in base a quello che mi capita in mano, so già dove va. Quando arriva il calendario nuovo, ci do un occhio per vedere se c'è qualche novità e cerco, se ci sono delle differenze, di seguire le nuove regole.

For this reason, all the respondents affirmed that, at least sometimes, they had to rely on alternative strategies to cope with doubts and informative gaps. A first strategy consisted in seeking information and advices asking to other people, in particular to other family members (see Chapter 6 for a description of the figure of the household 'recycling expert'). Alternatively, often people made choices about recycling based on their common sense, intuition and past experience with similar objects.

> **Maddalena**: I try to understand of what material the product could be composed of, comparing it with other similar products that I usually differentiate. Maybe doing wrong… but I try to make a comparison and at the end, if I am not still sure, I throw it in the garbage bin.
>
> **Paolo**: Yes, it is often a question of similarity with other products…
>
> **Paola**: …of their physical appearance. For example, when I am faced with a packet of biscuits, it is not easy to decide where to dispose of it, because the inside of the package seems made not of paper but instead of aluminum, and I do not understand.
>
> **Alessia**: In a case like this, I tried to tear the package and I saw that it was quite resistant and 'plasticky', so I opted for the plastic bin. Having still some doubts, however, because in these ambiguous cases you are never 100% sure of what you are doing, you follow good sense, relying in part on general information you have, and in part on your past experience with similar products. **[H01 – M.,**

female, 24, student; Po., male, 60, manager; Pa., female, 55, housewife; A., female, 26, trainer][10]

This quotation is particularly interesting because it demonstrates that decisions about what can and cannot be recycled are based not only on what people have learnt and memorized from informative brochures and recyclability symbols on packaging, but appear to be connected also to learnt perceptions, understandings and comparison between different materials to be discarded and their attributes and properties (e.g., physical appearance, consistence, texture, resistance, etc.). Whilst this strategy can be useful in order to help people speeding up the process of sorting waste, it presents also some drawbacks. In particular, it may lead to persistent sorting failures that can be not apparent to people, or, alternatively, to an increased likelihood for recyclable products to be thrown in the garbage instead of being recycled, if their characteristics do not fit the stereotypical ones held by the individuals with regard to a specific class of products/materials. This is the case, for example, of certain types of paper and plastic such as foil-lined cardboard and thin plastic films, as well as of some non-

[10] **Maddalena**: Provo a pensare di che materiale possa essere fatto il prodotto e faccio il confronto con prodotti simili che butto via di solito. Magari sbagliando eh… Però, provo a fare un paragone e se poi alla fine non sono troppo sicura, lo butto nell'indifferenziato.
Paolo: Sì, spesso è una questione di similitudine con altri prodotti…
Paola: … del loro aspetto fisico. Per esempio, quando mi trovo davanti un sacchetto di biscotti, non è così facile decidere dove buttarlo, perché all'interno sembra di alluminio, e non si capisce.
Alessia: Io in quel caso ho provato a strappare un lembo e ho visto che il materiale era abbastanza resistente e 'plasticoso', quindi ho optato per il bidone della plastica. Con qualche dubbio però eh, perché in questi casi un po' ambigui uno non è mai sicuro al 100% di quello che fa, si va a buon senso, basandosi un po' sulle informazioni generali che si possiede, e un po' sull'esperienza con prodotti simili.

edible organic waste, as discussed above. In addition, the frequent mismatch between the logic of the users (based on expectation that collected products would get recycled for their material) and that of the waste management system (based on the principle that packaging is recycled, but not other items; Henriksson et al., 2010) can cause uncertainty, at least among people who are motivated to observe the rules. Some sorting decisions may indeed constitute a mistake from the system's perspective, but not necessarily from the user's perspective. Lorenzo, who worked for some years in the waste management sector, explained this as follows:

> **Lorenzo**: Unfortunately, many recycling rules are not deductive, but rather counter-deductive. Maybe due to relevant legislation, maybe for current contracts. Disposable plastic dishes are accepted, disposable cutlery are not. People look at you and say: "Are you crazy?!". People have in mind only that all these products are made of plastic. They do not know regulatory issues or industrial regulations, which often go against common sense. Explaining to individuals that they have not to do a thing that for them is logical, is not easy. Because they listen to you in that moment, but hardly introject the concept and apply it later in practice. **[H07 – male, 61, clerk]**[11]

[11] **Lorenzo**: È che purtroppo molte regole di raccolta differenziata non sono deduttive, ma anzi sono contro-deduttive. Vuoi per motivi di legge, vuoi per i motivi più vari, di contratti. Il piatto di plastica sì, la posata di plastica no. La gente ti guarda e ti dice "ma sei scemo?!". La gente ha in mente solo che sia plastica. Non conosce gli aspetti normativi, i regolamenti di settore, che molte volte vanno contro il buon senso. E spiegare ad una persona che una cosa logica non deve farla

The consequences of this mismatch are two. First, it causes a certain degree of skepticism toward the entire recycling process, due to the fact that there are no well-known or widely accepted reasons for collecting and recycling some materials (i.e., packaging) but not others. Second, some respondents admitted to regularly put in recycling bins extra things 'just in case', as a consequence of the desire to see all the items that they think should be collected for recycling actually recycled.

4.2. THE VALUE OF WASTE

At some point in the life of end-use products in the consumers' home, they change their status becoming waste. In other words, they go through «a transition from something of use, of value and of worth to the consumer to something that is no longer any of these» (Langley et al., 2011, p. 161). Previous studies revealed that products to be discarded that are perceived by people as more valuable are also more likely to be recycled (Langley et al., 2011; Wikström et al., 2016). However, little is known about the transition of products into waste, the reasons why people assign or not a residual value to waste, as well as the relationship between perceived value and recycling knowledge. Being able to identify factors that might have an impact on this transitional point to change the perceived value of waste so that the product is recycled rather than discarded can be useful in

non è facile. Perché lui magari la sente con l'orecchio però poi è difficile che la faccia, che introietti questa cosa.

order to promote successful diversion of domestic waste from landfill. Indeed, according to Koponen (2002), the act of recycling is precisely about a judgment of something's value: «if I decide that this bottle is worthless, I throw it in the garbage […]. On the other hand, if I value the planet, or think that recycling is a way of doing my part for any of a list of altruistic beliefs (energy conservation, good citizenship, preserving forests, or alleviating guilt imposed from neighbors), I can place the trash into a special box or bag» (p. 553).

Results presented in this section aim at unveil these aspects, filling the gap existing in previous literature and answering to the second research question:

RQ2 - How do people assign a value to objects and products to be discarded? Does it influence the choice to recycle rather than throw them in the garbage?

In the third section of the online survey (Study 1), respondents were asked to indicate, among a list of 25 common-use objects to be discarded, the three they valued the most and the three they valued the less. An open question "Why?" followed each choice. Results are synthetized in Figures 4.4 and 4.5.

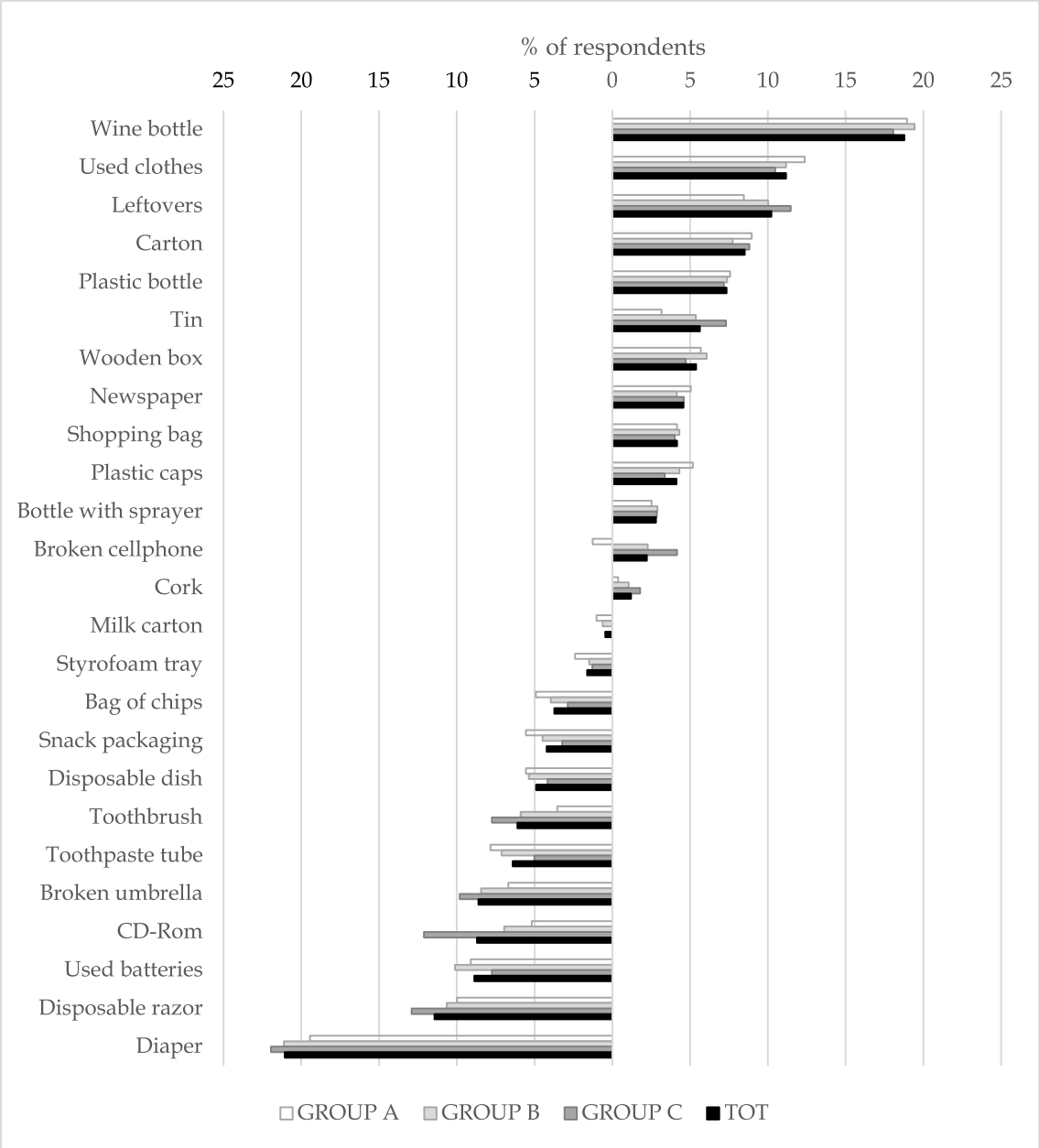
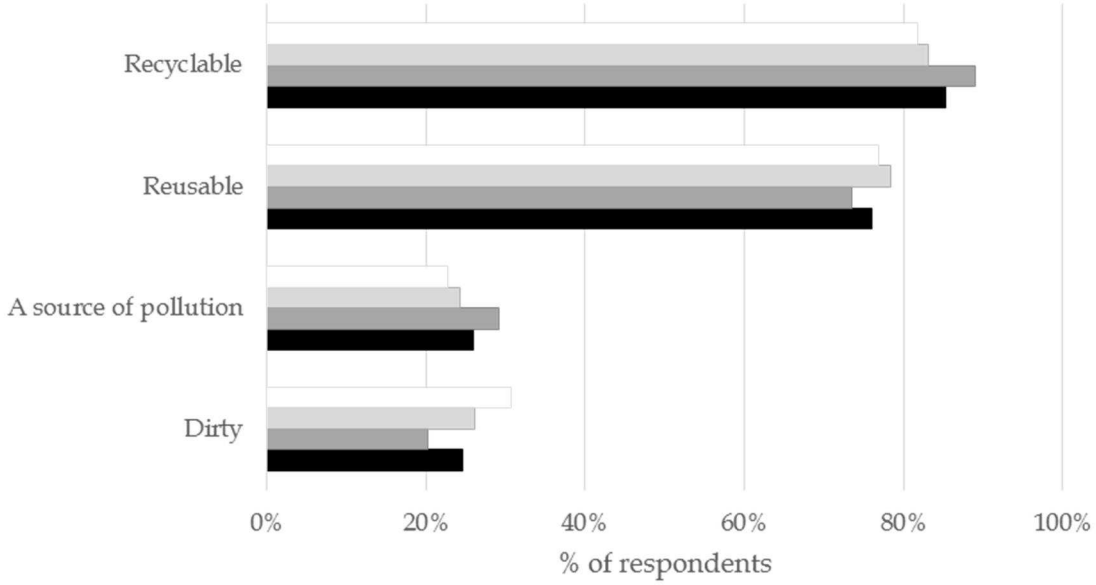


***FIGURE 4.4**. The value of different types of waste, as perceived by respondents to the online survey. For each of the listed objects to be discarded, the percentage of respondents who indicated it as a valuable object minus the percentage of those indicating it as a valueless one has been computed. Positive differences (i.e., a greater percentage of respondents indicated the object as still valuable) are reported on the right side of the figure, with respect to 0; negative ones (i.e., a greater percentage of respondents indicated the object as valueless) are reported on the left. Percentages group by group, as well as for the entire sample, are detailed in Appendix D (Table D.3).*



	Recyclable	Reusable	A source of pollution	Dirty
GROUP A	81.8%	76.9%	22.7%	30.7%
GROUP B	83.1%	78.4%	24.3%	26.1%
GROUP C	89.0%	73.5%	29.2%	20.2%
TOT	85.3%	76.0%	26.0%	24.7%

FIGURE 4.5 . *Reasons why respondents assigned (or not) a residual value to waste, reported for the entire sample, as well as for each of the three groups described in section 4.1. Responding to open-ended questions allowed respondents to indicate any number of reasons why products to be discarded have a residual value for them or not.*

As reported in Figure 4.5 (and more in detail in Appendix D, Table D.4), the most cited reasons why common-use products to be discarded retain a value in the eyes of people were the possibility to recycle and to reuse them, respectively. With regard to products' recyclability, it has been considered important by four respondents in five on average, since through the collection and remanufacturing of recyclables it is possible to obtain materials to be used in the production of

new objects, but also energy and compost (from food waste) usable as a non-chemical fertilizer.

> **P6**: Wine bottle is composed of glass, which is a valuable raw material with an immediate recyclability and suitability for being reprocessed, returning in short to be a new glass container. **[male, 61]**[12]

> **P985**: Leftover food, as every organic thing, if properly composted becomes natural fertilizer, which can be used without causing pollution in agriculture and gardening. **[male, 26]**[13]

Another point made clear by many respondents was the advantage offered by recycling in terms of the possibility to preserve natural resources and to spare energy through the reuse of recyclables instead of extracting and using new raw materials, with direct environmental, economic and health-related benefits.

> **P194**: Tin is valuable because it can be recycled, which means saving economic and environmental resources (thus

[12] **P6**: La bottiglia di vino è formata da vetro, che è una materia prima pregiata che ha una immediata riciclabilità ed idoneità alla lavorazione ritornando a ciclo breve ad essere un nuovo contenitore in vetro.

[13] **P985**: Gli avanzi di cibo, come tutto ciò che è organico, se compostati correttamente diventano fertilizzante naturale, che può essere interrato senza causare inquinamenti e utilizzato in agricoltura e giardinaggio.

preserving health and again economic resources). **[male, 30]**[14]

P265: Recycling aluminum to obtain new aluminum saves 95% of energy needed to produce it starting from bauxite. **[male, 51]**[15]

P969: Milk carton is made of paper that can be recycled to obtain new paper without cutting down trees. **[female, 52]**[16]

Having accurate information regarding the life cycle of materials and products, as well as their recycling/recovering process, appeared to be a crucial factor in evaluating the product to be discarded as still valuable. Poor, incomplete or heuristic-based information about products' recyclability (e.g., general lack of knowledge or understanding of recycling process, incorrect information on the recyclability of materials such as printed paper or thin plastic packaging), on the other hand, emerged as a factor having the potential to distort people's judgments of value, as evidenced by the following quotation:

P1113: In my opinion, snack packaging are valueless. Even if they are collected separately for recycling, for me

[14] **P194**: La lattina ha valore perché può essere riciclata, il che significa risparmio di risorse economiche e ambientali (quindi di salute e di nuovo economiche).
[15] **P265**: Riciclare l'alluminio per fare nuovo alluminio permette di risparmiare il 95% dell'energia necessaria per produrlo partendo dalla bauxite.
[16] **P969**: La confezione di latte è fatta di carta che può essere riciclata per fare nuova carta senza abbattere alberi.

> they are not recyclable and so I think that they are incinerated. **[female, 36]**[17]

This excerpt is particularly interesting as it evidences not only how the respondent's judgement of value was distorted by incorrect information (i.e., in her opinion snack packages are not recyclable), but also the persistence of this belief even in presence of contrary information (i.e., snack packages are actually collected for recycling in her community, and she is aware of this). Similarly, others affirmed that they do not recycle some products indicated as recyclables, not trusting in the recyclability information reported on their package label.

Three respondents in four on average, on the other hand, considered reuse important as it permits to prolong the life of the object by continuing to use it for the same purpose for which it was conceived or for other purposes (both personally or donating/selling it to other people), instead of discarding it as waste.

> **P10**: Shopping bag can be reused to shop in other occasions, and then for collecting waste. [**male, 32]**[18]

> **P381**: Wine bottle has a value because it can be reused for the same purpose for which it was conceived (namely,

[17] **P1113**: Per me gli imballi delle merendine non hanno valore. Anche se vengono raccolti in maniera differenziata come imballaggio, per me non sono riciclabili e quindi penso che vengano inceneriti.

[18] **P10**: Il sacchetto per la spesa può essere riutilizzato per fare la spesa altre volte e poi per l'immondizia.

to contain liquids such as water, wine or other), or for different purposes, for example as a candle holder. **[female, 25]**[19]

P715: Used clothes, depending on their conditions, can be used for different purposes: clothes for someone else (semi-new conditions), clothes for staying at home or for working (e.g., for gardening), rags to clean, toys for children (from used jeans, for example, it is possible to obtain "whale puppets"), everyday clothes (e.g., obtaining clothes for children from recycled t-shirt belonged to adults), blankets for covering pets (my 15-years ago jacket is still used by my dog). **[female, 36]**[20]

As evidenced in the excerpts, products that fell into the reuse route were generally not thought of as waste by people. In the words of Langley and colleagues, user's perception of reuse opportunities gives the product «a higher status than the bin» (2011, p. 171), namely a higher perceived value, which in turn leads to a greater likelihood of not being thrown in the garbage.

It is interesting to note that the possibility to reuse an object and to recycle it were often cited together by respondents. That is, products that presented the

[19] **P381**: La bottiglia di vino ha valore perché può essere riutilizzata per lo stesso scopo per cui la bottiglia è nata (contenere liquidi, siano essi acqua, vino, o altro), oppure per fini diversi, ad esempio come porta candele.

[20] **P715**: Un vestito usato, in dipendenza dal suo stato di usura, può avere vari utilizzi: vestito per qualcun altro (condizione semi nuova, decorosa), vestito "da casa" o "da lavoro" (es. in giardino), straccio per pulire, gioco per bambino (da i vecchi jeans nascono ad esempio tanti pupazzi "balena"), accessori di uso quotidiano (vestiti da bambino da riciclo magliette adulto, ad es.), coperta per foderare cucce/coprire animali da compagnia (il mio giubbotto di 15 anni fa è ancora in uso dal mio cane).

potential for being reused and *also* recycled were associated with the highest perceptions of value, as can be noted in Figure 4.4. On the contrary, disposable products (which are not reusable) and non-recyclable ones were generally considered valueless by respondents, and were more likely to be thrown in the garbage, since «if an object is non-reusable nor recyclable, it is just waste» [P341, female, 44]. In addition, responses to the survey made apparent that the majority of respondents assumed reuse to be a preferable option to recycling, as it permits to avoid the need for reprocessing materials before having the possibility to use them again. This was evidenced, among others, by respondents P247 and P293:

> **P247**: Wine bottle is valuable because it is sufficient to wash it for reuse. It is not even necessary to recycle glass. **[female, 40]**[21]

> **P293**: Carton has a value because it can still be reused, and reuse is preferable to recycling. Before to recycle objects, it is good indeed seeking to reuse them. **[female, 27]**[22]

The point highlighted by P293 (that is, reuse comes first and recycling is considered a viable option only when the product is no longer reusable) was

[21] **P247**: La bottiglia di vino ha valore perché basta lavarla per riutilizzarla. Non serve nemmeno riciclare il materiale.

[22] **P293**: Lo scatolone ha un valore perché può ancora essere riutilizzato, e il riuso è da preferire al riciclo. Prima di arrivare alla raccolta differenziata, è bene infatti cercare un riutilizzo degli oggetti.

corroborated also by participants to the field study (Study 2). They described indeed the transition of products into waste in their household as a process comprising at least two stages. The first stage corresponds to seek potential for reuse. That is, people try to repair the object if it is broken, in order to continue to use it (e.g., Giacomo [H10], Laura [H15], Anna and Nicola [H17]; Elisabetta [H22]). Alternatively, if the product is considered unsuitable for its original purpose but still usable, people look for alternative uses or alternative people who might use it. Daniela [H07], for example, described the use of empty jars, bottles and plastic trays for gardening, while Serena [H09] affirmed that in her household objects rarely become waste, as almost everything is reused. She brought as an example the passage of used clothes from her older son to the younger one, and then to other children, if clothes are still in fair conditions. The second stage follows when products are no longer reusable, then people have to decide between recycling and discarding them. These passages are well exemplified by Elena:

> **Elena**: In general, we try to avoid throwing things away, even those that no longer serve. For used clothes, for example, we evaluate whether we can still use or giving them to someone else. In other words, we think first to alternatives. If they are definitely no more usable, or they no longer fit us and we know that they will never fit us again, then we decide to throw them away. And at this

point, we think about how to recycle them. **[H14 – female, 23, student]**[23]

In some cases an intermediate stage between reuse and recycle was identified by respondents, in which family members no longer use the object, nevertheless they are still reluctant to throw it away. This is the case of Sara [H20] and Viviana:

> **Viviana**: It happens that you hold some things thinking that they might serve in future. Then months pass, years pass, and you realize that you do not use them... and then, in a certain moment, you decide to throw them away [...]. These objects pass through a sort of antechamber where you try to understand if it is possible to use them again, and then, after a certain time, when you see that they are only accumulating, you do some cleanings. We did it recently in the garage. **[H08 - female, 41, secretary]**[24]

In summary, reusability and recyclability were considered by the majority of respondents as the primary reasons why products to be discarded retain a

[23] **Elena**: In generale cerchiamo di evitare di buttare via le cose, anche quelle che non ci servono più. Ad esempio per i vestiti, vediamo se sono ancora utilizzabili o se possiamo darli a qualcun altro. Si pensa quindi prima all'alternativa, insomma. E se invece non sono proprio più utilizzabili, o non ci vanno più bene e sappiamo che non ci andranno più bene, lì si decide di buttarli via. E allora si pensa a come è possibile riciclarli.

[24] **Viviana**: Capita che tieni delle cose pensando che ti potrebbero servire. Poi invece passano i mesi, passano gli anni, e vedi che non le usi... e allora ad un certo punto le smaltisci […]. Questi oggetti passano attraverso un'anticamera in cui si cerca di vedere se si può utilizzarli ancora, e poi, dopo un tot di tempo, quando vedi che si accumulano e basta, fai un po' di pulizia. L'abbiamo fatto di recente giù in garage.

value, regardless of the group (A, B or C) to which they belonged (and thus of their level of recycling knowledge). Conversely, differences between groups emerged with regard to motivations for *not* assigning a residual value to waste. In particular, respondents with a higher level of knowledge (group C) appeared to be more concerned than respondents belonging to the other two groups about pollution arising from massive production of «avoidable waste» [P94, female, 54] deriving from disposable products. Respondents motivated their concern by affirming that disposable products can be used only once, without having obvious secondary functions. In addition, many respondents evidenced that they are often landfilled or burned (instead of being recycled), since recycling them is not convenient nor cost-effective, with negative consequences for environment and health. For these reasons, they judged these products as valueless and invoked the need to stop buying and using them, as well as their removal by law from the market. The implementation of more effective recycling systems capable of recover the materials contained in disposable products were mentioned as a further possible solution.

> **P815**: Styrofoam tray is valueless because recycling it is not convenient, and its disposal poses risks for environment and health. Styrofoam should be replaced. **[male, 52]**[25]

[25] **P815**: La vaschetta di polistirolo non ha valore in quanto il suo riciclo credo non sia conveniente, e la sua distruzione comporta rischi per ambiente e salute. Il polistirolo dovrebbe essere sostituito.

> **P1094**: Disposable dishes are an aberrant invention. Usually made of plastic, produced using a precious and non-renewable raw material such as petroleum, they are used for a few minutes and then they become immediately non-recyclable waste. All disposable plastic products should be prohibited by law. **[male, 52]**[26]

On the contrary, more than one in four respondents belonging to groups A and B considered the fact that a product to be discarded is dirty as a more important reason to judge it as valueless, as opposed to consider it a source of pollution. Interestingly, among products considered valueless by respondents because perceived as dirty and not easily cleanable, there were disposable dishes, bags of chips, snack packaging and toothpaste tube, which are commonly collected and recycled in Italy. This result is consistent with those of Langley et al. (2011) and Wikström and colleagues (2016), who found that easy to empty and easy to clean products are more likely to be recycled. If there are residuals of food or other products (e.g., toothpaste, shampoo) left inside the packaging, the product may be perceived indeed as too time-consuming to prepare for reuse/recycling or disgusting to handle, and this in turn can result in consumers perceiving it as less useful and being more likely to throw it in the garbage.

[26] **P1094**: I piatti usa e getta sono una invenzione aberrante. Di solito in plastica, prodotti con una materia prima preziosissima come il petrolio e non rinnovabile, usati per pochi minuti, diventano immediatamente un rifiuto non riciclabile. Gli usa e getta in plastica andrebbero vietati per legge, tutti!

4.3. SUMMARY OF THE CHAPTER

In this Chapter, it has been demonstrated that people can be segmented based on their level of knowledge regarding recycling, evidencing specific informative needs connected to different profiles of knowledge.

In light of this result, errors committed by people when differentiating waste have been analyzed and categorized into two main types, namely poor capture (i.e., missing collection of recyclable products) and contamination (i.e., inclusion of non-targeted/dirty products in a certain recycling bin). Specific errors have been then identified with regard to different types of materials to be recycled, in particular plastic, paper and organic waste. It emerged from the analysis that whilst certain types of errors are quite common among people with either a lower or a higher level of knowledge about recycling, other errors, on the contrary, are made more frequently by people with a lower knowledge.

It has been demonstrated also that when in doubt, people decide how to differentiate a product based on their common sense, intuition and past experience with similar materials and objects, instead of searching for specific information. This strategy is useful in order to help them speeding up the process of sorting waste. However, it presents also some drawbacks, connected in particular to an increased likelihood of persistent sorting errors due to a mismatch between the logic of the users (based on expectation that collected products would get recycled for their material) and that of the waste

management system (based on the principle that packaging is recycled, but not other items).

In addition, responses to the survey have been analyzed in order to understand whether and how people assign a value to waste, evidencing that reusability and recyclability are considered by the majority of respondents, regardless of their level of recycling knowledge, as the primary reasons why products to be discarded retain a value. That is, products that present the potential for being reused and also recycled are associated with the highest perceptions of value. Conversely, differences between groups with different levels of knowledge emerge with regard to motivations for not assigning a residual value to waste. In particular, respondents with a higher level of knowledge appear to be more concerned about pollution arising from massive production of waste from disposable products, while respondents with a lower level of knowledge consider as a more important reason to judge a product to be discarded as valueless the fact that it is dirty. This evidences that having accurate information regarding the life cycle of materials and products, as well as their recycling/recovering process, is a crucial factor in evaluating the product to be discarded as still valuable, increasing this way the likelihood of it being recycled instead of thrown in the garbage.

CHAPTER 5

MOTIVATIONS AND JUSTIFICATIONS

5.1. ENVIRONMENT AND BEYOND: MOTIVATIONS FOR RECYCLING

One of the main purposes of the present research was to gain a deeper understanding of the motivations that lead people to differentiate waste at home, answering to the third of the research questions that constitute the foundation of the present work, that is:

RQ3 - Which are the factors that motivate people to recycle?

In order to answer this question, the present Chapter analyzes part of the empirical data gathered within the field study (Study 2), during which respondents were asked to reflect on their personal reasons to recycle.

The majority of them cited as a primary motivation the desire to contribute preserving the environment, in order to have a better place to live now and in the future. Recycling is seen indeed as an effective means to avoid pollution generated by undifferentiated waste ending up in landfills or by its alternative treatment through incineration. While numerous respondents highlighted the

importance of recycling for environment in general terms, a few of them such as Argia [H06], Elena [H14], Adriano [H18] and Elisabetta [H22] explained that their motivation to recycle was connected to the desire of maintaining tidiness and cleanliness in the local environment surrounding them.

Other respondents cited as a motivation to recycle the advantages offered by recycling in terms of the possibility to avoid wasting resources, reuse existing materials and save energy and money. Lorenzo made these arguments clear describing his personal reasons for recycling:

> **Lorenzo**: Recycling is very useful, because it allows retrieving materials that would otherwise end up to landfill, increasing the heap of rubbish and polluting the area. It also allows an economic saving, since the recovered materials can be used as secondary raw materials. **[H07 – male, 61, clerk]**[1]

Notably, the narratives of respondents evidenced that environmental concern is not mentioned as a primary reason to recycle due to a strong ecological ideology, but instead, as noted also by Meneses (2009), because environment and environmental discourses have become «a solid part of our contemporary culture, i.e. a routine without any radical connotations» (p. 667). Representations

[1] **Lorenzo**: È utilissimo riciclare, perché si recuperano tutti i materiali che altrimenti andrebbero in discarica, aumentando il cumulo di rifiuti indifferenziati e inquinando il territorio. Inoltre permette un risparmio economico, in quanto i materiali di recupero possono essere utilizzati come materia prima secondaria.

of environment as victim of massive exploitation and contamination are common by mass media and other informative sources (Hawkins, 2006), as well as the discussion of the potential damages for human health and well-being deriving from this situation. This is probably the reason why respondents appeared to be concerned about these issues. The underlying value emerging from interviews seems to be indeed environmental justice (namely, the desire to protect the rights of all people to clean environment, air, water, etc., pursued through collective actions such as recycling), rather than concern for the environment for its own sake. These points were clarified by Giovanni and his wife, a middle-aged couple in their late sixties:

> **Giovanni**: Recycling is certainly important, since it allows to reduce pollution and to recover raw materials. This is the essential reason for recycling. We care about the environment, but it is not a matter of being environmentalists - we are *not* environmentalists - the matter is that we are concerned for future generations. One wonders: continuing this way, what will we leave to those coming after us, to future generations? [...] There is already the plan to go to the Moon or to Mars to save a part of humanity. The Earth, in these conditions, I do not know... the ozone hole, polluted water, hydrocarbons... there are so many evils, that listing them would be too long. One has to feel responsible. Because we are part of a planet, and we should all be concerned that we can continue to live on this planet.

Antonella: Yeah, we have to feel more responsible.

[H11 – G., male, 70, shopkeeper; A., female, 68, retired][2]

The excerpt evidences two interesting aspects. On the one hand, the widespread diffusion of environmental discourses and concern among broad, not radically connoted, segments of society (Giovanni, during the interview, has been resolute in affirming that his words were not dictated by being 'an environmentalist'). On the other, the adherence to ideals of environmental justice and personal responsibility as means to protect the environment for future generations. These respondents perceived indeed the task of recycling as important for them since they believed it is a responsible way to do something that contributes toward a better environment. In a similar way, another respondent, Pietro [H19], affirmed that the responsibility to recycle derives from the fact that recycling is not a personal thing, but one involving a large number of people and the quality of their living conditions. For this reason, every single individual should protect the environment in which we all live, by means of

[2] **Giovanni**: Fare la raccolta differenziata è sicuramente importante. Perché permette di ridurre l'inquinamento e il recupero delle materie prime. E questo è il motivo essenziale, la base per cui la facciamo. Ci preoccupiamo per l'ambiente: ma non è questione di essere ambientalisti, noi non siamo ambientalisti, è che ci si preoccupa per le generazioni future. Uno si domanda: continuando così, cosa lasciamo a chi viene dopo di noi, alle generazioni future? […] Stanno già pensando di andare sulla Luna o su Marte per salvare una parte dell'umanità. La Terra, in queste condizioni, non so io... il buco nell'ozono, l'acqua inquinata, gli idrocarburi... ci sono tanti di quei mali che elencarli sarebbe lunghissimo. Uno deve sentirsi responsabile. Perché facciamo parte di un pianeta dove dovremmo essere tutti preoccupati che in questo pianeta si possa vivere ancora.
Antonella: Eh sì, bisogna sentirsi più responsabili.

recycling his/her waste. Mauro explained the connection between responsibility, recycling and environmental care as follows:

> **Mauro**: Having the civic awareness of trying to reduce your own environmental impact and to behave in the right way from an environmental point of view, in short, that is the point... this is the urge that pushes me to recycle. **[H02 – male, 60, retired]**[3]

It seems thus that the diffusion of environmental discourses and concern among people shaped a new social imaginary (Hawkins, 2006), according to which being a 'good citizen' implies not only traditional (e.g., political, civic and social) responsibilities and duties, but also environmental ones such as household recycling. For numerous respondents recycling is indeed connected to the willingness to do the right thing and make their bit for the environment, even if it may be sometimes troublesome.

> **Carla**: Everyone does his bit, and I do mine willingly. I cannot even imagine throwing paper in the organic waste bin, for example. I do not do it on principle. I spontaneously

[3] **Mauro**: Avere la coscienza civica di cercare di ridurre il proprio impatto ambientale e di comportarsi nella maniera corretta da un punto di vista ambientale, insomma, ecco… questo è lo stimolo che mi spinge a fare la raccolta differenziata.

do it *[recycling]*, trying to be civil, doing the right thing as it should be done. **[H05 – female, 69, shopkeeper]**[4]

Antonella: I eat a mozzarella: I take it, I throw away the water, rinse the package, and turn it to control for absence of milk residues... These are tasks that I have to do in more, and I could say: who cares? Nevertheless, I do them, because it is right to do so. **[H11 – female, 68, retired]**[5]

Giacomo: Maybe *[recycling]* requires attention, time, and it may even be a little troublesome, because you have to buy dedicated bags, you have to be careful not to mix the items, if there is a multi-material package you have to separate the different materials in order to differentiate everything correctly... Nevertheless, if this allows a saving of energy for all, I do my bit willingly. I think that, surely, this kind of activity is marginal in order to reach an optimal level of environmental protection and energy use optimization. However, it is necessary to start somewhere. **[H10 – male, 33, air traffic controller]**[6]

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[4] **Carla**: Ognuno fa un po' la sua parte, e io la faccio volentieri. Non mi passa per la mente di buttare nel cassonetto dell'umido la carta, ad esempio. Non lo faccio per principio. Mi viene spontaneo farlo, cercare di essere civile, di fare la cosa giusta come dovrebbe essere fatta.

[5] **Antonella**: Mangi la mozzarella: io la prendo, butto via l'acqua, risciacquo, giro la carta che non ci siano residui di latte... E sono tutti lavori in più, che io potrei dire: ma chi se ne frega? Ma lo faccio perché è giusto farlo.

[6] **Giacomo**: Magari richiede dell'attenzione, del tempo e anche un po' di sbattimento, perché devi comunque prendere i sacchetti dedicati, devi stare attento a non mischiare gli articoli, se magari ti capita il blister con dei materiali promiscui devi metterti lì a dividerli per poter poi differenziare tutto correttamente... però, se questo consente un risparmio di energia per tutti, io faccio la mia parte volentieri. Poi sicuramente penso che questo tipo di attività sia molto marginale per poter arrivare ad un livello ottimale di rispetto dell'ambiente e ottimizzazione dell'energia. Però bisogna pure iniziare da qualche parte.

In addition of doing one's duty to preserve the environment (and often mentioned in conjunction with it), a different class of motives refers to recycling as a habit. The term habit describes a pattern of practices that has been executed many times and has thus become automatic, «the routine accomplishment of what people take to be the 'normal' ways of life» (Shove, 2004, p. 117). It emerged indeed from numerous interviews that respondents considered recycling as a routine embedded into their household daily practices, as the normal, natural way to deal with waste at home. Many of them affirmed that they experience the feeling of doing something odd, wrong or even bad when they do not recycle.

> **Serena**: It is now a habit, we are no more used to don't recycle. For example, when we participate to a party where everything is thrown in the same bag, I feel bad, I cannot do it...
>
> **Matteo:** For me it is the same!
>
> **Serena:** By now recycling has entered the daily rhythm, it is not a waste of time, it is what you must do. Stop. Because we recycle since many years, recycling has entered into our routine, it is the right way of doing things. **[H09 – S., female, 47, teacher; M., male, 11, student]**[7]

[7] **Serena:** Ormai è un'abitudine, non siamo proprio più abituati a non farla. Anche quando andiamo a qualche festina che magari si butta tutto in un sacchetto, io mi sento male, non riesco neanche più...
Matteo: Anch'io!
Serena: Ormai la raccolta differenziata è entrata nel ritmo quotidiano, non è che sia una perdita di tempo. È quello, si deve fare. Punto. Poi sono tanti anni che la facciamo, è entrata nella routine, è un modo di fare le cose.

> **Mirca:** Recycling requires only a little additional effort, because it has become so automatic that when you have a pot of yogurt or cheese, it is instinctive to rinse it and to throw it *[in the right bin]* [...]. It is a lifestyle, it is like feeding. That is, you enter in the order of ideas that you must behave in a certain way. **[H19 – female, 56, housewife]**[8]

Other respondents such as Maddalena [H01], Daniela and Lorenzo [H07], Elena [H14] and Nicola [H17] cited as a motivation to recycle the fact that this activity is not perceived by them as a burden, but instead as a low-effort, habitual activity with great benefits for the environment and for other people. They affirmed that, given these premises, the right question to pose is not why people recycle, but why some of them do not.

On the other hand, a minority of respondents highlighted that recycling is connected for them with more disadvantages than advantages, and motivated their recycling participation only in terms of the presence of an obligation by law to do so.

> **Ioana:** At the moment, here in Venice there is no advantage, *[recycling]* is just a hassle because you have to be careful, to read, to do additional things...

[8] **Mirca**: Che poi è uno sforzo fino ad un certo punto, perché poi diventa talmente automatico che quando prendi il vasetto dello yogurt o del formaggio, ti viene istintivo sciacquarlo e metterlo lì […]. È proprio uno stile di vita, è come l'alimentazione. Cioè, entri nell'ordine di idee che ci si comporta in un certo modo.

> **Filippo**: Yeah, there are more disadvantages than advantages. Because when you divide waste, you never have the right amounts to bring out, whereas if you throw all in a single bag, you can reach a certain volume of waste and you can bring out one or two bags per day. **[H04 – I., female, 39, part-time clerk; F., male, 46, civil engineer]**[9]

> **Ketty:** It was easier when you could throw waste all together in the garbage bin... Yeah, all together was less complicated. I mean, I had only to throw all the waste there, then took the bag and put it out. We had a waste container in our street. Two or three times a week, they *[the service provider staff]* emptied the container. Actually, I recycle because I am obliged by law to do so. And because if I do not recycle and I throw all the waste in a single bag, maybe I could also get a fine. **[H16 – female, 42, housekeeper]**[10]

This viewpoint was contrasted, however, by other respondents who believed that the motivations that lead people to recycle are not connected to the very fact that there is an obligation by law to do so (since there are only limited

[9] **Ioana**: Al momento qui a Venezia non c'è nessun vantaggio, è solo una rottura di scatole che hai perché devi stare attento, leggere, fare...
Filippo: Sì, ci sono più svantaggi che vantaggi. Perché quando vai a dividere, non riesci mai a fare la quantità giuste da portare via. Mentre se fai tutto un sacco e arrivi ad un certo volume, uno o due al giorno li porti via.

[10] **Ketty**: Era un po' più facile quando si poteva buttare tutto assieme nell'indifferenziato… Sì, perché tutto assieme è meno complicato. Voglio dire, butto tutto lì, insomma, e poi prendevi il sacchetto e lo portavi via. Una volta avevamo anche il bidone qui nella nostra via. E due o tre volte alla settimana passavano a svuotare il bidone. In effetti, viene fatta perché c'è l'obbligo, diciamo. E perché se non viene fatta e butti tutto in un sacchetto magari potresti anche prendere la multa.

controls and incorrect behaviors are rarely sanctioned), but instead to personal commitment and willingness to do the right thing. This point raised a discussion between Enrico and his father Mauro, and it was remarked also by Anna and Nicola:

> **Enrico:** In my opinion, if there was not the obligation to do so, hardly anyone would recycle by his own initiative. My commitment, for example, is motivated by obligation, since in my town there is a mandatory recycling collection system. Otherwise, I probably would not do it *[recycle]*. I would hardly differentiate waste for recycling at home.
>
> **Mauro:** I think that it is not completely true, because yeah, actually there is an obligation, but this obligation is not sanctioned. Doing it is only due to personal commitment, to the consciousness one has while doing it, because, in fact, sanctions are given very rarely, as it is not easy to surprise people who do not recycle properly in the very act to do so. **[H02 – E., male, 29, internal auditor; M., male, 60, retired]**[11]

[11] **Enrico:** Se non ci fosse, secondo me, l'obbligo del comune di farla, difficilmente uno di sua iniziativa va a farla. Il mio impegno, per esempio, è motivato dall'obbligo che nel mio comune è presente la raccolta differenziata, sennò probabilmente non la farei. Difficilmente mi metterei a casa a dividere.
Mauro: Secondo me non è proprio vero questo, perché di fatto, sì, c'è un obbligo, però è un obbligo che non è sanzionato. Per cui il farlo è dovuto solo all'impegno più che altro personale, alla coscienza che uno ha nel farlo, perché di fatto di sanzioni molto raramente ne vengono date, perché non è facile sorprendere quelli che versano in maniera scorretta.

> **Anna**: I think that it *[the fact that one recycles or not]* depends on the willingness of the individual and on his sensibility to the issue, more than anything else.
>
> **Nicola:** Since there are not incentives nor controls that could originate a possible sanction, one recycles only because he wants to do so, otherwise he can throw everything in the undifferentiated bin. **[H17 – A., female, 30, clerk; N., male, 33, industrial engineer]**[12]

5.1.1. PROMOTING RECYCLING THROUGH EXTRINSIC AND INTRINSIC INCENTIVES

In order to gain a deeper understanding of the motives that lead people to recycle, interviewees were asked to talk about the means they consider to be more effective to promote recycling. Within these discussions, a range of themes emerged. The first, cited by the majority of respondents, is the use of extrinsic rewards, such as the reduction of fees connected to recycling services for keen recyclers through pay-as-you-throw systems, deposit-refund mechanisms, and the use of points/bonus/vouchers given in exchange to certain amounts of collected recyclables.

> **Argia:** I would like if there was a law that makes you pay less if you recycle well. One would recycle more gladly,

[12] **Anna:** Io penso dipenda dalla volontà della persona, dalla sensibilità al tema più che altro. **Nicola:** Perché, non essendoci nessun incentivo e nessun controllo che porta ad una possibile sanzione, o fai la raccolta differenziata perché hai voglia di farla, sennò butti tutto sul secco.

since the work that one does would be acknowledged. **[H06 – female, 78, retired]**[13]

Lorenzo: Incentives in the bill would help. Discount coupons to be used at the supermarket would be useful as well, like in other European countries, where in exchange of plastic and glass bottles brought back to the supermarket, one receives a ticket spendable inside the supermarket itself. **[H07 – male, 61, clerk]**[14]

Alternatively to monetary incentives, Maddalena [H01] affirmed that it could be motivating to receive a non-monetary compensation for recycling, in the form for example of recycling bags given in exchange to a predefined amount of collected recyclables, since in her opinion this would encourage and help people to continue performing recycling tasks.

Other respondents cited the sanctioning of defective behaviors as an incentive to properly recycle. Filippo, however, feared that an incentivisation mechanism such as pay-as-you-throw, combined with sanctions, could have the reverse effect of inducing people to illegally dump residual waste instead of correctly dispose of them, in order to avoid paying more fees.

[13] **Argia**: Mi piacerebbe se ci fosse una legge che ti fa pagare meno se fai bene la raccolta differenziata. La faresti anche più volentieri, perché verrebbe riconosciuto il lavoro che uno fa.
[14] **Lorenzo**: Degli incentivi in bolletta sarebbero utili. E sarebbero utili anche i buoni sconto nei supermercati, come fanno in altri paesi d'Europa, dove con la plastica o le bottiglie di vetro che porti indietro al supermercato, ti danno un ticket che tu puoi spendere dentro al supermercato.

> **Enrico:** Recycling should be managed, let us say, in an univocal way, that is, equipping bins with a weighing system and a bar code reading system for every single user, so that it would then be easier to punish those who do not do well. **[H02 – male, 29, internal auditor]**[15]

> **Filippo**: This thing generates panic: how much residual waste am I permitted to thrown away in a year? How can I know this? Have I to write down a progressive until the end of the year? And then, what can I do? Am I supposed to thrown *[residual waste]* in the paper bin? [...] Obviously, if penalties will be introduced for those who do not recycle well, people will dump trash around, thereby the little that has been achieved is likely to gone lost. If there will be a certain number of planned conferments, I will adapt, but it is certain that if I will exceed the quota, I should make it *[residual waste]* disappear. **[H04 – male, 46, civil engineer]**[16]

Conversely, some respondents were doubtful about the efficacy of extrinsic incentives, since recycling for them is induced by civic duty and not by money or sanctions, and thereby it was more important in their opinion, in order to obtain

[15] **Enrico**: Bisognerebbe gestire la raccolta differenziata in modo, diciamo, univoco, cioè quindi dotando i bidoni di un sistema di pesatura, di una lettura a codice a barre per singolo utente, che renderebbe poi più facile sanzionare chi non la fa bene.

[16] **Filippo**: Questa cosa qua crea panico, perché quant'è che posso buttare via all'anno? Come faccio a saperlo io? Devo scrivere i progressivi finché arrivo a fine anno? E poi cosa faccio, butto dentro alla carta?! […] Ovvio che se ci sono penalizzazioni per chi non si applica, la gente lascerà la spazzatura in giro, quindi quel poco che è stato raggiunto rischia di andare perso. Se c'è un numero di svuotamenti programmato mi adeguerei, certo che se sforo poi li farei sparire.

a long-lasting behavioral change, educating people to recycle as the right thing to do, instead of paying them when they actuate the behavior. Sara and Adriano clarified this point:

> **Sara:** I do not think that rewards are a decisive factor for a recycler. One recycles also if he has nothing in return. Because it is a matter of sensibility, it is a different matter. I believe that the motivation behind is less venal. That is, I believe that one is moved by a spirit of citizenship, that he owns in any case, regardless of the fact that the bill is less costly. **[H20 – female, 30, research assistant]**[17]

> **Adriano:** You know, rewards are like candies for a child: when he ate it once, then he returns to do the same as before. In my opinion, *[recycling]* has to be an idea, education, correctness, instead of being motivated by money as an end in itself. **[H18 – male, 63, retired]**[18]

Alternatively to extrinsic rewards/sanctions directed to single individuals, several respondents stated that recycling should have a visible return in term of value created for the entire local community: in their opinion, the economic

[17] **Sara**: Un discorso di premialità, sì e no, insomma: non credo sia un fattore incisivo per una persona che fa la raccolta differenziata. Non è che, se non hai niente in cambio, la raccolta differenziata non la fai. Perché è un discorso di sensibilità, è un discorso diverso. Credo ci sia dietro una questione meno venale. Cioè, sei mosso da uno spirito di senso civico, che comunque c'hai, a prescindere dal fatto che, credo, la bolletta costi di meno.

[18] **Adriano**: Sai, il contentino è come la caramella al bambino: quando l'ha mangiata una volta, poi torna a fare come prima. Secondo me, *[il riciclo]* deve essere un'idea, un insegnamento, una correttezza, più che motivato dal soldo fine a se stesso.

gain/saving obtained through recycling should be redistributed among all the citizens that contributed to the process, in the form of building new public infrastructures and maintaining in good state the existing ones. Respondents affirmed that this would make the outcomes of recycling tangible, motivating and sustaining their engagement in household recycling behavior.

> **Paola:** Seeing that everything that has been thrown away, has changed its shape but it still exist and is still beautiful, and functional, and new materials have not been wasted to build new objects. Seeing that waste that once was burned, wasted, thrown away, can reborn in new beautiful and valid things. I think it would be an incentive, especially if these things were put at the disposal of people, for example in public parks, or by using them as building materials. I think it would be an important incentive. **[H01 – female, 55, housewife]**[19]

> **Adriano:** This could motivate people to recycle: that municipal authorities announce that the 1 or 2% of recycling that has been done more in 2015 compared to 2014, enabled the construction of a new kindergarten, or new structures, or a new playground. That is to say: this is what comes back to the community. Nobody gives you

[19] **Paola**: Vedere, cioè, che tutto quello che si è gettato, ha cambiato forma ma c'è ancora ed è ancora bello, ed è funzionale, e non è stato sprecato materiale nuovo per costruire nuovi oggetti. Questi rifiuti che andavano bruciati, sprecati, buttati via, che rinascono, cioè che sono cose ancora belle, ancora valide. Penso sarebbe un incentivo, e soprattutto se magari poi li metti a disposizione della gente, tipo nei parchi pubblici, o fai materiali da costruzione. Penso sarebbe un incentivo importante.

> money back, but they settle the streets, the square, the park... **[H18 – male, 63, retired]**[20]

The concept of redistribution is present also in the narratives of Giovanni [H11] and Lorenzo [H07], who advanced the idea to redistribute for free the compost obtained from collected organic waste to people owing a vegetable garden, or to local community gardens:

> **Lorenzo:** It would be important that the companies that produce compost from collected garden and organic waste, in addition to sell it for their profit, would distribute a part of it to local authorities, and that these, in turn, would give it to people who own fields or a vegetable garden. Alternatively, it could be brought to community gardens. **[H07 – male, 61, clerk]**[21]

Finally, respondents cited as a means to strengthen their recycling motivation an intrinsic form of incentive, namely the provision of information regarding how to properly recycle and what happens to recyclables materials once the service provider collects them.

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[20] **Adriano**: Questo potrebbe motivare le persone a riciclare. Magari dire, a livello di comune, che l'1 o 2% che si è fatto in più nel 2015 rispetto al 2014 ha permesso di fare un asilo nuovo, o delle strutture nuove, o dei giochi nuovi per i bambini al parco. Cioè dire: alla comunità torna questo. Nessuno ti dà indietro i soldi, però magari sistemano le strade, la piazza, il parco...

[21] **Lorenzo**: Il compost ottenuto dalla raccolta del verde e dell'umido, sarebbe importante che le ditte che lo recuperano, oltre a venderlo per loro beneficio aziendale, ne dessero in distribuzione una parte agli enti locali, e che questi a loro volta lo diano a chi ha terreno o orto. Oppure potrebbe essere portato negli orti sociali per recuperarlo.

Antonietta: If there was a clear, univocal and more explicit indication about how single products should be collected, recycling would be easier. You know, it would encourage people… if one knows, one is encouraged, isn't she? If you are aware that an object goes in a certain bin, then you will be more careful. **[H03 – female, 83, retired]**[22]

Anna: It would be interesting to understand. Yes, I do not know what happens once recyclables have been collected. I am confident, I think that if we recycle and if resources are expended to collect materials separately, this actually serves to something. I have not investigated, but I would really like to know what the service provider does next. It would be interesting. Maybe a little, further incentive to say: yes, I am doing it for a reason.

Nicola: Yes, exactly. It could constitute a motivation that comes from information. Ultimately, this is marketing. The company says to you: look, I am doing my bit. You do not do it *[recycle]* because you are obliged to do so, or because you pay a fee, but because I can help the environment, thanks to your contribution. **[H17 – A., female, 30, clerk; N., male, 33, industrial engineer]**[23]

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[22] **Antonietta**: Se ci fosse una indicazione chiara, univoca, molto più esplicita di dove il singolo prodotto dovrebbe essere raccolto, sarebbe più facile fare la raccolta differenziata. Sai, invoglierebbe anche le persone… Se uno sa, invoglia, no? Questo sai che va qua, allora magari stai più attenta.

[23] **Anna:** Sarebbe interessante capire. Sì, quello che succede post-raccolta, io non lo so. Mi fido, penso che se la faccio e se si impiegano risorse per raccogliere i materiali in maniera differenziata, poi effettivamente a qualcosa serva. Anch'io non ho indagato, mi piacerebbe però sapere magari il bacino di competenza, cosa fa poi dopo. Sarebbe interessante. Forse un piccolo incentivo in più per dire: sì, lo sto facendo per qualcosa.

5.2. EXPLANATIONS OF DEFECTIVE RECYCLING EPISODES

A further aim of the research was to investigate the justifications people use to explain defective recycling episodes, that is, the attributions they make for their own violations of recycling rules, answering to the fourth research question:

RQ4 - <u>How do people justify defective recycling episodes?</u>

During the interview, respondents were asked to think about past episodes in which they deliberately did not recycle products they knew were actually recyclable, and to explain the reason(s) behind this decision. Whether or not the attributions cited were real (i.e., based on objective facts, constraints, etc.) was not important, since even «perceived constraints are 'real' in the sense that they are reasons why people might deviate from their recycling routines, which may lead to the formation of new, less desirable habits» (Smeesters et al., 2003, p. 458).

A first type of narrative emerging from the interviews corresponds to what Scott and Lyman (1968) have defined as 'excuses based on defeasibility'. These are described as statements used to explain an untoward behavior in which one admits that the act in question is bad, wrong, or inappropriate, but denies full responsibility for it appealing to the fact of being not fully informed. The individual thus excuses him/herself from responsibility by claiming that certain

Nicola: Sì, esatto. Potrebbe costituire una motivazione che nasce dall'informazione. Perché alla fine è marketing. L'azienda ti dice: guarda che io faccio. Non lo fai perché sei obbligato a farlo, perché paghi la Tasi, o che ne so, ma perché io aiuto l'ambiente, grazie anche al tuo contributo.

information was not available to him/her, which, if it had been, would have altered him/her behavior. Various respondents appealed to the lack of precise indications regarding how and where to correctly dispose of products as the main motive for not recycling part of them. Mauro [H02], for example, cited the risk to make confusion and to throw an object in the wrong bin when it is not clearly labelled for recycling. The same point was confirmed by Serena:

> **Serena**: Coffee bags, for example: there is no indication, therefore I throw them in the undifferentiated bin. I think they should be disposed of there. However, they could be composed of plastic, who knows? Why don't they indicate this? If there is no clear indication, I throw them in the undifferentiated bin. **[H09 – S., female, 47, teacher]**[24]

Paola, on the other hand, stated that she never throws recyclable products intentionally in the wrong bin in order to make the process easier, trying to apply in every occasion her knowledge of recycling rules. However, she lamented that recycling indications sometime are missing and this perhaps might cause her commits *bona fide* mistakes.

> **Paola**: Maybe I do not know that object, I do not know where to confer it. Maybe it has to be thrown - who knows?

[24] **Serena**: Tipo le buste del caffè: non c'è scritto niente, quindi le butto nel secco. Secondo me vanno lì. Però potrebbero anche essere di plastica, chi lo sa? Perché non lo scrivono?! Se non lo scrivono, io le butto nel secco non essendoci un'indicazione chiara.

> - in the plastic bin, and I throw it in the undifferentiated bin because I do not find indications, I do not know how to treat it. **[H01 – female, 55, housewife]**[25]

Ketty [H16], however, was more polemical on this aspect, complaining that the service provider does not adequately inform people through informative leaflets or the recycling calendar about how to properly recycle. Furthermore, she was convinced that provider's call center operators would not be able to give her correct answers and clarifications in case she would call them for help.

Ignorance (or incomplete knowledge) of recycling rules originates some 'recycling myths', which seemed to be deep-rooted in people's beliefs and were often cited by them as valid reasons for not recycling some items. The first of them, reported by various respondents (Maddalena [H01], Ioana [H04], Daniela [H07], Giacomo [H10], Ketty [H16] and Diletta, Mirca and Pietro [H19]), was that an object (e.g., a plastic container) is not recyclable if it is dirty or if it contained chemical products (e.g., toothpaste, shampoo) (see Chapter 4).

Another 'myth' was that it is not a big problem throwing an object in the wrong bin, since at the recycling center someone will divide and differentiate it from the rest. Filippo, for example, believed that 'real' differentiation is possible only after household collection, asserting the impossibility for people to distinguish between different types of similar materials, e.g., different types of

[25] **Paola**: Magari non conosco quella cosa, non so dove va. Magari va, che ne so, nella plastica, la metto nel secco perché non trovo indicazioni, non so come trattare questo rifiuto e lo butto via così.

plastic, because for them «plastic is plastic», evidencing thus what Henriksson and colleagues (2010) described as a structural mismatch between professional and people waste sorting principles. That is, professional waste sorting principles are in some cases counterintuitive to people, who use other categorizations and principles closer to their experience to sort waste (e.g., if it is good for the environment to recycle some kinds of plastic items, why should not all kinds be recycled?). This may cause uncertainty and skepticism (Henriksson et al., 2010), or may serve, as in the case of Filippo, as a justification for defective episodes.

> **Filippo**: There are a lot of symbols... so you cannot understand whether it is polypropylene, polyethylene... one cannot going mad. I think that differentiation is made after our collection. For us, plastic is plastic. **[H04 – male, 46, civil engineer]**[26]

Alternatively, respondents cited as an excuse for defective episodes misinformation arising from misrepresentation of the facts by other people, or from the observation of their behavior. While discussing the results of the questionnaire, for example, Annamaria, Adriano and Alessandro [H18] were very surprised at discovering that Styrofoam trays are actually recyclable, and justified their erroneous beliefs by asserting that 'others' have always said to

[26] **Filippo**: Ci sono tutte sigle... quindi non si può capire se è polipropilene, polietilene... uno non è che può impazzire. Penso che la cernita venga fatta dopo la nostra raccolta. Per noi plastica è plastica.

them that Styrofoam is a non-recyclable, residual waste. Ketty [H16], on the other hand, asserted that she does not recycle thin plastic packages, but specified also that in her opinion everyone behaves in the same manner, since she knows personally a number of other people (e.g., the family where she works as housekeeper) doing the same.

> **Annamaria**: I throw Styrofoam in the undifferentiated bin. Because it has been said to us that it has to be conferred there...
>
> **Adriano**: Yeah, once it has been said to us that it has not to be disposed of in the plastic bin.
>
> **Alessandro**: Everybody have always said to us that Styrofoam is not recyclable.
>
> **[H18 – Am., female, 63, retired; Ad., male, 63, retired; Al., male, 34, start-upper]**[27]

A second type of excuses used by respondents were 'accidents', where responsibility is mitigated or relieved by pointing to the generally recognized human incapacity to control all motor or cognitive responses (Scott & Lyman, 1968). In particular, various interviewees invoked distraction and lack of attention as a source of defective episodes.

[27] **Annamaria**: Io il polistirolo lo metto nel secco. Perché ce l'hanno detto, che va nel secco...
Adriano: Eh sì, una volta ce l'hanno proprio detto che non va nella plastica.
Alessandro: Ce l'hanno sempre detto tutti che il polistirolo non si ricicla.

> **Antonietta**: It happens that something ends up in another bin, unintentionally, because in that moment one maybe is a little distracted. **[H03 – female, 83, retired]**[28]

> **Annamaria**: Sometimes I get confused, I mean that I know where I have to dispose of the object, but I throw it elsewhere. **[H18 – female, 63, retired]**[29]

A third type of excuses refers to lack of space in the home to collect one or more prescribed types of materials. Argia [H06], for example, said that she collects for recycling only journal paper, while she throws other types of paper (e.g., pieces of packages, little leaflets, etc.) in the undifferentiated bin. She motivated this fact by explaining that she lives in a tiny house with little space for recycling containers. She has thus to collect paper in a little external storeroom, but since it is outside and not completely closed, wind could blow away smaller paper pieces. Diletta also lamented lack of space in the house where she lives as offsite student as the main reason why, when there, she recycles very little.

> **Diletta**: It is a problem of space, because I barely have space for recycling bins. I live in a very small studio and I have no space for three or four bins. Indeed, I throw in the undifferentiated bin the majority of my waste, even if not

[28] **Antonietta**: È facile insomma che una cosa scivoli su un altro bidone, anche senza volere, perché al momento magari uno è un po' distratto.
[29] **Annamaria**: A volte faccio confusione, cioè so dove va una cosa e la metto da un'altra parte.

> all. For a matter of space, because I have no space for the bins. **[H19 – female, 26, student]**[30]

A different type of explanations for defective episodes are justifications, namely accounts in which - contrary to excuses - one accepts responsibility for the act in question recognizing that, in general, it is impermissible, but claiming that the particular occasion permits or requires the very act (Scott & Lyman, 1968). Numerous respondents cited justifications as reasons for not recycling. For Maria Luisa, for example, not recycling scraps of fish (skin and bones) and the plastic package containing it was motivated by avoiding the production of bad smells. For this reason, she affirmed to put them in the garbage bin, or, alternatively, in the bin that has to be collected first by service provider operators. Antonietta [H03] and Viviana [H08], on the other hand, do not recycle expired food with a creamy texture (e.g., yogurt or ricotta) since it might create problems of dirt, percolation and bad smell.

> **Maria Luisa**: Usually when I buy fish, I cleanse and prepare it, and then all goes in the undifferentiated bin. Alternatively, in any case, I do not confer it where I should,

[30] **Diletta**: È anche un problema di spazio, perché a me i bidoni quasi non ci stanno. Io ho un monolocale piccolissimo e non mi starebbero mai tre-quattro bidoni. Infatti io non tutto, però tanto lo butto nel secco. Per una questione proprio di spazio, perché non ci stanno.

but I throw it in the bin that has to be collected first. For a matter of smell. **[H02 – female, 63, retired]**[31]

Viviana: I have to say the truth: we dispose correctly of some objects, such as mozzarella. That is, we open it, empty out the water and throw the mozzarella in one bin, and the packing in another one. However, I am not always so careful: that is, if I see that a yogurt is expired, I do not empty the jar, I throw all together in the undifferentiated bin. I know that it is not the best thing to do, but it is annoying emptying it. Let's say that we confer wrongly expired creamy foods, which have a consistency that is neither liquid, which can easily go down the drain, nor solid, which can be safely thrown in the organic bin without causing damages. Creamy products percolate and are sticky, and this is annoying. Therefore, we tend to throw all together. Thankfully, it does not happen so often. **[H08 – female, 41, secretary]**[32]

[31] **Maria Luisa**: Di solito quando compro il pesce, lo curo, lo pulisco, ecc., poi va tutto nel secco. O comunque non lo metto dove dovrei metterlo, lo metto nel rifiuto che va via per primo, che elimino per primo. Per una questione di odore.

[32] **Viviana**: Io dico la verità: alcune cose, come la mozzarella, le smaltiamo bene. Cioè, la apriamo, svuotiamo l'acqua e buttiamo via la mozzarella da una parte e l'imballo dall'altra. Io però non sempre sono così brava: cioè, se vedo che uno yogurt è scaduto non mi metto a svuotare il vasetto, butto tutto nel secco. So che non è il massimo, però è un po' rognoso dedicarsi a svuotarlo. Diciamo che capita di smaltire male il prodotto scaduto con quei prodotti che hanno una consistenza che non è né liquida, che può andare giù tranquillamente per lo scarico, e né solida, che può essere tranquillamente buttata nell'umido senza creare danni. I prodotti un po' cremosi, metterli nell'umido che poi percolano, appiccicano per sotto, è un po' una rogna. E quindi si tende a buttare via tutto assieme. Però non capita spesso per fortuna.

When invited to reflect upon defective episodes and their causes, some respondents recognized that no other valid motivation can be adduced, but laziness. Maddalena [H01] said that sometimes she does not adequately prepare some items for recycling (e.g., squeezing or rinsing juice bottles or Tetrapak containers), while Elisabetta [H22], reporting on defective acts, admitted to feel a sense of guilt when she is committing them, due to the awareness that her behavior is guided by no other reasons than laziness.

On the other hand, Alessia [H01] explained her violations of recycling rules in terms of the relative non-importance, for her, of the behavior in question. She believed indeed that dividing the parts of which a packet of cigarettes is composed (i.e., the paper box and the plastic film) is a trifling act, on which it is thus not worth to spend fatigue and time. She affirmed also that the only things that matter for her are the easiness of the action in itself and not wasting time on it, and that she never reflects upon the effects of her behavior, for example on environment, while performing it.

5.2.1. REASONABLE RECYCLING ACTIVITIES

By discussing on the reasons why respondents sometimes commit defective acts, it emerged that, despite the great majority perceived themselves as keen recyclers, and some of them claimed that there is nothing more they can do since they are already recycling at their best, in practice there are clear limits to what people are willing to do with regard to household recycling. These limits

correspond to what Skill and Gyberg (2010) have called 'reasonable activities', that is, the (green) activities people consider reasonable for them to do in the context of their daily life. While not doing reasonable activities (e.g., recycling waste instead of dumping it) was seen as ignorant, stupid and disturbing by most respondents, going as far as dividing items composed by different materials that are not easily separable was considered as overly time consuming to be reasonable for several of them.

Carla [H05], for example, commenting on having seen her daughter in law dividing an empty aluminum can from its paper label, said that this was not her case, since it is correct to be committed with recycling, but one does not have to exaggerate in order to avoid going mad. Similarly, Antonella [H11] affirmed that she had not the time nor the willingness to make a job (i.e., dividing paper labels from glass bottles and jars) that in her opinion pertains to the service provider. A common way to deal with recycling in a 'reasonable way' is that exemplified by Silvano:

> **Silvano**: We do the bulk. Then, take as an example the Tetrapak milk carton... I try to divide, in addition to the plastic cap, even its support. If it is possible to remove it quickly it's ok, otherwise I leave it there. I do not want to get stressed with it! [...] But I think that what we do is right. Maybe we could put even more attention, maybe avoid to throw expired yogurt all together with the jar in the

undifferentiated bin. But for me, what we are already doing is more than enough. **[H08 – male, 56, manager]**[33]

This excerpt highlights various interesting aspects: where the limits for Silvano's commitment and individual efforts lie (i.e., recycling tasks have not to be too time consuming); how he considers himself as a good recycler even if he is aware that more could be done, since that 'more' is not deemed as reasonable in the context of his family's daily routine; and the fact that 'doing the bulk' of recycling activities seems to relieve him from the responsibility of not recycling all the items properly.

The narratives of Serena [H08] and Elena [H14], on the other hand, highlighted that reasonable actions are often connected to moral considerations, since what is considered to be reasonable could contrast with the desire of being a conscious recycler. Serena and Elena claimed indeed that they do not recycle some multi-material packages because it would take them too much time to properly separate all the parts composing them, but at the same time, throwing these packages undivided in the garbage causes them a feeling of uncomfortableness. This fact led the two respondents to blame manufacturers, as well as institutions for lack of control, affirming that manufacturers should be forbidden by law to produce and use such type of packages.

[33] **Silvano**: Il grosso si fa. Poi vabbè, prendiamo ad esempio la confezione del latte in Tetrapak… io provo a staccare, oltre al tappo in plastica, anche il suo supporto. Se viene via velocemente bene, sennò lo lascio là. Non è che mi sto a dannare! […] Penso comunque che quello che facciamo sia giusto. Magari potremmo metterci ancora un po' più di attenzione, magari lo yogurt scaduto non buttarlo intero nel secco. Però per me, quello che già facciamo è più che sufficiente, ecco.

5.3. SUMMARY OF THE CHAPTER

This Chapter has demonstrated the significance of multiple factors in motivating household recycling. Alongside well-studied factors such as environmental protection, the role of other important factors has been evidenced, as well as the ways in which they influence recycling practices. In particular, it has been pointed out that motivations to recycle refer not only to environmental, but also to civic duty-related values, as well as to habit. That is, people recycle in order to help protect the environment, because they consider it is their civic duty to do so, and because recycling has become a habit embedded in their daily routines, that is, the natural way for them to manage waste at home. Interestingly, respondents do not mention environmental concern as a primary reason to recycle due to a strong ecological ideology, but instead because taking care of the environment through actions such as recycling has become part of the way they intend their civic duty as responsible citizens.

The majority of respondents cite the use of extrinsic rewards (such as fees reduction through pay-as-you-throw mechanisms, the use of points/bonus/vouchers, and deposit-refund systems) and of sanctions, as useful incentives to motivate people to recycle. Others, however, are doubtful about the efficacy of extrinsic incentives, since recycling for them is induced by intrinsic values and motivations (e.g., civic duty) and not by money or sanctions. Alternatively to extrinsic rewards/sanctions directed to single individuals, several respondents state that recycling should have a visible return in term of

value created for the entire community (e.g., use of recyclables as building materials for the creation of public parks, re-distribution of compost obtained from organic waste to people who own a vegetable garden, or to community gardens, etc.). Finally, respondents cite as a means to strengthen their recycling motivation the provision of information regarding how to properly recycle items and what happens to recyclables materials once the service provider collects them.

Another purpose of the present research was to understand how people justify defective episodes. By talking with participants about their everyday recycling practices and routines (rather than simply offering them a list of possible justifications and asking to choose the ones that fit most their situation), it was obtained a wealth of information regarding justifications and what is considered to be reasonable with regard to recycling. In particular, it has been highlighted that respondents tend to justify defective recycling episodes by pointing to external factors such as lack of information, distraction while sorting items and lack of space in the home for recycling bins. Personal responsibility is mitigated or relieved by these excuses, since external circumstances are held responsible for defective episodes, rather than the self. In other cases, respondents accept responsibility for the defective act in question, but justify their behavior claiming that the particular occasion permits or requires the very act. Only three respondents admitted that defective episodes are often dictated by internal causes, namely laziness and the belief that recycling an item is such a trivial act that refraining from it will not lead to negative external effects.

In addition, it has been demonstrated that despite the great majority of respondents perceive themselves as keen recyclers, there are clear limits to what they consider reasonable and thus are willing to do with regard to household recycling. For example, going as far as dividing items composed by different materials that are not easily separable is considered as overly time consuming to be reasonable for several of them, and the typical decision is thus to throw all together in the garbage bin. However, a moral dilemma may arise when actions considered reasonable (in term of sparing time, effort, etc.) contrast with the desire of being a conscious recycler (i.e., a recycler that correctly disposes of all his/her recyclables).

CHAPTER 6

RECYCLING AS A SHARED HABIT AND RESPONSIBILITY

6.1. RECYCLING AS A HABITUAL AND SHARED DOMESTIC PRACTICE

Various authors conceptualize domestic recycling as a habitual practice. That is, a practice occurring frequently, in the stable context of the home, involving regular sets of activities often carried out at the same time of the week, and strictly connected to other household's management activities (cleaning, cooking, etc.) and the everyday domestic routine (Aberg et al., 1996; Comber & Thieme, 2012; Cotterill et al., 2009; Thomas et al., 2004). According to Ronis, Yates and Kirscht (1989), habits are characterized by two stages: formation and persistence. The first phase is the result of reasoned action. That is, when people are exposed to an alternative way of managing a household activity, they have to actively and consciously reflect upon the practice in question and take precise decisions about it. Participation in a newly introduced recycling scheme, for example, represents a situation where active decision-making and consideration of the current routine are necessary. While dealing with these issues, people are forming a new habit, which once established (phase two), ceases to require much

conscious thought to be carried out and develops in a behavioral routine. Although the original model proposed by the authors was related to the establishment of health-related behavioral habits, Aberg et al. (1996) demonstrated that it is applicable also to a practice conceptually very close to recycling, namely composting of household organic waste.

Starting from here, respondents have been inquired about the physical and social organization of recycling tasks inside their household, with the aim to understand which are the mechanisms and dynamics leading to the formation of a domestic recycling routine and whether they differ from the ones underlying recycling maintenance over time. Therefore, this Chapter analyzes the interviews and part of the other materials collected during the field study (Study 2), such as information retrieved from waste diaries and the data gathered during home-tours, in order to answer to the fifth research question:

RQ5 - How are recycling habits developed and maintained by people over time?

6.1.1. HABIT FORMATION

Two main mechanisms emerged from the interviews through which people acquire a recycling habit. In addition to the one described by Ronis et al. (1989), which derives routines from conscious choices and problem solving, another emerging mechanism seems to be based on socialization, and can be regarded as

«the acquisition of skills (practices), knowledge and attitudes relating to environmental actions participation from another household member» (Scott et al., 2015, p. 5807).

The first mechanism involved primarily older respondents (those aged more than 35 years), who lived the transition occurred around mid-90s in Italy from undifferentiated waste collection to recycling. They described extensively the difficulties encountered when recycling system was first introduced, relating them mainly to the necessity of rearranging the spaces inside the house in order to accommodate recycling bins, organizing them into an efficient domestic system, as well as to acquire the needed information to deal with waste according to the new recycling rules. The arrangement of a system judged efficient and fully respondent to their needs often required respondents to change the bins initially provided by the service provider with others bought directly by them, considered more practical, compact (in order to deal with the problems posed by limited in-home spaces) and aesthetically pleasant. Some respondents such as Paola [H01], Giacomo [H10] and Sara [H20], affirmed having tried different solutions, before finding the proper one. In many cases, respondents appeared to be proud of their recycling system, arranged in spite of the presence of external constraints such as a limited space or the initial lack of adequate containers, affirming that recycling becomes simpler if one finds a way to organize it properly and effectively.

With regard to initial information acquisition, several respondents such as Paola [H01], Argia [H06], Daniela and Lorenzo [H07], Serena [H0] and Sergio

[H12] affirmed to have read the informative brochures provided by the service provider in order to acquire relevant information and solve initial doubts about some difficult items. In addition, others such as Anna and Nicola [H17] reported the use of various strategies to improve their ability to correctly manage waste for recycling, as the placement of colored stickers on the kitchen bins in order to remember the right collection day for each material:

> **Sergio**: We have solved doubts about difficult items at the beginning. We did not know, and now we know where to dispose of them. Now it has become very simple, a routine. **[H12 – male, 44, shopkeeper]**[1]

> **Anna:** We learned *[to recycle]* mainly by reading the recycling calendar and on-product recyclability labels. We have learned, and now it has become a habit.
>
> **Nicola:** In addition, we placed some stickers here *[on the kitchen bins]*, writing on them, for example, Tuesday on the undifferentiated bin, or Wednesday on another bin...
>
> **Anna:** And then we learned also them, it is quite automatic now.
>
> **Nicola:** Yeah. We could also remove them. **[H17 – A., female, 30, clerk; N., male, 33, industrial engineer]**[2]

[1] **Sergio**: Diciamo che le cose difficili le abbiamo risolte all'inizio. Non si sapeva e ormai sai dove buttarlo. È diventato molto semplice, una routine.

[2] **Anna**: Noi abbiamo imparato leggendo il calendario, principalmente, e poi le etichette. Abbiamo imparato, e adesso è diventata un'abitudine.
Nicola: E poi avevamo messo di bigliettini qui *[indica i bidoni sotto al lavello]*, con scritto ad esempio martedì sul secco, o mercoledì su un'altra cosa...
Anna: Poi abbiamo imparato anche quelli, è abbastanza automatico ormai.

These excerpts highlight how these respondents were forming a sorting habit while dealing with issues posed by the introduction of a new practice (recycling) inside their household routine. Importantly, both Sergio and the couple Anna-Nicola insisted on the fact that, once habitualized, persistence of recycling activity did not longer require them much active thought, entering the household daily routine and becoming automatic, that is, the normal way to deal with waste. Similarly, the need of external visual aids such as colored stickers ceased to be necessary to prompt the correct behavior.

The second mechanism that leads to the formation of a recycling habit is socialization. According to Scott and colleagues (2015), the influence exerted by a household member on another one can shape the habitual behavior of the latter by determining what is seen as a normal practice. Parents to sons socialization influence appeared to be the prevalent one, and proved to be an important mechanism of recycling habit formation especially with regard to younger respondents. Many of them such as Alessia [H01], Maria [H09], Giacomo [H10], Elena [H14], Pietro and Diletta [H19], Sara [H20] and Elisabetta [H22] affirmed indeed that being grown up in a family in which recycling is considered as an important part of the daily routine positively influenced their attitudes toward it, as well as their behavior. Recycling was seen by younger respondents as the normal, natural way to deal with waste at home: Maria [H08], for example, one of the youngest respondents aged 11, was very surprised to discover during the

Nicola: Sì, infatti: potremmo anche toglierli.

interview that, in some places, waste is not recycled but instead thrown away all together, while Elena affirmed:

> **Elena**: It is a thing I have always seen, maybe not from my born, but here recycling has always been done. Therefore, it comes natural to me, actually. **[H14 – female, 23, student]**[3]

Other young respondents claimed that recycling is such an «assimilated practice» (Nicola [H17]) that it would be inconceivable for them not to separate waste at home for recycling. According to Alessia and her parents:

> **Alessia:** I realize that being grew up in a certain type of family environment has had a big influence on what I think about recycling, that is, thinking that it is a good thing, that it is worthwhile to engage in it, spending maybe an extra minute to rinse the products, to do it well, to separate items correctly, etcetera. This influenced me a lot and I cannot ever imagine doing things differently [...]. My parents have always done things in a certain way, and I have absorbed this way of doing as the right one.
>
> **Paola:** Yes, a matter of education.
>
> **Alessia:** Yeah, but not only education. More properly, the actual way of doing things here at home, that is...

[3] **Elena**: È una cosa che ho sempre visto fare, non dico da quando sono nata però qui la facciamo da sempre. Per cui mi viene naturale, insomma.

Paolo: ...the example. **[H01 – A., female, 26, trainer; Pa., female, 55, housewife; Po., male, 60, manager]**[4]

This quotation is interesting as it evidences the key role played by parental example in the formation of sons' recycling habits, by means of their passage from one generation to the next one. Alessia pointed out the importance of seeing recycling habitually undertaken by her parents and the fact that she naturally took their behavior as an example to replicate, because she considered its performance as the norm. The importance of parental example was mentioned also by some other respondents such as Viviana [H08] and Antonella [H11], who expressed the hope that their own behavior can serve as an example for next generations (children and nephews) to grow up assimilating recycling as a core part of their culture and way of living. Along with parental influence, Nicola affirmed that also school educational programs have had a role in the definition of what he and his contemporaries think about recycling:

Nicola: Those of our age have started in elementary school to hear about recycling, with billboards indicating where one thing or another have to be thrown, and what

[4] **Alessia**: Io mi rendo conto che essere cresciuta in un certo tipo di ambiente familiare ha avuto una grossa influenza su quello che penso della raccolta differenziata, cioè sul fatto che penso che sia una cosa giusta, che valga la pena di impegnarsi un po' di più, spendere magari quel minuto in più per sciacquare la cosa, per farla bene, per dividere bene ecc. Questo mi influenza molto e non penserei di poter fare diversamente. […] I miei genitori hanno sempre fatto le cose in un certo modo, tale per cui anche io ho assorbito questo modo di fare come giusto.
Paola: Una questione di educazione, sì.
Alessia: Sì, non solo l'educazione ma anche proprio il modo di fare le cose in casa, cioè...
Paolo: …l'esempio.

> happens next. I remember that at the elementary school we have been divided into groups, I was in the group of paper, for example... It is beautiful, actually: because it is a game, but you also understand that these are important things, and this is a concept that you hold back. **[H17 – male, 33, industrial engineer]**[5]

It is worth to note that those young respondents who have left parental house declared to continue practicing recycling also in their new house, as a result of recycling habits learned during their permanence in the parental house. As it will be illustrated in the following section, socialization mechanisms proved to be very important not only in the formation, but also in the maintenance of a recycling routine inside the household.

6.1.2. HABIT MAINTENANCE

During the interview, several respondents pointed out that the routinization of household recycling practices makes them becoming automatic, spontaneous and simpler. They cease to be perceived as a burden, but instead as normal activities to be carried out in the context of the daily management of the home. Francesco made this point clear discussing about the reasons why people recycle or not. He indeed ascribed the fact that some people do not recycle their

[5] **Nicola**: Quelli della nostra età hanno iniziato alle elementari a sentir parlare di riciclaggio, coi cartelloni di dove va questo, dove va quello, cosa succede dopo… Mi ricordo che alle elementari ci avevano diviso in gruppi, io per esempio avevo la carta... È bello, comunque: perché un po' giochi, un po' però capisci che sono cose importanti e poi ti resta questa cosa.

waste at home to a lack of habit, and to the cognitive fatigue (and consequent discouragement) characterizing activities that require much conscious thought:

> **Francesco**: Everything becomes more difficult, if you have to spend time reflecting upon it. Therefore, if one is not used to do it automatically... You know, people are prone to do automatic things, as is the case *[of recycling]* for us, but things requiring that one has to spend time thinking about them, are hardly done by many people [...]. For example, sometimes for me it is a little bit difficult to understand whether an item is recyclable or not. Apart from the usual items, that you know where they have to be disposed of, sometimes you are confronted with less usual items, and then one has to... concentrate, remember. On the contrary, waste we throw away often is not difficult to recycle. **[H09 – male, 47, unemployed]**[6]

The excerpt is interesting also because it evidences that routinization is never absolute. That is, in situations that deviate from the norm (e.g., unusual, non-daily recycling items that Francesco does not have to discard very often), the related «decisions continue to involve conscious thought and the consideration

[6] **Francesco**: Perché diventa tutto più faticoso, se ci devi stare lì a pensare. Quindi se uno non è abituato a farlo in automatico... Sai com'è, le cose automatiche ti va bene farle, come facciamo noi, ma le cose che devi stare lì a pensarci, tante persone faticano a farle. […] Delle volte io ad esempio faccio un po' fatica a capire se una cosa è riciclabile o no. A parte le cose solite, che sai dove buttarle, a volte ti capita qualcosa di un po' meno consueto, e allora ti devi un po'... concentrare, ricordare. Mentre i rifiuti che buttiamo via spesso non sono difficili da riciclare.

of at least one alternative to the selected course of action» (Smeesters et al., 2003, p. 456).

More in general, it emerged from the interviews that the maintenance of household recycling habits, even if recycling is perceived by respondents at this stage as natural and automatic, actually requires not only active cooperation between the members of the family (often with a distribution of tasks and responsibilities), but also the development of ad-hoc strategies to organize recycling activities, as well as their modification over time to cope with the unique situation of the household and its surrounding environment.

> **Anna:** Originally, newly married, it was decided that it had to be the man taking care of recycling. Then it went a bit waning, and now it is fifty-fifty. Who leaves first in the morning, and has a little more time, goes down and takes away waste. So now, both of us take care of recycling.
>
> **Nicola:** Sometimes I forget to take away waste, therefore I write her a SMS: "Please, could you take away waste, since today there is the collection of plastic?"
>
> **Anna:** Yeah, he writes me SMSs!
>
> **Nicola:** But definitely, I am the person assigned to training, and also to control, because sometimes...
>
> **Anna:** ...he calls me back to order!
>
> **Nicola:** Exactly, but I saw her improving over time. When I say to her: "Ehi!..."
>
> **Anna:** …I already know that I did something wrong *[she laughs]*. And when in doubt I ask him, and he reads.

> **Nicola:** Yeah, I look at the recycling calendar. Here there is written everything, usually. **[H17 – A., female, 30, clerk; N., male, 33, industrial engineer]**[7]

This quotation introduces two interesting aspects. First, it shows how Anna and Nicola developed a shared recycling routine as a result of a negotiation between them regarding their reciprocal involvement, tasks and responsibilities in domestic recycling. It is worth to note that the current routine was shaped by the performance of the practice itself, and was modified over time in order to better fit with the actual, emerging needs of the household members. This demonstrated that, although repetitive, recycling habits do not denote a mechanical, rigid behavior. Conversely, they imply «a flexible disposition which, though pre-reflective, remains commensurate with purposive action and in no way precludes intelligence, understanding, strategy or knowledge on the part of the actor» (Crossley, 2013, p. 139).

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[7] **Anna**: In origine, freschi di matrimonio, era stato deciso che doveva essere l'uomo ad occuparsi della raccolta differenziata. Poi la cosa è andata un po' scemando, e adesso è fifty-fifty. A chi capita, fa. Chi parte prima la mattina, e ha un po' più di tempo, scende e mette fuori. Quindi entrambi adesso ce ne occupiamo. Sì, dai.
Nicola: Magari a volte vado giù e non riesco a portare giù le cose, perché mi dimentico, allora scrivo un messaggio a lei: "Per favore, puoi portare fuori tu dato che oggi c'è la plastica?"
Anna: Sì, mi scrive i messaggi!
Nicola: Però io sono l'addetto alla formazione, sicuramente. E anche al controllo, perché ogni tanto...
Anna: ...mi richiama all'ordine!
Nicola: Esatto. Però l'ho vista migliorare nel tempo, dai. Quando la richiamo: ehi! ...
Anna: ...so già che ho fatto qualcosa di sbagliato *[ride]*. E in caso di dubbio chiedo a lui! E lui legge.
Nicola: Sì, io guardo il calendario. Che c'è scritto quasi sempre tutto.

Considering the 17 out of 22 households with more than one member, and analyzing the distribution of recycling-related tasks and responsibilities by gender, it emerged that:

- in nine households both men and women participated in recycling, but different sub-tasks were carried out by different household members, namely women usually sorted and stored waste while men delivered it to the curbside/recycling center; this is consistent with the findings of Wheeler and Glucksmann (2014), as well as with those of Aberg and colleagues (1996) regarding composting practices;
- in five households there were not distinctions in the assignment of recycling-related activities with regard to the gender of the householders;
- in three households, recycling was an activity carried out exclusively by women.

Sons and daughters, even if adult, usually displayed a lower degree of involvement in the domestic recycling process, dealing only with the separation of (part of) the produced waste. The analysis of the waste diaries showed indeed that on average parents recycled in three days twice the number of products recycled by their sons in the same period of time (18 vs. 9 products). As demonstrated by the type of products that have been disposed of, it appeared that parents, in addition to the products used for their personal care, managed also the differentiation of waste produced during the execution of other domestic activities (meals preparation, washing clothes and dishes, cleaning the house,

etc.). On the contrary, with only one exception, sons differentiated only products connected to personal use and care.

Whilst in the case of Anna, Nicola and other respondents the division of recycling-related tasks and responsibilities was agreed and accepted by all the household members, in some other cases different opinions emerged inside the household regarding how recycling should be handled and/or who is considered responsible for it. Sometimes, as reported by Laura [H15] and Ketty [H16], such differences of opinions resulted in a stricter division of labor, that is, a member had to do most of the work involved in recycling, while the other did not actively participate in the activity.

> **Laura**: Who puts out the bins and remembers collection days it's me. Because Federico puts everything together, and sometimes I have to do the job even for him... He throws everything together. I say to him: "When you go out, separate waste!". However, he is not very attentive. I also have to remind by myself when I have to put off plastic bin. Because he forgets, he does not know. **[H15 – female, 61, teacher]**[8]

> **Ketty:** I always take care of recycling alone, unfortunately. When Roberto opens a tuna can, he leaves it

[8] **Laura**: Chi mette fuori e si ricorda i giorni della raccolta sono io. Perché Francesco mette lì tutto quanto, e delle volte devo fare il lavoro anche per lui, insomma… Lui butta tutto assieme. Io gli dico: "Quando vai fuori, separa". Ma non è molto attento. Devo anche ricordarmi da sola i giorni in cui devo mettere fuori la plastica. Perché lui si dimentica, non sa.

above the sink and then I have to throw it away. He does not throw it into the bin. He leaves it there and then I recycle it by myself. **[H16 – female, 42, housekeeper]**[9]

In other cases, this situation led to tensions and discussions between household members:

Argia: I said several time to my son's wife to do the right thing, to recycle well, because I do not want to pay a fine because of her. Because I do my things well. However, she responded that others said it is useless to devote so many attentions to recycling, and that she does not have much time because she works. But what does it mean? If you have to do something, you do it! **[H06 – female, 78, retired]**[10]

Alessia: I would empty my home-office bin directly in the bigger garbage bin in the kitchen, because the idea of having to get my hands in the garbage to divide them disgusts me, but my parents want that I correctly differentiate all the waste. Every time is somewhat a fight on this point! **[H01 – female, 26, trainer]**[11]

[9] **Ketty**: Mi occupo sempre io della raccolta differenziata, purtroppo. Se Roberto apre una scatoletta di tonno la lascia sopra il lavandino e poi io la butto. Non è che lui prende e la butta sul secco. La lascia là e poi mi arrangio io.

[10] **Argia**: Ho detto diverse volte alla moglie di mio figlio di fare le cose giuste, di fare la raccolta differenziata per bene, perché io la multa per lei non la pago. Perché io le cose le faccio bene. Ma lei mi ha risposto che le hanno detto che è inutile dedicarci tante attenzioni, e che lei non ha tanto tempo perché lavora. Ma cosa vuol dire? Se devi fare una cosa la fai!

[11] **Alessia**: Io vorrei svuotare il cestino che ho nel mio studio direttamente in quello più grande dell'indifferenziato che abbiamo in cucina, perché l'idea di mettere le mie mani fra i rifiuti mi

The second interesting aspect emerging from the quotation of Anna and Nicola's interview concerns the role of socialization in the maintenance of recycling routine inside the household. The reciprocal influence exerted by the family members' behavior, as well as the active exchange of information and resources between them, were cited indeed by Anna and Nicola (and by the majority of other respondents) as vital for the flowing performance of domestic recycling. In particular, it emerged as important the influence exerted by the household 'recycling expert', that is, the person who is considered by the other family members as the most informed and skilled about recycling. This is the person who is usually asked for information when it is not clear how to deal with a particular item (where to throw it, how to correctly prepare it for recycling). In the case of Anna and Nicola, for example, when she is in doubt about where to put an object, she asks to Nicola, who indicates her the right behavior to follow. Anna does not read the informative brochure to search for information; active search is a task deemed to Nicola, who reads the indications contained in the informative brochure, collects the needed information to properly recycle, and then communicates them to Anna. That is, the expert plays the role of 'information gatherer and gatekeeper' (Scott et al., 2015) into the household. This dynamic was evidenced by several respondents, who declared to refer to a specific family member (the expert) when in trouble with recycling and need help about how to properly carry out it. In addition to that, the expert is usually the

disgusta. Però i miei genitori vogliono che differenzi correttamente. Ogni volta è una battaglia su questo punto!

person in charge of pushing others into recycling and controlling the adequacy of their performance:

> **Maria**: Everyone throws away waste here at home. Usually, when we create a waste, then we throw it away. But if one of us does not, mum says: "Throw it away!", and if one says: "It's not mine!", she replies: "I do not care!", and the person in question has to throw it away anyway. **[H08 – female, 11, student]**[12]

Finally, the presence of a form of 'reverse socialization' (from adult sons to their elder parents) was evidenced by all the older respondents, who affirmed that their sons help them with recycling through the indication of where to correctly dispose of items, as well as by giving them general information about it. This is, for example, the case of Carla:

> **Carla**: I have nothing to teach to my sons and daughters in law, on the contrary I am the one asking information to them... For example, sometimes there are objects that report indications on the package about where one has to dispose of them, this thing has been told to me by my daughter in law. My son, on the other hand, told me that the carton boxes of pizza, if dirty, have to be discarded

[12] **Maria**: Tutti quanti buttiamo via le cose qui in casa. Di solito, quando ognuno di noi crea un rifiuto, poi lo butta via lui. Poi se non lo fa, la mamma dice: "butta via!", e se uno dice "non è mio!", lei risponde "non mi interessa!". E allora chi le capita sotto tiro, deve buttare via.

in the undifferentiated bin and not in the paper one. **[H05 – female, 69, shopkeeper]**[13]

6.1.3. HABIT MAINTENANCE AND THE ORGANIZATION OF DOMESTIC RECYCLING SPACES

A final point to examine concerning the maintenance of a recycling routine inside the household is the organization of domestic spaces for recycling. The purpose was to understand how people organize recycling from a spatial and material point of view, and how this organization responds to the needs of the family and its various members, as well as to the characteristics of the waste collection service and the constraints it poses.

As emerged from the home-tours and the interviews, it is possible to recognize different spaces and stages in the domestic organization of waste storage for recycling. In particular, three types of waste collection points arranged by respondents in order to effectively manage domestic recycling have been identified: central, peripheral and long-term, each showing peculiar characteristics and meeting different needs.

In central waste collection points, respondents placed the majority of their recycling bins in order to operate the daily management of waste differentiation. All respondents arranged a central waste-collection point in their home.

[13] **Carla**: Ai miei figli e nuore non ho niente da insegnare, anzi gli domando... Ad esempio, a volte ci sono degli oggetti che nella confezione hanno scritto dove si deve mettere, me l'ha detto mia nuora. Mio figlio, invece, mi ha detto che i cartoni della pizza, se sono sporchi, vanno nell'indifferenziato e non nella carta.

According to previous studies (Cone Communication, 2014; Macy & Thompson, 2003), in most cases this point was located in the kitchen, which can be considered «the recycling hub of the home, as it's the room in which consumers most frequently recycle» (Cone Communication, 2014, p. 7). Only two families out of 22 organized their central waste collection point in another room (the garage) (Figures 6.1 and 6.2); however, even in these cases they collected at least some materials (e.g., food waste) in the kitchen. This organization allows respondents to accomplish their recycling activities inside the home, close to the area where the great majority of waste is generated and processed, in order to carry out recycling without disrupting other related household activities (e.g., meal preparation).

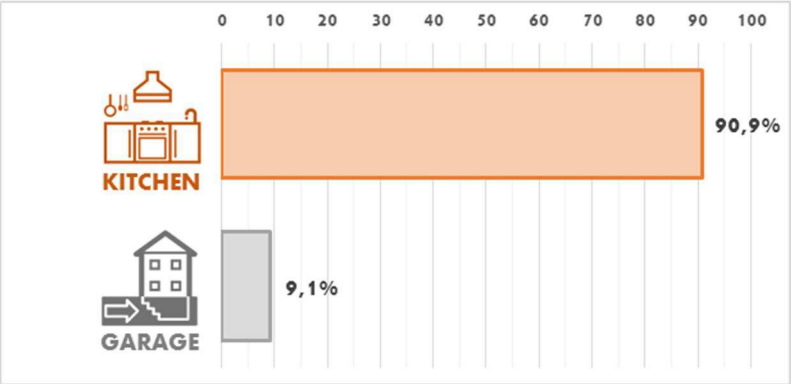

FIGURE 6.1. *Rooms in which respondents have arranged their central waste collection point.*

FIGURE 6.2. *Examples of central waste collection points arranged in the kitchen [H01, H03, H09] and in the garage [H11].*

Peripheral waste-collection points corresponded to small containers placed in rooms other than the central collection point (e.g., bathroom or home office) and emptied only when necessary, usually without differentiating the various materials they contain (Figures 6.3 and 6.4). Respondents indeed seemed to consider them «not as recycling bins, but as undifferentiated bins useful to collect little things such as used sheets or paper towels» (Alessia [H01]). Consistent with Boulay et al. (2014), the fact that the items usually placed in these peripheral bins are often perceived as dirty makes them less likely to be retrieved later for recycling. Nine out of 22 households arranged one or more peripheral waste-collection points in their homes. They appears to serve the need to collect garbage where it is produced without expecting such garbage to be taken to the central collection point, also acknowledging the independence of the space where peripheral bins are placed. In one family, for instance, the older daughter Maria (aged 11) complained about the absence of a bin in her bedroom, since her mother kept on 'forgetting' to buy her one.

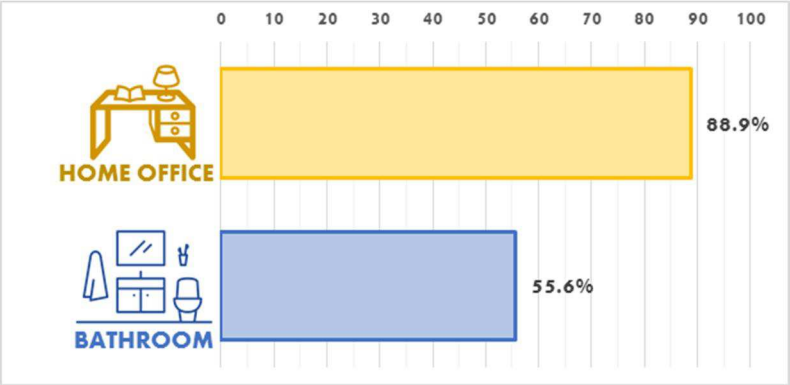

FIGURE 6.3. *Rooms in which respondents who have arranged peripheral waste collection points keep the bins, in addition to the central one.*

FIGURE 6.4. *Examples of peripheral waste collection points arranged in the home office [H01, H02] and in the bathroom [H02, H09].*

Long-term waste collection points duplicated the central collection point, with sets of larger recycling bins where differentiated waste were stored for a relatively long period of time (1-2 weeks), until the designated day when the local provider collected it. They were usually placed outside the house, in the garage or in the garden (Figures 6.5 and 6.6), solving the space and hygiene issues produced when waste accumulates over time while allowing a convenient, short-term recycling station inside the house. Consistent with the results of Macy and Thompson (2003), it thus emerged that respondents often used a two-step waste collecting process, in which recyclables were firstly collected in a convenient

location (usually the kitchen), and then were transported to some other storage areas (the garage or the garden) (Figures 6.7 and 6.8). It emerged also that this two-step domestic recycling strategy was adopted only where a curbside collection scheme was running. 11 out of 13 households confronted with curbside collection arranged intermediate waste collection points outside their home, for one or more of the collected materials; the remaining two families lamented lack of space or absence of garage/garden as the only reason for not having arranged them. In the houses of respondents living in a municipality where waste was collected using a drop-off collection scheme, on the contrary, the presence of a long-term collection point became redundant and unnecessary, since people had the possibility to bring waste daily to the communal 'ecological islands', instead of having to store it into the house for longer periods of time. According to Chappells and Shove (1999), the organization of recycling spaces represents thus the gateway between domestic recycling habits and the system of public provision.

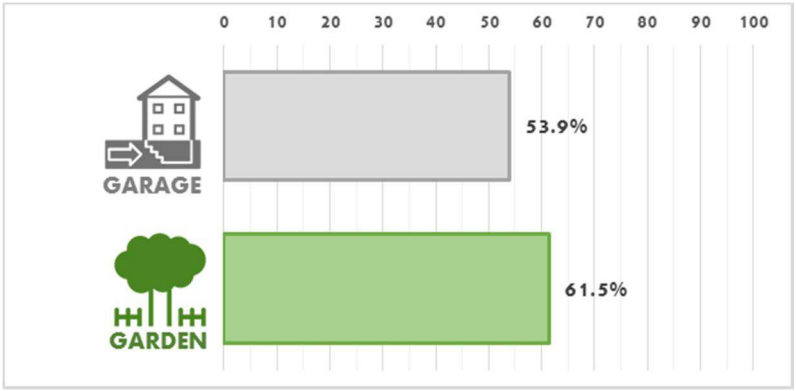

FIGURE 6.5. *Areas in which respondents who have arranged one or more long-term waste collection point(s) keep the bins, in addition to the central one.*

FIGURE 6.6. *Examples of long-term waste collection points arranged in the garden [H06] and in the garage [H14, H17].*

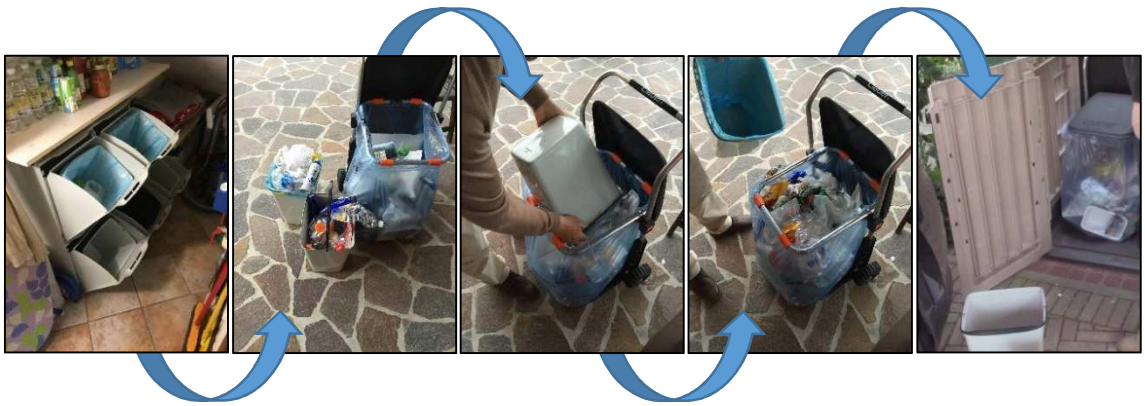

FIGURE 6.7. *The passage of waste from the central collection point arranged inside the house, in the kitchen, to the long-term one in the garden [H01].*

FIGURE 6.8. *The passage of waste throughout the house [H01].*

6.2. RESPONSIBILITY ATTRIBUTIONS FOR RECYCLING

Recycling is a complex process, involving the participation of several societal actors: the service provider, who materially collects waste; the local authorities; the industry and companies, which are responsible for the production and commercialization of goods and their packaging; and the citizens, who are in charge of the first separation of waste at home. One of the purpose of the present work was thus to answer to a sixth research question, that is:

RQ6 - <u>What do people think about the behavior and responsibilities of other social actors involved in recycling process, and how does it influence their own behavior?</u>

In this section, respondents' perceptions of the behavior, attitudes and responsibilities of the other relevant actors with regard to recycling as emerged from the interviews are thus examined, in order to understand whether and how these attributions influence their own recycling behavior.

The first interesting finding is that respondents tended to make a clear distinction between own household and inner social circle (e.g., closest relative, friends, etc.) and other people. While the former were generally believed to be keen recyclers (several respondents affirmed that they were personally doing their best toward recycling), 'others' were often blamed of being not responsible and sufficiently careful about this activity. The individual's tendency to believe that s/he is superior to the average person on certain traits or abilities has been defined by Taylor and Brown (1988) as superiority belief. It is a common self-serving bias motivated to the desire of people to hold positive beliefs about themselves and to maintain self-esteem, which has been demonstrated to generalize also to pro-environmental behaviors (Pieters, Bijmolt, Van Raaij & de Kruijk, 1998). That is, by delineating the portrayal of irresponsible others, people create a backdrop against which constructing their own identity as recyclers and, simultaneously, framing themselves as better and more responsible. Their own behavior can thus be explained and legitimized, creating a positive self-image in

relation to others (Skill & Gyberg, 2010). This point is well exemplified by Ioana and her husband Filippo, and by Sara:

> **Ioana:** In this moment we are committed *[to recycling]* at the maximum level.
>
> **Filippo:** Speaking about us, there is no way to do it better. That is, we rinse plastic objects if they are dirty. We wash tuna cans...
>
> **Ioana:** But for other people this is struggling [...]. When you throw away your things, sometimes you see that next to the communal bins there is abandoned stuff, for example an old TV, because there is so many people who is not yet informed about recycling. And when they throw away waste, they throw it at random. It happens that you see paper in place of plastic, into the organic bins they throw all types of waste, because these bins are the simplest to open, or they dispose of paper putting it inside plastic bags, this is a classic. **[H04 – I., female, 39, part-time clerk; F., male, 46, civil engineer]**[14]

> **Sara**: There is enough indifference. In my opinion, it is so. I see the waste being put out here, and it is waste being put out at random. I see so many transparent bags full of

[14] **Ioana**: Noi in questo momento ci stiamo impegnando al massimo.
Filippo: Parlando di noi, per far meglio non c'è modo. Cioè, anche la plastica la laviamo se la vediamo sporca. Le lattine del tonno le laviamo…
Ioana: Gli altri vedi che fanno fatica […]. Quando vai a buttare via le cose vedi che magari accanto ai bidoni ci sono delle cose abbandonate, ad esempio una vecchia tv, perché c'è tanta gente che non è ancora informata su queste cose. E quando butta, butta a caso. Succede che vedi carta al posto di plastica, sull'umido buttano di tutto perché è il bidone più facile da aprire, o magari buttano la carta dentro i sacchi di plastica, è un classico.

> different types of waste putted together. This thing puzzles me. Conversely, people close to me do not behave in this way. After all, they are quite careful, because they are grew up as me in familiar contexts where waste separation is accomplished. **[H20 – female, 30, research assistant]**[15]

As evidenced in the two reported excerpts, the first and immediate comparison made by respondents is between their recycling behavior and that of their neighbors, as they can easily see and compare each other's waste on the streets or in communal collection areas. Respondents generally perceived recycling as a widespread activity, however several of them were doubtful about the fact that the materials collected by other people are actually differentiated in the right manner. Serena and Francesco, for example, comparing the quantity of undifferentiated waste and plastic recyclables produced by them and by their elder neighbors, concluded that the neighbors are not capable to correctly recycle, throwing a large amount of recyclables in the undifferentiated bin:

> **Serena:** I think that pretty much everyone recycle, but there is who makes it better, who makes it worse... People are not capable to differentiate waste, or they do not care to differentiate. I think for example that our neighbors just do not know how to differentiate waste properly, because they

[15] **Sara**: C'è abbastanza menefreghismo. Secondo me sì. Io vedo la spazzatura qui fuori, ed è spazzatura che viene messa fuori in maniera così, a caso. Vedo tanti sacchetti trasparenti che c'hanno dentro le cose tutte assieme. Perciò mi lascia un po' così questa cosa. Le persone che mi circondano invece no. Sono, tutto sommato, abbastanza attente, perché comunque cresciute come me in contesti familiari in cui bene o male la raccolta differenziata si fa.

are not properly informed. They are elderly... other people instead are not precise, because they do not care about recycling.

Francesco: When we put out our bins, we see that our undifferentiated bin is almost always empty, while their bins are full. It is the opposite for plastic... so I guess that they do not differentiate waste so much. When they are faced with doubtful items, these persons for sure throw them in the undifferentiated bin. That is, if they have a doubt they do not spend much time to reflect upon it [...]. I see that they separate plastic bottles correctly, because it is an obvious plastic item. And therefore you see that they put out for collection these big bags full of bottles *[he laughs]*… with only plastic bottles inside! Everything else, such as plastic yogurt pots, or similar, is discarded by them in the undifferentiated bin. **[H09 – S., female, 47, teacher; F., male, 47, unemployed]**[16]

Other respondents did not make a comparison between own household and their neighbors, but referred to «a nebulous group of mythical 'bad guys'» (De

[16] **Serena**: Secondo me tutti più o meno fanno la raccolta differenziata. Poi c'è che la fa meglio, chi la fa peggio... Le persone o non sanno differenziare, o non gli interessa differenziare. Credo ad esempio che i nostri vicini proprio non sappiano differenziare adeguatamente. Perché non sono adeguatamente informati. Sono anziani... e poi altre persone invece sono poco attente, non gli interessa.
Francesco: Quando mettiamo fuori i bidoni, vediamo che il nostro del secco è quasi sempre vuoto, mentre il loro è colmo. E succede al contrario per la plastica... quindi mi sa che non differenziano tanto bene. E quando si trovano di fronte a dei casi dubbi, queste persone che la fanno non tanto bene, è sicuro che buttano nel secco. Cioè, se hanno il dubbio non stanno lì tanto a pensarci. […] Perché io vedo che le bottiglie le separano benissimo, perché è una cosa lampante. E quindi vedi che fanno questi sacconi di riciclabile pieni di bottiglie *[ride]*... e ci sono solo bottiglie dentro! Tutto il resto, come i contenitori di plastica dello yogurt, o quelle cose là, le mettono sul secco.

Coverly et al., 2008, p. 8), variously indicated as 'the others', 'other people' and 'the average citizen'. Respondents sometimes indicated them as belonging to stereotypic social categories, such as 'the youngers' and 'the immigrants'. Some respondents, for example, claimed that in places inhabited by a predominance of older people there is more order and tidiness (Argia [H06]), and that there are many young couples having no idea of what waste differentiation and recycling actually mean (Maria Luisa [H02]). Carla [H05], on the other hand, described the problems of dirt caused by the members of a Bangladeshi family living nearby, who throw bags full of used diapers on the ground instead of in the bins placed in the communal area, while Paolo [H01] and Antonella [H11] mentioned the lack of a common cultural and linguistic background as the main cause of defective recycling episodes involving immigrants.

> **Paolo**: When there are people who do not share your own culture, who do not speak your language, all becomes black. The bags become black, their content becomes black. All waste being put promiscuously without differentiation, and all this goes into piles of waste that disgust everyone... where nobody wants to get their hands inside. **[H01 – male, 60, manager]**[17]

[17] **Paolo**: Quando ti ritrovi davanti persone che non hanno la tua cultura, che non parlano la tua lingua ecc., tutto diventa nero. I sacchi diventano neri, i contenuti diventano neri. Tutto promiscuo e non c'è nessuna raccolta, e tutto questo va ad alimentare cataste di prodotti che fanno solo schifo a tutti… dove poi nessuno ha voglia di metterci le mani.

The 'average citizen' was often described as an irresponsible recycler because s/he does not spend time to get informed about how to properly recycle because of his/her laziness:

> **Sara**: An attentive citizen is informed, consults Veritas' *[the local service provider]* website, contacts the proper municipal offices, and manages to have all conceivable information. Information is there. That is, people who say to me: "I do not recycle because I do not know"... what is that you do not know? **[H20 – female, 30, research assistant]**[18]

> **Elisabetta**: People are lazy and do not stay informed, even when they can do it without any effort [...]. Even when information is present, people often do not read it. Alternatively, they have read it once ten years ago, thinking that in this way their duty has been done. Like those who have not yet realized that Polystyrene is recyclable since at least five years, continuing to affirm that once they have read on the recycling calendar that you cannot recycle it. **[H22 – female, 30, marketing expert]**[19]

[18] **Sara**: Un cittadino attento si informa, si vede il sito di Veritas, contatta gli uffici comunali preposti, riesce ad avere tutte le informazioni possibili e immaginabili, a casa. Le informazioni ci sono. Cioè, a me la gente che mi dice: "non faccio la raccolta differenziata perché non so"... *cossa non ti sa*?!

[19] **Elisabetta**: La gente è pigra e non si informa, anche quando può farlo senza nessuna fatica […]. Anche quando le informazioni ci sono, la gente spesso non le legge. O le ha lette una volta dieci anni fa e pensa che il suo dovere l'ha fatto. Come quelli che non si sono ancora resi conto che il polistirolo è riciclabile da almeno 5 anni e continuano a dire che sul calendario, una volta, loro hanno letto che non si può riciclare.

It is interesting to evidence the different attributional styles used by respondents when they described the causes of their own recycling behavior and others' behavior. As described in the previous Chapter, own recycling behavior is frequently considered attributable more to situational factors. In this sense, lack of information is regarded as an objective barrier and a legitimate justification to motivate defective episodes. When requested to make attributions about other people' behavior, however, respondents tended to attribute it more to dispositional factors, such as laziness and lack of *willingness* to stay informed about recycling. According to De Coverly and colleagues (2008), this type of attitude might be problematic because it tends to absolve the individual of personal responsibility, shifting blame only onto the others. Furthermore, personal responsibility and the willingness to commit themselves to recycling might be reduced because individuals feel that other people are not performing correctly the behavior and that their effort is thus a futile one (Burn, 1991; Montada & Kals, 2000). The resentment about the irresponsible activity of others and the feeling that this can compromise recycling process emerged clearly during the interviews with Serena, Francesco and Ioana:

> **Serena**: In the apartment building where we lived before, a family discarded in the organic waste bin the yogurt with the entire pot. No, you cannot, come on!
>
> **Francesco:** This generated doubts to me actually, because I did all right, while others did not, and you could see every kind of stuff in the common organic waste bin...

Serena: Pfff... *[disgusted]*

Francesco: ...so if I dispose of my waste correctly, and then I see that in the same container other people throw, for example, their organic waste inside plastic bags... well, then you think that all is nullified. **[H09 – S., female, 47, teacher; F., male, 47, unemployed]**[20]

Ioana: Sometimes you get angry, because you think: I make an effort, I do everything, and then arrives one person who throws away waste randomly... sometimes it happens to me that I take cardboard boxes and move them from the plastic bin, where they have been discarded, to the paper one. Because I feel displeased: for one person that has discarded a thing in the erroneous bin, all the materials contained in it are ruined. **[H04 – female, 39, part-time clerk]**[21]

On the contrary, Elena highlighted the motivating effect of observing that recycling is a common practice and that also other people are committed to it:

[20] **Serena**: Nel condominio dove abitavamo prima, c'era una famiglia che buttava nei sacchetti dell'umido lo yogurt con il vasetto. Cioè, no: non si può, dai!
Francesco: Difatti lì mi venivano i dubbi, perché io facevo tutto bene, mentre altri no, e vedevi di tutto nel bidone condominiale dell'umido...
Serena: Pfff... *[disgustata]*
Francesco: ...quindi se io devo buttare la mia roba che è giusta, corretta, e poi vedo che nello stesso bidone gli altri buttano ad esempio dei sacchetti di plastica, magari anche con l'umido dentro... beh, allora pensi che viene vanificato tutto.

[21] **Ioana**: Alcune volte ti arrabbi, perché vai a buttare e dici: io mi sforzo, faccio tutto, e poi arriva questo che butta a caso... alcune volte mi succede che prendo gli scatoloni e li sposto dalla plastica dove li hanno buttati, alla carta. Perché ti dispiace: per uno che ha sbagliato una roba, tutta la campana è rovinata.

> **Elena**: Being surrounded by people who recycle surely encourages me a bit, because I realize that I am not the only one, or my family is not the only one that recycles. As for all the things, if I see that it is a thing that also other people take in care, it seems to me that it is a more useful thing. Because nothing changes if I am the only one who recycles. So surely, if I see that also other people are sensitized on this topic, it definitely helps and motivates me. **[H14 – female, 23, student]**[22]

With regard to the behavior and responsibilities of the other actors involved in recycling process (service provider, local authorities and industry/companies), a substantial majority of respondents affirmed that they are not doing enough, in their opinion, to make recycling process more efficient and to sustain citizens' participation. With regard to industry and big companies, respondents felt dissatisfied about the lack of clear on-product recyclability labels indicating how and where to dispose of the packaging once the product is terminated, as well as about the use of packaging that is often excessive and difficult to dispose of, since frequently formed by different types of materials. That is, respondents believed that it is not the consumer buying products being ultimately responsible for the production of packaging-related waste, but

[22] **Elena**: Sicuramente essere circondata da persone che differenziano mi incentiva un po', perché mi rendo conto che non sono io l'unica, o che non è la mia famiglia l'unica che differenzia. Come in tutte le cose, se vedo che è una cosa a cui tengono anche gli altri, mi sembra che sia una cosa più utile in generale. Perché non cambia niente se faccio la raccolta differenziata solo io. Per cui sicuramente, se vedo che anche le altre persone sono sensibilizzate su questo argomento sicuramente mi aiuta e mi motiva.

manufacturers producing and packaging those products without considering their impact on environment. According to respondents, recycling process has to be a chain in which all the involved actors give their contribute, since otherwise its burden and costs hang only on citizens' shoulders (Serena [H09]). In this sense, industry should produce easier to separate and better labelled packaging, since this simplifies recovery. The ease of handling packaging for disposal might also have the effect to encourage people to recycle better (Laura [H15]). This point was effectively synthetized by Paolo:

> **Paolo**: Recycling should aim to become every day more and more specialized, until nothing, *nothing*, will end in the undifferentiated bin. This depends, obviously, upon the entire system, because it is necessary that manufacturers create packaging suitable for this function; that those who give information, give it in an adequate way; that those who print recyclability labels, do it properly. And so on, until the end of the process [...]. It has to be ensured that products continue to be manageable, but their packaging at the same time can be disposed of in a satisfactory manner for the consumer [...]. Companies that produce packaging should become aware of that. Not least Barilla *[the leading Italian pasta producer]*, which continues to write "packaging not yet recyclable" on its products, and this is an absolute shame. All producers should do as Conad *[a big Italian GDO player]* and other quite attentive companies have already done, that is, predisposing on-product recyclability labels that are comprehensible and

> readable by people aged 6 to 100 years... well, that is the point. **[H01 – male, 60, manager]**[23]

Local authorities are demanded to provide better information about how to properly recycle and to create more occasions to involve people in the thematic of recycling, because, as evidenced by Paolo [H01] and numerous other respondents, there are only rough indications about recycling, with absence of real and complete information. In this situation, very often it is only people's common sense that helps and guides them in the definition of recycling rules to be followed (see Chapter 4). Respondents exposed various ideas regarding how local authorities could provide this information, for example realizing more frequent informative face-to-face campaigns (Enrico [H02]), or organizing open days for schools during which children can visit local recycling plants and have the possibility to discover what happens to recyclables once they are collected, «creating value from every citizen's effort» (Viviana [H08]). For other respondents, recycling should be included in school educational programs

[23] **Paolo**: La raccolta differenziata ha come scopo quello di specializzarsi ogni giorno di più, fino a che niente, niente, neanche una virgola, sarà nel secco dell'indifferenziato. Questo dipende, ovviamente, dall'intero sistema, dall'intera filiera, perché bisogna che i fornitori di imballi creino imballi idonei a questa funzione; che chi dà le informazioni le dia in modo adeguato; che chi stampa le etichette lo faccia in modo adeguato; e via così, fino alla fine del processo. […] Bisogna fare in modo che i prodotti siano gestibili e immediatamente disponibili, ma allo stesso tempo si possa puntare sull'eliminazione del loro imballo, del blister, ecc. in modo soddisfacente anche per chi ha comprato. […] Bisognerebbe sensibilizzare notevolissimamente le società che producono gli imballi. Non ultima ad esempio la Barilla, che continua a scrivere "Incarto non ancora riciclabile", e questa è una vergogna assoluta. E fare, come fanno società abbastanza attente a queste cose, Conad ecc., delle etichettature che siano leggibili dai 6 ai 100 anni insomma… ecco, questo è il punto.

starting from kindergarten, with the aim to create and strengthen a real and widespread recycling culture among people (Lorenzo [H07], Adriano [H18]).

In addition to that, local authorities (and government in general) are held accountable for promulgating more severe laws regulating industrial activities that may cause pollution, as well as to operate more stringent controls (Lorenzo [H07]). For Mirca [H19], more controls would be needed also with regard to recycling activities of restaurants and bars.

The relation between respondents and the service provider emerged as the most problematic one. The majority of respondents believed indeed that in Italy there is a great speculation around waste management, the beneficiaries of which are corrupted politicians who use waste management companies to employ unskilled relatives and friends, and criminal organizations involved in illicit trade and disposal of waste. Giovanni [H11], for example, affirmed that doubts arise because people have no information regarding where collected waste is stored. He described the recent discovery of a huge illegal landfill near Venice, where waste was stored before being illicitly sent overnight to Naples, in order to be buried, destroyed or exported for gain by the Camorra. In addition to that, it is commonly believed that the management of waste companies is interested more in profit than in people wellbeing and environment:

> **Francesco**: So many times, you have the impression that they *[the service provider]* want only to make profit, for example on the shoulders of their employees who work

> outdoors, in harsh conditions, with measured time, without having the possibility to do their job well. Because they all have temporary contracts and can be blackmailed. These things could seem stupid, but in the end, they make you to think that recycling is a little bit futile actually, even if it the right thing to do. **[H09 – male, 47, unemployed]**[24]

It is thereby not surprising that approximately half of the respondents, when asked to describe what happens, in their opinion, to collected recyclables, proved to be very skeptical about their actual retreatment. In the words of Pietro and Mirca:

> **Pietro:** The fear is that recycling is just a front. That yes, there is waste collection, but actually it is not a differentiated one.
>
> **Mirca:** There are doubts about the transparency of declared processes. Something definitely exists, because you can see it, you read it. But I do not know... **[H19 – P., male, 24, student; M., female, 56, housewife]**[25]

[24] **Francesco**: Tante volte hai l'impressione che ci vogliano solo guadagnare, ad esempio sulle spalle degli addetti che lavorano all'aperto, in condizioni molto dure, col tempo cronometrato, senza avere la possibilità di poter fare bene il loro lavoro. Perché hanno tutti contratti a tempo determinato e sono ricattabili. Sono cose che sembrano stupide, però alla fine creano il dubbio che fare la raccolta differenziata sia sì giusto, ma anche uno sforzo un po' vano.

[25] **Pietro**: La paura è che la raccolta differenziata sia solo una facciata. Che quindi ci sia sì una raccolta, ma che poi tanto differenziata non sia.
Mirca: Ci sono dei dubbi sulla trasparenza dei processi dichiarati. C'è qualcosa che sicuramente esiste, perché lo vedi, lo leggi. Poi io non so...

Silvano and his wife Viviana stated that recycling would be a great thing if there were a real waste management policy and an (observable) guarantee of the actual retreatment of waste once the service provider has collected it. They concluded affirming that it is not possible for common citizens to know what happens to recycling materials after household collection, and then the only thing one can do is having hope for the entire recycling process to be factual and effective.

> **Silvano:** I do not know... because, if collected materials were actually treated and recycled, then it would be a good thing. I have serious doubts about whether this actually happens [...]. That is, I do not know if there is actually a waste management policy that permits a truly differentiation of waste. Not at the level of the single individual, I mean later, at waste management industry level. I do not know what happens once waste is collected, I have seen lot of things... when bins are emptied in the truck, and other similar things. Let's say that this raises doubts on the management of waste. You wonder: "What is the sense of my participation in recycling?". Then I do not know. I want to be confident, but who knows... In any case, this fact does not prevent me from trying.
>
> **Viviana:** I never chased the waste truck to verify what they actually do. So, one has to be hopeful. **[H08 – S., male, 56, manager; V., female, 41, secretary]**[26]

[26] **Silvano**: Non so... perché, se effettivamente il prodotto della raccolta differenziata venisse trattato e i materiali riciclati, allora sarebbe una cosa ottima. Ho dei seri dubbi sul fatto che questo

As emerges from the excerpt, the concern of these respondents for the fate of collected waste was not based on extensive factual knowledge about waste management process. It appeared instead to be built on declared absence of information. That is, recycling for many householders seems to mean simply putting waste outside for collection, with little or no sense of what happens next. While some respondents such as Elena [H14] and Laura [H15] reported about a generic fear of mountains of waste accumulating in landfill, for others waste taken away simply disappears, becoming a thing they cease to think about, and for whom they feel to have no responsibility anymore:

> **Elena**: I am quite confident in the system, but perhaps because I have never searched for information, I am not well informed on what happens next. Therefore, who knows, maybe mine is a sort of blindly confidence. Ok, I differentiate waste, I do my bit, and at this point it is no longer... my fault - maybe it is such a mechanism. **[H14 – female, 23, student]**[27]

avvenga realmente […]. Cioè, non so se effettivamente ci sia una politica di gestione di questi rifiuti che porti veramente ad una differenziazione. Non a livello del singolo, intendo poi, dopo, a livello di industria. Non so che cosa succede da quando i rifiuti vengono tirati su, perché io ne ho viste di tutte... anche a livello di carico dei cassonetti, e cose del genere. Diciamo che ti vengono dei dubbi a livello della gestione a posteriori. Ti chiedi: ma io cosa differenzio a fare?! Poi non so, voglio sperare bene. Però mah... Ciò comunque non mi esime dal provarci.

Viviana: Io non ho mai inseguito il camioncino per vedere come fanno. Quindi, si spera.

[27] **Elena**: Io sono abbastanza fiduciosa nel sistema, però forse perché non mi informo, non sono bene informata su quello che succede dopo. Per cui boh, è un po' una fiducia a scatola chiusa forse. Mi rendo conto che ok, facciamo la raccolta differenziata, io faccio il mio e poi non è più... colpa mia - forse è un meccanismo del genere.

> **Carla**: To be honest... I do not even care! I do not wonder about it. It never happened that I thought: what happens to that paper? No [...]. Maybe it is wrong, but I have never considered the problem or done anything to retrieve information. It is not up to me, I won't measure up to judge or find something wrong. It is not a field in which I can say a sensible thing, because from the moment when waste goes inside the bin I cease to know what happens, and it is no longer my business... **[H05 – female, 69, shopkeeper]**[28]

> **Argia**: I never thought about that. I never wondered whether collected products are used again, or they are burned. I put them there, they collect them, and I tell myself: someone will know what to do with them, what they are needed for. **[H06 – female, 78, retired]**[29]

In other cases, skepticism about the effectiveness of recycling process appeared to be based on incomplete and fragmented 'half-truths', obtained from a diversity of sources such as media or neighbors, as highlighted in the following excerpts from the interviews of Antonella, Annamaria and Adriano:

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[28] **Carla**: Se vuoi che sia sincera... non me ne può fregare di meno! Non mi pongo proprio il problema. Mai successo che abbia pensato: chissà cosa ne fanno di quella carta? No. […] Sarà sbagliato, però non mi sono mai posta il problema più di tanto o fatto niente altro per documentarmi. È una cosa che non mi compete, e non sono all'altezza di poter giudicare o trovare da ridire. Non è un campo in cui posso inoltrarmi a dire una cosa sensata, perché dal momento in cui il rifiuto è dentro al cassonetto io non so cosa succede, e non è più affare mio...

[29] **Argia**: A questo non ci ho mai pensato. Non mi sono mai chiesta se questi prodotti vengono utilizzati di nuovo, oppure se li bruciano. Li metto là, li portano via, e io mi dico: sapranno loro cosa devono fare, a cosa gli servono.

Antonella: You do not know. Where does waste go? I do not know! We have been told that it is the same waste truck passing to collect all the products we differentiate, and everything is put together. Someone claims to have seen these things right there. Who knows...? **[H11 – female, 68, retired]**[30]

Annamaria: We have seen at the television - even if I do not know whether things that have being said are correct - that collected materials are eventually thrown all together. Then I say: well, it does not seem to be a right thing.

Adriano: We have seen reportages of Le Iene and Striscia *[two popular Italian TV programs]* in which waste was collected and everything was put together.

Annamaria: It is the reason why I think that it *[recycling]* is a good thing, but the whole system should actually work for recycling being useful.

Adriano: You predispose one, two, three recycling bags, another outside, another inside... and then you hear these things. Ok, you keep recycling the same, but...

Annamaria: Yeah, because you hope that everything goes well, but who knows.

[H18 – An., female, 63, retired; Ad., male, 63, retired][31]

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[30] **Antonella**: Qua non lo sai: dove va? Boh! Ci è stato detto che è un camion solo che passa a prendere tutto quello che noi ricicliamo, e che poi viene messo tutto assieme. Alcuni sostengono di aver visto queste cose proprio qui da noi. Mah…

[31] **Annamaria**: Abbiamo visto per la televisione - anche se poi non so se quello che hanno detto è giusto - che la raccolta alla fine veniva buttata tutta assieme. E allora dico: beh, non mi sembra giusto.

The power of media as credible and authoritative sources of information regarding recycling process is testified by the fact that respondents seemed to accept portrayals depicted by them without criticism, declaring that the stories heard in TV undermined their motivation to recycle. This problem is evidenced by Sara, who affirmed that it is difficult for citizens to develop and maintain a positive idea regarding recycling only on the basis of TV news and documentaries, most of which telling stories about recyclables being wasted or, alternatively, treated in unappropriated manners (e.g., illegally buried or incinerated). At the same time, she highlighted the risk that media stories may be used as an excuse for not recycling, allowing people to taking responsibility away from them and avoiding a sense of obligation to recycle (and of guilt if not).

> **Sara**: I believe that recycling here is real, that products are truly differentiated. That is, there is trust on my part. Then you know, at the TV you hear all kinds of things, news concerning improper handling of waste, mafia, bribes... And these stories probably, or better certainly, do not help the average citizen, who is get informed primarily by TV, to develop a positive idea of recycling and its cycle. For sure, this thing is used also by people to take responsibility

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Adriano: Abbiamo visto servizi delle Iene e di Striscia che portavano via e buttavano tutto assieme...
Annamaria: È per questo che dico che è giusto farla, ma poi tutto il sistema dovrebbe funzionare perché sia utile.
Adriano: Uno si tiene un sacchetto, due sacchetti, tre sacchetti, un altro fuori, uno altro dentro... poi dopo senti queste cose. Vabbè, continui a fare lo stesso, però insomma...
Annamaria: Sì, perché speri che tutto proceda per il meglio, ma chissà.

> away from them with regard to this thematic, such as: "what does it matter? What does it change if I recycle well or not? In every case, everything is then put together". **[H20 – female, 30, research assistant]**[32]

Another problem is connected to the beliefs of respondents about what is considered the rightful division of tasks and responsibility between them and the service provider. A few respondents such as Antonella [H11] declared indeed to have the sensation of paying for recycling, and, at the same time, having to do the work due to the service provider in its place, without getting anything in return. Antonella reported the example of the request made by the service provider to separate paper labels from glass jars. She admitted to not carry out this task, as she considered it excessively burdensome and time-consuming, and claimed that it is unbelievable that citizens are requested to work for free without any monetary compensation or at least acknowledgment of their activity.

Finally, it emerged from the interviews that respondents tended to experience a sense of powerlessness, frustration and lack of communication in the relationship with the other institutional actors of recycling process (local authorities, service provider and industry). They affirmed indeed that their

[32] **Sara**: Io credo che la raccolta differenziata qui sia reale, che il prodotto venga veramente differenziato. Insomma, c'è fiducia da parte mia. Poi sai, per la tv si sentono cose di tutti i tipi, notizie riguardanti trattamenti errati dei rifiuti, mafie, tangenti... E queste notizie probabilmente, anzi sicuramente, non aiutano il cittadino medio, che si informa prevalentemente attraverso la tv, a farsi un'idea positiva della raccolta differenziata e del suo ciclo. Certo, anche questa cosa è usata spesso dalle persone per deresponsabilizzarsi rispetto a questa tematica, del tipo: "ma sì, cosa cambia se io faccio bene o no?! Tanto poi buttano tutto assieme".

possibility to choose the best for themselves and the environment is limited by the alternatives available on the market (e.g., in the case of packaging) and by the choices the system made for them:

> **Giovanni:** We can only be concerned, because it is people in leadership positions that must decide... We want these things, we can make some shopping choices, but apart from this you cannot do much, and you have to adapt to the system [...]. We can be careful about our choices and the environment, but it is from the top they should take care of this a little bit more.
>
> **Antonella:** We went also to public assemblies, but when they decide, they do not take people into consideration, there's no way. **[H11 – G., male, 70, shopkeeper; A., female, 68, retired]**[33]

6.3. SUMMARY OF THE CHAPTER

In this Chapter, it has been demonstrated that recycling is a habitual domestic practice, which is formed alternatively by means of active problem solving or socialization mechanisms. The first mechanism is activated when people are confronted with an alternative way of managing waste (e.g., in the

[33] **Giovanni:** Però noi possiamo solo preoccuparci, poi è dall'alto che devono fare... È inutile, noi vogliamo queste cose qua, possiamo fare delle scelte negli acquisti, però per il resto non si può fare molto e ci si deve adeguare al sistema […]. Delle scelte nostre sì, possiamo preoccuparci dell'ambiente, però dall'alto devono pensarci un po' di più.
Antonella: Tanto, siamo andati anche alle assemblee, ma quando hanno deciso loro *no ghe se Santi ne Madonne che i scolta e persone*.

case of introduction of a new recycling scheme), and they have to actively reflect upon the practice in question, taking precise decisions and coping with the initial problems they encounter (e.g., information acquisition, organization of in-home spaces). The second mechanism (socialization) consists in the transfer of recycling habits from one family member (e.g., parent) to another (e.g., child), as the habit is perceived by the socialized member as a norm to be followed because it is the normal way for him/her to deal with waste.

Once habitualized, recycling does not longer require much active thought, becoming an automatic and routinized activity. However, routinization is never absolute, since it actually continues to require active cooperation between the members of the family (often with a distribution of tasks and responsibilities), as well as the development of ad-hoc strategies to organize recycling activities, which are the result of negotiation processes between household members, leading sometimes also to arguments and tensions between them. That is, the habit is maintained (and partially evolves over time) through the very performance of recycling practice itself, adapting to the particular household situation and to the needs of the various family members.

In particular, in the maintaining of recycling habits it emerged as important the influence exerted by the 'expert' household member on the others. This person not only plays the role of information gatherer and gatekeeper, but also of pushing other members into recycling activities and controlling the adequacy of their performance.

In addition to that, the physical organization of domestic recycling also plays a critical role in the maintenance of recycling habits, responding not only to the characteristics and constraints of the current waste collection service, but also to the needs of the recyclers, being thereby a gateway between the household and the public service. For example, it emerged that in the case of curbside collection, household waste is collected in different points of the house (before in the kitchen where the great majority of waste is generated and processed, and then transporting it to the garage/garden, where waste can be stored for longer periods without causing space or smell issues), within a multi-stage process. Conversely, in the case of drop-off collection the presence of a multi-stage recycling process becomes redundant and unnecessary, since people have the possibility to bring waste daily to the communal 'ecological islands', instead of having to store it into the house for longer periods.

With regard to the beliefs developed by the individuals about the behavior and responsibilities of the actors involved in recycling process, respondents tend to perceive themselves as keen recyclers, while other people are often blamed of being not responsible and sufficiently careful about this activity. Others can be their neighbors, as they can easily compare each other's waste on the streets or in communal collection areas, or, alternatively, a group of 'mythical bad others', sometimes indicated by respondents as belonging to stereotypic social categories, such as 'the youngers' and 'the immigrants'. This type of attitude might be problematic because it tends to absolve the individual of personal responsibility, shifting blame only onto the others.

When inquired about the other actors involved in recycling process (service provider, local authorities and industry/companies), a substantial majority of respondents affirm that they are not doing enough, in their opinion, to make recycling process more efficient and to sustain citizens' participation. Respondents think that the burden and costs of recycling process currently hang only on citizens' shoulders. In addition, they report a sense of powerlessness, frustration and lack of communication in the relationship with the other institutional actors.

The most problematic relationship is between respondents and the service provider. The majority of respondents believe indeed that there is a great speculation around waste management, and that waste management companies are interested more in profit than in people wellbeing and environment. It is thereby not surprising that approximately half of the respondents, when asked to describe what happens, in their opinion, to collected recyclables, proved to be very skeptical about their actual retreatment. The concern of these respondents for the fate of collected waste is not based, however, on extensive factual knowledge about waste management process. Conversely it appears to be based, often, on incomplete and fragmented 'half-truths', obtained from a diversity of sources such as the media or neighbors.

CHAPTER 7

CONCLUSIONS AND RECOMMENDATIONS

7.1. KEY FINDINGS AND CONCLUSIVE REMARKS

In recent years, the ever-increasing generation of urban waste is posing serious problems to developed countries and cities, highlighting the pressing need to transform their current recycling practices into more efficient and sustainable ones. This is not possible, however, without the involvement and active cooperation of citizens as key initiators and sustainers of the entire recycling process. During the last decades, the question of what makes people recycle or not has occupied researchers and practitioners seeking to understand this behavior and how to promote its adoption. This resulted in a great number of publications examining recycling from a range of perspectives including psychology, economics, sociology, geography and marketing. Nevertheless, its comprehension is still far from being exhaustive. In light of the relevant environmental, societal and economic implications of recycling, a deeper understanding of this phenomenon seems thus to be mandatory.

The research work described in the present thesis aimed at extending the current knowledge regarding household recycling, by means of reviewing through a meta-analysis the effectiveness of interventions to promote it (Chapter 2), and connecting them with the determinants of the behavior identified in

Chapter 1. In addition, the present work aimed at overcoming the limitations that characterize both quantitative and qualitative research using an innovative mixed-method approach (Chapter 3) to investigate recycling practices in the Italian context. More specifically, various dimensions such as recycling knowledge, sorting errors and perceived value of waste (Chapter 4), motivations to recycle and justifications for defective episodes (Chapter 5), recycling habit formation and maintenance, as well as responsibility attributions for recycling (Chapter 6) have been explored, with the aim to shed light on the way people experience and make sense of them. The insights emerging from the present thesis are several and multifaceted, with a significant potential for concrete application. They are synthetized in the present section, while in section 7.2 a set of practical recommendations for the design of behavior change interventions will be delineated building upon them.

A first noteworthy result is connected with recycling knowledge and its measurement. It has been shown that having accurate information regarding how to properly recycle waste and what happens to it after collection is a prerequisite to the correct and consistent performance of household recycling. Indeed, it affects not only the quantity of recyclables collected and their quality, but it is also a crucial factor in evaluating the product to be discarded as still valuable (e.g., because it is possible to recycle it). Poor, incomplete or heuristic-based information about products' recyclability, on the other hand, emerged as a factor having the potential to increase the likelihood of persistent sorting failures. Furthermore, it leads people to question the value of recycling and to be skeptic

about actual retreatment of collected recyclables. These results are in line with previous literature (e.g., Boulay et al., 2014; Schultz, 2002), evidencing that lack of knowledge is a major barrier preventing people from effective recycling behavior. Identifying knowledge gaps and informative needs of citizens is thus a prerogative in order to define the most appropriate strategies of intervention to overcome them. Traditionally, the knowledge about recycling has been measured by means of self-report techniques, namely by asking people how good they think they are in recycling household waste (e.g., Andersson & von Borgstede, 2010; Scott, 1999; Seacat & Northrup, 2010). Nevertheless, as demonstrated in section 3.2.1, perceived knowledge often differs substantially from actual knowledge, since people tend to either underestimate or overestimate it. In addition, self-report techniques do not allow to detect which errors are committed by people when sorting waste and to categorize them by type. This calls for the use of alternative measures, capable of assessing people's actual knowledge and being practical to use on a relative large scale. The online questionnaire developed and tested in Study 1 (see sections 3.2.1 and 3.2.2) proved to be useful in this respect, permitting to segment people based on their actual level of knowledge (instead of the self-reported one) and to explicit knowledge gaps pertaining specifically to people characterized by different levels of knowledge. Further studies are thus needed in order to better characterize the potential of structured questionnaires including simulation tasks to measure individual procedural knowledge about recycling. It would be useful

indeed to test and validate measures capable of reaching high level of internal consistency and discriminant capacity.

A second aspect of novelty concerns motivations behind recycling. It has been shown that motivations to recycle refer not only to environmental, but also to civic duty-related values, as well as to habit. Furthermore, it emerged that environmental concern is not mentioned as a primary reason to recycle due to a strong ecological ideology, but instead because environment and environmental protection have become part of people's culture and of the way they intend their civic duty as responsible citizens. The present research also demonstrated that monetary incentives may actually be an effective way to motivate some people recycling more, but they could also be of little relevance to other people driven more by altruistic motivations. They appear indeed to be more motivated by receiving information from the city council on the amount recycled, the money saved, and the redistribution of the value created with recycling to the entire local community. These results appear particularly interesting not only because they underline the complex and multifaceted nature of motivations connected to recycling, but also because they constitute a first step toward shedding light on previous conflicting results regarding the relationship between recycling and environmental motivations (e.g., Bowman et al., 1998; Lansana, 1992; Domina & Koch, 2002; Thomas et al., 2003). In this respect, future studies would be beneficial in order to explore the link between recycling and the concept of environmental citizenship (Dobson, 2010), in which pro-environmental behaviors are considered a means to reduce people's ecological footprint

motivated by the key value of justice between humans, rather than concern for the environment for its own sake.

A third advance emerging from this thesis is connected to the concept of personal responsibility. In particular, it has been demonstrated that despite people tend to perceive themselves as keen and responsible recyclers, there are clear limits to what they consider reasonable and thus are willing to do with regard to household recycling. In addition, they tend to justify defective episodes by considering external circumstances (e.g., lack of clear information, lack of space, etc.) responsible for them, and to believe that recycling a single item is such a trivial action that refraining from it will not have negative consequences. These findings are even more interesting if one considers that the sample is composed by active recyclers, showing that even a sample of supposedly committed respondents displays rationalizations and resistance to perform certain 'unreasonable' actions. Other people, conversely, are often blamed of not being responsible about recycling, and their defective actions are usually attributed more to dispositional factors, such as laziness and lack of willingness to stay informed, instead of external ones. The value of these attributions lies in the fact that they represent the way in which people make sense of their experiences, becoming «'real' in the sense that they are reasons why people might deviate from their recycling routines» (Smeesters et al., 2003, p. 458). They should thus be understood for the value they have for the individuals, and considered in the design of interventions to promote recycling (see section 7.2). The qualitative data collected through the interviews (Study 2) do not allow to define a causal

relationship between responsibility attributions and recycling. The emerging findings, however, give some indications in this sense, i.e., by highlighting the importance of experiencing a sense of personal responsibility with regard to recycling and pointing out the risk of personal responsibility being reduced when individuals feel that other people are not committed to perform the behavior. To fully investigate this relationship, future studies should combine qualitative and quantitative data (e.g., simulations in controlled settings) to unveil the mechanisms underlying responsibility attributions, understanding also how the latter influence recycling behavior and how it is possible to intervene to modify them.

A final aspect deserving mention is the characterization of recycling not as an individualized act, but instead as a shared domestic practice requiring active cooperation and negotiations between family members, the distribution of tasks, responsibilities and roles (e.g., the 'expert'), the organization of domestic spaces, as well as the exchange of informative resources. The outcome of this complex set of factors is the formation and maintenance over time of a domestic routine, namely a learned habit embedded into daily life, responding not only to the needs of the household members, but also, simultaneously, to the characteristics of the external socio-technical infrastructure (i.e., type and frequency of waste collection; Boulay et al., 2014). These considerations are relevant not only for their practical implications (see section 7.2), but also in order to open a new line of research within the behavior change field, since «more needs to be known about the recycling behavior of all the different people within the home if we are to get

better at helping households make the changes that will result in effective recycling behaviors» (Jesson et al., 2014, p. 6).

7.2. PRACTICAL RECOMMENDATIONS

The practical implications of the findings discussed above can be synthetized into four key messages for policy makers, scheme operators, practitioners and researchers interested in designing and implementing field interventions aiming to promote household recycling[1]. Along with the indications provided by the meta-analysis on interventions' effectiveness (Chapter 2), these practical recommendations aim to provide general guidance and advice. Yet they are not intended to replace preliminary in-depth research. This is indeed necessary to uncover the underlying determinants and barriers of household recycling in the specific context under examination, based on which it is possible to define some fundamental aspects of the intervention such as its specific contents, the medium through which presenting them, the framing of the messages, the length of the intervention as well as its targeted recipients.

Preliminary qualitative research able to highlight habits, norms and values is useful also to avoid a critical and 'sustainable-centric' perspective towards

[1] Although the conclusions and recommendations presented here are pertinent to household recycling practices in Italy, they retain relevance and significance also for professionals operating in other national and local contexts. They highlight indeed the importance of carrying out a preliminary in-depth investigation of the context under examination, providing methodological indications on how to conduct it and exemplifying how to translate key findings into practical advice to make the intervention better tailored to its targeted recipients and their needs.

people' practices. This might lead indeed to a poor understanding of the target context, and to design interventions that are perceived as less convincing by their recipients. Qualitative investigations serve not only to identify where to intervene, but also to unveil how people locally organize and account for their waste management practices, understanding them for the value they have for the individuals. In this way, the reasons behind them are disclosed and can be thus used to direct the intervention design. Methodologically, this means changing focus from etic phenomena (i.e., phenomena categorized based on a predefined criterion) to emic ones (i.e., phenomena accounted for based on the practical implications they have for the observed participants), in line with the current interest toward practice studies and in empowering the individual. Even though the finality of the intervention is to correct informative gaps or heuristic-based knowledge, erroneous beliefs, inexperience or inefficacy, the value and constraints served by them can be indeed respected also by the new, sustainable alternatives promoted by the intervention. This point has been made strongly in the neighbor field of energy conservation, where it is recommended to empower users instead of conditioning them to adopt predefined routines, offering sustainable behavioral alternatives that are at the same time able to preserve the values served by old, unsustainable habits (Brynjarsdottir et al., 2012).

[#1] ADDRESS SPECIFIC INFORMATIVE NEEDS. Recycling promotion and education should target difficult materials and errors which are most commonly made by respondents when sorting their domestic waste. In this regard,

segmenting people using appropriate instruments to measure their actual level of knowledge of recycling rules appears to be very useful in order to identify existing difficulties in disposing of specific kind of waste and to tailor the intervention strategy accordingly. In addition, it appears important to educate people about what happens to recyclables once they have been collected for recycling, in order to allow them understanding how recycling process works, how their individual actions are making a difference, and to tackle 'recycling myths' that all ends up in landfill or incinerator anyway. According to Boulay and colleagues, this type of information is useful also to contrast poor capture (i.e., missing collection of recyclable products) acting on the perceived value of waste, since it «gives people a better connection to the materials they consume and then discard, incentivizing them to recycle more» (2014, p. 9).

[#2] RECOGNIZE THE MULTIFACETED NATURE OF MOTIVATIONS TO RECYCLE. While environmental considerations remain important, it appears to be necessary to change the focus of the message, presenting recycling as a relevant activity for people and not just for the environment. Environment should be presented as the life support system on which we all rely on, evidencing that «if we don't start looking after the environment, it might stop providing what we need» (Hounsham, 2006, p. 141). The emphasis of the message should thus be placed on the pragmatic outcomes of recycling, linking them to both global issues such as climate change, and to local issues such as saving local landfill space, street cleaning and the general livability of the local area. Furthermore, it is important

to recognize that different people have different motivations for recycling, and to tailor messages accordingly. For example, it has been demonstrated that people with a lower recycling knowledge are usually motivated to recycle by the desire to protect environment and to obtain personal benefits (e.g., avoid fines, reduction of fees). In this case, associating environmental considerations with the provision of information about money which can be saved by recycling more, along with advice about how to do this, could be useful in order to motivate them to recycle more and better.

[#3] RAISE THE AWARENESS OF PERSONAL RESPONSIBILITY FOR RECYCLING. Interventions should convey the message that every little bit of material is important and that every individual's action counts, raising people's awareness of the consequences of action and non-action. In this way, they might come to realize that the benefits of this activity are higher than its perceived personal cost and that there are not 'unreasonable actions' with regard to recycling, stimulating this way any extra effort needed, for example, to properly prepare materials - e.g. washing and squashing them.

[#4] CONVEY THE MESSAGE THAT RECYCLING IS A WIDESPREAD ACTIVITY. The individual must feel comfortable that recycling is carried out up to the desired outcome by all the individuals and actors involved upstream and downstream in the recycling chain (i.e., manufacturers, service provider, and local authorities). Group feedback which convey messages about recycling being 'normal' and

'what most other people do' could thus be used to encourage and sustain people's participation, since they feel of being not the only ones who recycle (Cialdini, 2003; Thomas & Sharp, 2013). In addition, information on how local goals for source separation are being met can give further motivation, helping people to better understand recycling process and encouraging confidence in the local collection system.

With regard to interventions' effectiveness, the results of the meta-analysis indicated social modeling as the most effective intervention technique to promote recycling, followed by environmental alterations, combined interventions, prompt and information, incentives, commitment, and feedback. Nevertheless, the selection of the intervention strategy (or combination of strategies) to be used should be guided not only by these results, but also and foremost by the characteristics of the context under examination, in order to make the intervention better tailored to its targeted recipients and their needs.

To conclude, in addition to the general advice reported in Chapter 2 (namely, the necessity to assess the longevity of the intervention's effects and the use of multiple indicators as a measure of its success), two further recommendations can be drawn starting from the empirical results of the present research. The first is connected with the recipients of the intervention. It has been demonstrated that recycling is a shared practice requiring active cooperation between family members, the distribution of tasks and responsibilities, as well as the development of ad-hoc strategies to organize it. For this reason, «the

household, not the individual, is the basic behavioral unit» (Jesson et al., 2014, p. 6) of interventions aiming at promoting domestic recycling. This means that interventions need to reflect the fact that everyone in the household who creates or handles waste has a specific and different role to play, rather than being based on the idea that contacting and motivating one of them is sufficient to make all the members recycling more effectively. This does not necessarily imply communicating with every household member. Indeed, as described in Chapter 6, households generally have an 'expert', namely a person who mostly deals with recycling and is held responsible for it, playing the role of information gatherer and gatekeeper and controlling the adequacy of the performance of the other family members. This person should thus being identified, targeted for the intervention and then trained to transfer recycling messages and behaviors that are most effective to everyone else in the household. This highlights also the need for further (qualitative) research in this area to gain a better understanding of how behavior change interventions could best influence household members, taking into account the way domestic recycling tasks are organized in order to respond to both internal and external needs and constraints, and how informative messages delivered to 'the household' are transmitted internally and reflected in changes in collective recycling behavior.

The second aspect deals with timing of the intervention. Three specific situations emerged in which it appears to be particularly important promoting household recycling:

(a) **introduction of a new recycling program**: as demonstrated in Chapter 6, at the start of a new program people are confronted with an alternative way of managing waste and do not generally know procedures for recycling, coping with the new situation by means of active problem solving to acquire information and to organize in-home spaces. Interventions at this stage should thus aim to convey procedural knowledge about how to properly recycle waste, advice on the organization of household storage, as well as knowledge regarding recycling process (i.e., what waste becomes, how it is treated and the benefits connected to recycle it);

(b) **changing an existing program**: when an established program is modified (e.g., new types of materials collected, different days of collection, passage from drop-off to curbside collection, etc.), the change should be accompanied by dissemination of information. In this case, people already have a basic knowledge of the program, and interventions should thus focus on disseminating information on materials and procedures which are particularly complex or difficult to remember;

(c) **life course changes**: the findings of the field study (section 6.1.2) pointed out that whilst young respondents who moved to a new house declared to continue practicing recycling as a result of recycling habits learned during their permanence in the parental house, they had also to face issues connected to the practical organization of recycling activity in the

new home. According to Verplanken and Roy (2016), when major habit disruptions occur, this may create an opportunity to be used strategically to promote behavior change. Indeed, «such discontinuities may force people to renegotiate ways of doing things, create a need for information to make the new choices, and a mind-set of being 'in the mood for change'. Interventions that capitalize on these conditions may thus be more effective compared to interventions under default conditions» (p. 128). Specific interventions should thus target, for example, people who relocate to a new house and make request to adhere to the recycling service.

Finally, and more in general, the need for interventions to promote and sustain recycling emerges every time specific problems are detected, such as in case of persisting sorting errors. This calls for the need of regular performance monitoring, not restricted to recovered tonnages, but including both participation and composition of collected materials (Tucker & Speirs, 2002), in order to understand whether citizens have acquired the necessary knowledge to perform recycling properly, and difficulties in disposing of specific kind of waste exist. This can indeed support and inform the development of actions targeting specifically the identified problems and informative needs, as well as and the rapid delivery of corrective feedback.

APPENDIX A.

SYNTHESIS OF THE MAIN RESEARCH FINDINGS REGARDING THE DETERMINANTS OF HOUSEHOLD RECYCLING

NOTE. In the subsequent Tables, '+' indicates a positive relationship between recycling and the identified variable; '-' indicates a negative relationship; 'no' indicates no relationship; 'U' indicates a reversed u-shaped relationship.

TABLE A.1. Socio-demographic factors and their relationship with recycling.

	AGE	EDUCATION LEVEL	INCOME	GENDER	HOUSEHOLD SIZE	HOUSEHOLD COMPOSITION	EMPLOYMENT STATUS	ETHNICITY
ABBOTT, NANDEIBAM & O'SHEA (2011)			no		no			
ANDO & GOSSELIN (2005)	+	+					-	
ARBUES & VILLANUA (2016)	U	+	+	no		+	+	+
BARILE, CULLIS & JONES (2015)	U			+		no	no	
BARR, GILG & FORD (2001)	no							
BARR, GUILBERT, METCALFE, RILEY, ROBINSON & TUDOR (2013)	U				+			
BATOR, BRYAN & SCHULTZ (2011)	+							
BELL, HUBER & VISCUSI (2016)	+		U	+		+		+
BERGER (1997)		+	+					
BEZZINA & DIMECH (2011)	no	no		no				
BOLDERO (1995)	no			no				

	AGE	EDUCATION LEVEL	INCOME	GENDER	HOUSEHOLD SIZE	HOUSEHOLD COMPOSITION	EMPLOYMENT STATUS	ETHNICITY
BOTETZAGIAS, DIMA & MALESIOS (2015)	no	no	no	no				
BOWMAN, GOODWIN, JONES & WEAVER (1998)	+			no				+
BRIGUGLIO, DELANEY & WOOD (2015)	no	no	+					
BUDAK & OGUZ (2008)	no	no	no		no	+		
CHAN (1998)	U	no		+			no	
COLLINS, O'DOHERTY & SNELL (2006)	+		+					
DAVIES, FAHY & TAYLOR (2005)	+							
DAVIES, FOXALL & PALLISTER (2003)		+						
DE FEO & DE GISI (2010)	U	+		+		+		
DEL CIMMUTO, MANNOCCI, RIBATTI, BOCCIA & LA TORRE (2014)	no			no		no		
DERKSEN & GARTRELL (1993)	+	+	no					
DOMINA & KOCH (2002)	+	no	+	no	+	no		
DO VALLE, REIS, MENEZES & REBELO (2004)	no	no	no	no				
EWING (2001)	+	+				+		
FERRARA & MISSIOS (2005)	no	no	-		no			
FIORILLO (2013)	U	+	+	+	no			
FOLZ & GILES (2002)		no	no					
FOLZ & HAZLETT (1991)	+	no	no	no	no			+
GAMBA & OSKAMP (1994)	no	no	+	no	+			
GARCES, LAFUENTE, PEDRAJA & RIVERA (2002)	+	no	-	no				
HAGE, SÖDERHOLM & BERGLUND (2009)	+	no	no	no				
HALVORSEN (2012)			+					
HAMBURG, HAQUE & EVERITT (1997)	U	no						
HANSMANN, BERNASCONI, SMIESZEK, LOUKOPOULOS & SCHOLZ (2006)	+		no					

	AGE	EDUCATION LEVEL	INCOME	GENDER	HOUSEHOLD SIZE	HOUSEHOLD COMPOSITION	EMPLOYMENT STATUS	ETHNICITY
HONG & ADAMS (1999)					-			
HORNIK, CHERIAN, MADANSKY & NARAYANA (1995)	no	no	no	no				
IOANNOU, ZAMPETAKIS & LASARIDI (2011)	+	+		no				
IZAGIRRE-OLAIZOLA, FERNANDEZ-SAINZ & VICENTE-MOLINA (2015)				+				
KACIAK & KUSHNER (2011)	U	no	no	no	no			
KIPPERBERG (2007)	+							
KURZ, LINDEN & SHEEHY (2007)			+					
LAKHAN (2015A)								+
LAKHAN (2015B)	+	+	no					
LANSANA (1992)	+	+	no				no	
LEE & PAIK (2011)	+	no	+	no				
LINDSAY & STRATHMAN (1997)	no	no	no	no				
MARTIN, WILLIAMS & CLARK (2006)	+		+					
MARTINEZ & SCICCHITANO (1998)	+	+	no					
MATSUMOTO (2011)	+	no	no	+				
MCDONALD & BALL (1998)	+				no		no	
MENESES & PALACIO (2005)	U	no		+				
MIAFODZYEVA & BRANDT (2013)	U	no	+	no				
MILIUTE-PLEPIENE, HAGE, PLEPYS & REIPAS (2016)	no	no	no	no				
NIXON & SAPHORES (2009)	+	no	no	no	+			+
OATES & MCDONALD (2006)				+				
OSKAMP, BURKHARDT, SCHULTZ, HURIN, & ZELEZNY (1998)		no	no		+			
OSKAMP, HARRINGTON, EDWARDS, SHERWOOD, OKUDA & SWANSON (1991)	no	no	+	no				
OWENS, DICKERSON & MACINTOSH (2000)	no	+	+	no	no			no

	AGE	EDUCATION LEVEL	INCOME	GENDER	HOUSEHOLD SIZE	HOUSEHOLD COMPOSITION	EMPLOYMENT STATUS	ETHNICITY
PALATNIK, BRODY, AYALON & SHECHTER (2014)	+	+	+	-	+	+		
PERRY & WILLIAMS (2007)								+
RESCHOVSKY & STONE (1994)	no	+	no	no	no	+	no	
ROBERTSON & WALKINGTON (2009)	+			no				
SAPHORES & NIXON (2014)	U	no	no	no				no
SCHULTZ, OSKAMP & MAINIERI (1995)	no	no	+	no				no
SCHWAB, HARTON & CULLUM (2012)				no				
SCOTT (1999)	+	no	no		no			
SIDIQUE, JOSHI & LUPI (2010)	+	+	-					
SIDIQUE, LUPI & JOSHI (2010)	+	no	+	no	+		-	
SMALLBONE (2005)	+		+					
STERNER & BARTELINGS (1999)	+		no					
SWAMI, CHAMORRO-PREMUZIC, SNELGAR & FURNHAM (2011)	+			no				
TABERNERO, HERNANDEZ, CUADRADO, LUQUEA & PEREIRA (2015)	+	+		no				
TILIKIDOU & DELISTAVROU (2001)	U	+					+	
TUCKER (2003)	+		+		no			
VENKATASWAMY, OHMAN & BRANNSTROM (2000)	+	+	no	no	no	no	no	
VINING & EBREO (1990)	+	no	+	no	no		no	
VISCUSI, HUBER & BELL (2011)			+					
WERDER (2011)	-		no	+				
WERNER & MAKELA (1999)	no	no		no				
WHEELER & GLUCKSMAN (2014)				no				
XU, LIN, GORDON, ROBINSON & HARDER (IN PRESS)	+							
YAU (2010)	+	no	+	no	no			
TOT.	68	51	51	46	22	11	11	10

TABLE A.2. Psychological factors and their relationship with recycling.

	SOCIAL INFLUENCE	INFORMATION &KNOWLEDGE	PRO-ENVIRON. ATTITUDES	RECYCLING ATTITUDES	BELIEFS/ PERCEPTION OF CONSEQUENCES	RESPONSIBILITY	MOTIVATION	PAST EXPERIENCE	SELF-ORGANIZAT. SKILLS	EMOTIONS	PERSONALITY CHARACT.
AGOVINO, CROCIATA & SACCO (2016)	+										
ALEXANDER, SMAJE, TIMLETT & WILLIAMS (2009)		+									
ANDERSSON & VON BORGSTEDE (2010)		+				+					
ARBUES & VILLANUA (2016)	+		+								
BAGOZZI & DABHOLKAR (1994)				+		+	+	+			
BARILE, CULLIS & JONES (2015)					+	+	+				
BARR, GILG & FORD (2001)		+	no			+					
BARR, GUILBERT, METCALFE, RILEY, ROBINSON & TUDOR (2013)	+	+	+			+	+				
BERGER (1997)	+										
BEST & KNEIP (2011)			+								
BEST & MAYERL (2013)			no	+							
BEZZINA & DIMECH (2011)	no	+			no						
BISWAS, LICATA, MCKEE, PULLIG, & DAUGHTRIDGE (2000)				+		+		+			
BOLDERO (1995)	+				+			+			
BOTETZAGIAS, DIMA & MALESIOS (2015)						+					
BOULAY, METCALFE, BARR & SHAW (2014)	+	+			+				+		
BOWMAN, GOODWIN, JONES & WEAVER (1998)	+	+	+		+		+				
BRATT (1999)	no				no	+					
BREKKE, KIPPERBERG & NYBORG (2010)						+					
BRIGUGLIO, DELANEY & WOOD (2015)	+							+			
BRUVOLL, HALVORSTEN & NYBORG (2002)							+				
BRUVOLL & NYBORG (2002)	+					+	no				
BUCCIOL, MONTINARI & PIOVESAN (2014)	+										

	SOCIAL INFLUENCE	INFORMATION &KNOWLEDGE	PRO-ENVIRON. ATTITUDES	RECYCLING ATTITUDES	BELIEFS/ PERCEPTION OF CONSEQUENCES	RESPONSIBILITY	MOTIVATION	PAST EXPERIENCE	SELF-ORGANIZAT. SKILLS	EMOTIONS	PERSONALITY CHARACT.
BUDAK & OGUZ (2008)	+	+	no								
CARLSON (2001)				no							
CARRUS, BONNES, FORNARA, PASSAFARO & TRONU (2009)	+										
CHAN & BISHOP (2013)						+					
CHEN & TUNG (2010)					+	+					
CHEUNG, CHAN & WONG (1999)			+					+			
CHU & CHIU (2003)						+					
CROCIATA, AGOVINO & SACCO (2015)	+										+
CULIBERG (2014)				+		+					
CZAJKOVSKI, HANLEY & NYBORG (2015)						+					
DAI, LIN, LI, XU, HUANG & HARDER (IN PRESS)	+										
D'AMATO, MANCINELLI & ZOLI (2014)	+										
DAVIES, FAHY & TAYLOR (2005)	+	+									
DAVIES, FOXALL & PALLISTER (2003)	no	no			+	+		no			
DE COVERLY, O'MALLEY & PATTERSON (2008)					no	+					
DE FEO & DE GISI (2010)		+									
DERKSEN & GARTRELL (1993)			no								
DE YOUNG (1990)		+									
DIAZ (2010)										+	
DOMINA & KOCH (2002)	+		no								
DO VALLE, REIS, MENEZES & REBELO (2004)	+		no	+	no	+					
ELGAAIED (2012)			no		+					+	
EWING (2001)	+				no	+					
FERRARA & MISSIOS (2005)	+										
FIORILLO (2013)	+		+								

	SOCIAL INFLUENCE	INFORMATION &KNOWLEDGE	PRO-ENVIRON. ATTITUDES	RECYCLING ATTITUDES	BELIEFS/ PERCEPTION OF CONSEQUENCES	RESPONSIBILITY	MOTIVATION	PAST EXPERIENCE	SELF-ORGANIZAT. SKILLS	EMOTIONS	PERSONALITY CHARACT.
FOLZ & GILES (2002)					no						
FOLZ & HAZLETT (1991)	no										
FORNARA, CARRUS, PASSAFARO & BONNES (2011)	+										
GAMBA & OSKAMP (1994)	+	+	+			no					
GARCES, LAFUENTE, PEDRAJA & RIVERA (2002)					+						
GRAHAM-ROWE, JESSOP & SPARKS (2015)	no					+				+	
GUAGNANO, STERN & DIETZ (1995)				+							
HAGE, SÖDERHOLM & BERGLUND (2009)	+					+					
HALVORSEN (2012)	+		+		+	+					
HANSMANN, BERNASCONI, SMIESZEK, LOUKOPOULOS & SCHOLZ (2006)		+		no			+		+		
HENRIKSSON, AKESSON & EWERT (2010)		+									
HORNIK, CHERIAN, MADANSKY & NARAYANA (1995)	+	+	+			+				+	
HOWENSTINE (1993)				+							
HUFFMAN, VAN DER WERFF, HENNING & WATROUS-RODRIGUEZ (2014)	+		+								
IOANNOU, ZAMPETAKIS & LASARIDI (2011)					+			+			
IZAGIRRE-OLAIZOLA, FERNANDEZ-SAINZ & VICENTE-MOLINA (2015)		+	no			+	+				
JOHANSSON (2016)		+			+		+				
KACIAK & KUSHNER (2011)	no										
KALINOWSKI, LYNNE & JOHNSON (2006)	+										
KIRAKOZIAN (2016)	-	+	+								
KNUSSEN & YULE (2008)								+			
KURZ, LINDEN & SHEEHY (2007)	+		no	+							
LANGLEY, TURNER & YOXALL (2011)		+									

	SOCIAL INFLUENCE	INFORMATION &KNOWLEDGE	PRO-ENVIRON. ATTITUDES	RECYCLING ATTITUDES	BELIEFS/ PERCEPTION OF CONSEQUENCES	RESPONSIBILITY	MOTIVATION	PAST EXPERIENCE	SELF-ORGANIZAT. SKILLS	EMOTIONS	PERSONALITY CHARACT.
LANSANA (1992)	+	+	no	+	+						
LEE & PAIK (2011)			+	+							
LINDSAY & STRATHMAN (1997)	no	no			+	+			+		
LONG, HARRÉ & ATKINSON (2014)	+										
MACY & THOMPSON (2003)	no		+		+				+	+	
MANNETTI, PIERRO & LIVI (2004)						+					
MARTIN, WILLIAMS & CLARK (2006)				no							
MARTINEZ & SCICCHITANO (1998)			+						+		
MATSUMOTO (2011)			+								
MCDONALD & BALL (1998)		+									
MCDONALD & OATES (2003)		+									
MENESES & PALACIO (2005)	no		+			+					
MIAFODZYEVA & BRANDT (2013)	+	+	+			+		no			
MILIUTE-PLEPIENE, HAGE, PLEPYS & REIPAS (2016)	+		+		+	+					
MIRANDA & BLANCO (2009)		+									
NIGBUR, LYONS & UZZELL (2010)	+					+					
NIXON & SAPHORES (2009)	+			+	+	+		+			
OJALA (2008)			+	+			+				
OSKAMP, BURKHARDT, SCHULTZ, HURIN, & ZELEZNY (1998)	no	+	+		+						
OSKAMP, HARRINGTON, EDWARDS, SHERWOOD, OKUDA & SWANSON (1991)	+				+			no			
OWENS, DICKERSON & MACINTOSH (2000)	+										
PALATNIK, BRODY, AYALON & SHECHTER (2014)	+	+				+					
PARK & HA (2014)					+	+					
PERRIN & BURTON (2001)		+	+								

	SOCIAL INFLUENCE	INFORMATION &KNOWLEDGE	PRO-ENVIRON. ATTITUDES	RECYCLING ATTITUDES	BELIEFS/ PERCEPTION OF CONSEQUENCES	RESPONSIBILITY	MOTIVATION	PAST EXPERIENCE	SELF-ORGANIZAT. SKILLS	EMOTIONS	PERSONALITY CHARACT.
POSKUS (2016)						+					
PRESTIN & PIERCE (2010)		+									
REFSGAARD & MAGNUSSEN (2009)		+			+						
RESCHOVSKY & STONE (1994)		+									
RHODES, BEAUCHAMP, CONNER, DE BRUIJN, KAUSHAL & LATIMER-CHEUNG (2014)									+		
ROBERTSON & WALKINGTON (2009)	+		no	+	no						
SANTI & RODIC (2010)	+			+		no					
SAPHORES & NIXON (2014)	+					+					
SCHILL & SHAW (2016)					+						
SCHULTZ, OSKAMP & MAINIERI (1995)		+	+	+		+					
SCHWAB, HARTON & CULLUM (2012)	+			+		no					
SCOTT (1999)	no	+	+				+				
SEACAT & NORTHRUP (2010)		+					+		+		
SHAW (2008)	+										
SIDIQUE, LUPI & JOSHI (2010)	+	+		+							
SMALLBONE (2005)			+								
SMEESTER, WARLOP, CORNELISSEN & VANDEN ABEELE (2003)	+	+		+	+	+	+				
SMITH, HAUGTVEDT & PETTY (1994)				+							
SUN & TRUDEL (2016)										+	
SWAMI, CHAMORRO-PREMUZIC, SNELGAR & FURNHAM (2011)											+
TABERNERO, HERNANDEZ, CUADRADO, LUQUEA & PEREIRA (2015)	+								+		
TILIKIDOU & DELISTAVROU (2001)				+							+
THOMAS (2011)		+									

	SOCIAL INFLUENCE	INFORMATION &KNOWLEDGE	PRO-ENVIRON. ATTITUDES	RECYCLING ATTITUDES	BELIEFS/ PERCEPTION OF CONSEQUENCES	RESPONSIBILITY	MOTIVATION	PAST EXPERIENCE	SELF-ORGANIZAT. SKILLS	EMOTIONS	PERSONALITY CHARACT.
THOMAS, SLATER, YOXON, LEAMAN & DOWNING (2003)	no	+	+	+			+	+			
THOMAS, YOXON, SLATER & LEAMAN (2004)	+	+						+			
TONGLET, PHILLIPS & BATES (2004)					no	no		+			
TUCKER (1999)	+										
TUCKER (2003)		+			+	+			+		
VENCATASWAMY, OHMAN & BRANNSTROM (2000)	no		+		+						
VINING & EBREO (1990)	no	+	no								
VISCUSI, HUBER & BELL (2011)						+					
WAN, CHEUNG & SHEN (2012)					+	+					
WERDER (2011)	+	+				+					
WERNER & MAKELA (1999)				+					+		
WHEELER (2014)	+										
WHEELER & GLUCKSMAN (2014)		+			no						
WHITE & HYDE (2012)						no		+			no
WHITE & HYDE (2013)	+										
XU, LIN, GORDON, ROBINSON & HARDER (IN PRESS)	+					+					
YAU (2010)	no										
TOT.	68	44	38	25	23	47	14	15	10	6	4

TABLE A.3. Contextual factors and their relationship with recycling.

	SERVICE CHARACT.	RECYCLING BINS	INCENTIVES	CONVENIENCE	PRODUCT CHARACT.
ABBOTT, NANDEIBAM & O'SHEA (2011)	+	+			
A-JALIL, GRANT, NICHOLSON & DEUTZ (2014)				+	
ALEXANDER, SMAJE, TIMLETT & WILLIAMS (2009)				+	
ANDO & GOSSELIN (2005)	+			+	
ANDREWS, GREGOIRE, RASMUSSEN & WITOWICH (2013)		+			
ARBUES & VILLANUA (2016)	+				
ASHENMILLER (2011)			+		
BARR, GILG & FORD (2001)	+			+	
BARR, GUILBERT, METCALFE, RILEY, ROBINSON & TUDOR (2013)		+		+	
BATOR, BRYAN & SCHULTZ (2011)	+				
BELL, HUBER & VISCUSI (2016)	+				
BERGER (1997)				+	
BEST & KNEIP (2011)	+				
BEZZINA & DIMECH (2011)	+			+	
BOLDERO (1995)	+			+	
BOULAY, METCALFE, BARR & SHAW (2014)				+	
BOWMAN, GOODWIN, JONES & WEAVER (1998)	+			+	
BRIGUGLIO, DELANEY & WOOD (2015)	+			+	
BRUVOLL & NYBORG (2002)	+			+	
BUCCIOL, MONTINARI & PIOVESAN (2011)	+		+		
CAMPBELL, KHACHATRYAN, BEHE, HALL & DENNIS (2016)	+		+		
CARLSON (2001)	+		+		

	SERVICE CHARACT.	RECYCLING BINS	INCENTIVES	CONVENIENCE	PRODUCT CHARACT.
CHAN (1998)	+				
CHAO (2008)	no		+	+	
CHAPPELLS & SHOVE (1999)		+			
CHEN & TUNG (2010)				+	
CHEUNG, CHAN & WONG (1999)				+	
COLLINS, O'DOHERTY & SNELL (2006)				+	
CHUNG & POON (1996)	+				
DAHLEN & LANGERKVIST (2014)			no		
DAI, LIN, LI, XU, HUANG & HARDER (IN PRESS)	no				
D'AMATO, MANCINELLI & ZOLI (2014)				+	
DAVIES, FAHY & TAYLOR (2005)	+			+	
DAVIES, FOXALL & PALLISTER (2003)	+			+	
DE FEO & DE GISI (2010)				+	
DEL CIMMUTO, MANNOCCI, RIBATTI, BOCCIA & LA TORRE (2014)	+				
DERKSEN & GARTRELL (1993)	+			+	
DE YOUNG (1990)			no	+	
DOMINA & KOCH (2002)	+			+	
DO VALLE, MENEZES, REIS & REBELO (2009)	+				
DO VALLE, REIS, MENEZES & REBELO (2004)	+			+	
DUFFY & VERGES (2009)		+			
DURUGBO (2013)		+			
ELGAAIED (2012)				+	
EVISON & READ (2001)	+				
EWING (2001)	+				
FERRARA & MISSIOS (2005)	+		+		

	SERVICE CHARACT.	RECYCLING BINS	INCENTIVES	CONVENIENCE	PRODUCT CHARACT.
FIORILLO (2013)	+		no		
FOLZ & HAZLETT (1991)	+		+		
FOLZ & GILES (2002)	+		+		
GAMBA & OSKAMP (1994)	+		no	+	
GARCES, LAFUENTE, PEDRAJA & RIVERA (2002)	+			+	
GONZALEZ-TORRE & ADENSO-DIAZ (2005)	+				
GUAGNANO, STERN & DIETZ (1995)	+				
HAGE, SÖDERHOLM & BERGLUND (2009)			no	+	
HALVORSEN (2012)	+		-	+	
HAMBURG, HAQUE & EVERITT (1997)				+	
HANSMANN, BERNASCONI, SMIESZEK, LOUKOPOULOS & SCHOLZ (2006)	no				
HONG (1999)			+		
HONG & ADAMS (1999)			+		
HORNIK, CHERIAN, MADANSKY & NARAYANA (1995)	+		+	+	
HOWENSTINE (1993)	+			+	
IOANNOU, ZAMPETAKIS & LASARIDI (2011)				no	
JENKINS, MARTINEZ, PALMER & PODOLSKY (2003)	+		no		
JESSON (2009)				+	
JOHANSSON (2016)				+	
KACIAK & KUSHNER (2011)				+	
KINNAMAN & FULLERTON (2000)			+		
KIPPERBERG (2007)	+		+		
KIRAKOZIAN (2016)	+			+	
KNUSSEN & YULE (2008)				+	

	SERVICE CHARACT.	RECYCLING BINS	INCENTIVES	CONVENIENCE	PRODUCT CHARACT.
KODA (2012)	+				
LAKHAN (2014)	no				
LAKHAN (2015B)	+	+	+		
LAKHAN (2016B)			no		
LANGE, BRUCKNER, KROGER, BELLER & EGGERT (2014)	+				
LANGLEY (2011)		+			
LANGLEY, TURNER & YOXALL (2011)				+	+
LANSANA (1992)	+			+	
LINDERHOF, KOOREMAN, ALLERS & WIERSMA (2001)			+		
LINDSAY & STRATHMAN (1997)				+	
MACY & THOMPSON (2003)	+		+	+	
MARTIN, WILLIAMS & CLARK (2006)	+			+	
MARTINEZ & SCICCHITANO (1998)	+				
MATSUMOTO (2011)	+				
MCDONALD & BALL (1998)	+				
MCDONALD & OATES (2003)		+		+	
MEE, CLEWES, PHILLIPS & READ (2004)	+				
MENESES & PALACIO (2005)				+	
METCALFE, RILEY, BARR, TUDOR, ROBINSON & GUILBERT (2013)		+			
MIAFODZYEVA & BRANDT (2013)	+		no	+	
MILIUTE-PLEPIENE & PLEPYS (2015)	+		no	+	
MONTAZERI, GONZALEZ, YOON & PAPALAMBROS (2012)		+			
NIXON & SAPHORES (2009)	+			+	
NOEHAMMER & BYER (1997)	+		+		

	SERVICE CHARACT.	RECYCLING BINS	INCENTIVES	CONVENIENCE	PRODUCT CHARACT.
OJALA (2008)	+				
ORDONEZ, HARDER, NIKITAS & RAHE (2015)	+				
OSKAMP, BURKHARDT, SCHULTZ, HURIN, & ZELEZNY (1998)			no	no	
OSKAMP, HARRINGTON, EDWARDS, SHERWOOD, OKUDA & SWANSON (1991)				+	
PALATNIK, BRODY, AYALON & SHECHTER (2014)	+		+		
PERRIN & BURTON (2001)				+	
PHILLIPS & ROWLEY (2011)	+		+		
PRESTIN & PIERCE (2010)				+	
REFSGAARD & MAGNUSSEN (2009)	+		+		
RESCHOVSKY & STONE (1994)	+		no	+	
RHODES, BEAUCHAMP, CONNER, DE BRUIJN, KAUSHAL & LATIMER-CHEUNG (2014)					
ROBERTSON & WALKINGTON (2009)	+			+	
ROBINSON & READ (2005)	+		+	+	
RYAN & BERNARD (2006)				+	
SALADIÉ & SANTOS-LACUEVA (2016)	+				
SANTI & RODIC (2010)	+			no	
SAPHORES & NIXON (2014)	+		+	+	
SCHULTZ & OSKAMP (1996)			+	+	
SCOTT (1999)			+	+	
SHAW & MAYNARD (2008)	+		no		
SIDIQUE, JOSHI & LUPI (2010)	+		+		
SIDIQUE, LUPI & JOSHI (2010)	+			+	
SMALLBONE (2005)				+	

	SERVICE CHARACT.	RECYCLING BINS	INCENTIVES	CONVENIENCE	PRODUCT CHARACT.
SMEESTER, WARLOP, CORNELISSEN & VANDEN ABEELE (2003)	+			+	
STERNER & BARTELINGS (1999)				+	
TABERNERO, CUADRADO, LUQUE, SIGNORIA & PROTA (2016)	+				
TABERNERO, HERNANDEZ, CUADRADO, LUQUEA & PEREIRA (2015)	+				
TIMLETT & WILLIAMS (2011)	+			+	
THØGERSEN (2003)			+		
THOMAS (2001)	+				
THOMAS, SLATER, YOXON, LEAMAN & DOWNING (2003)	+		+	+	
THOMAS, YOXON, SLATER & LEAMAN (2004)				+	
TONGLET, PHILLIPS & BATES (2004)				+	
TRIGUERO, ALVAREZ-ALEDO & CUERVA (2016)			+		
TRUDEL & ARGO (2013)					+
TRUDEL, ARGO & MENG (2015)					+
TRUDEL, ARGO & MENG (2016)					+
TUCKER (2003)	+			+	
TUCKER, SPEIRS & SMITH (2000)	no				
USUI & TAKEUCHI (2014)			+		
VENCATASWAMY, OHMAN & BRANNSTROM (2000)	+			no	
VINING & EBREO (1990)			+	+	
VISCUSI, HUBER & BELL (2011)	+		+		
WAGNER (2013)				+	
WAI, SIU & XIAO (2016)				+	
WALLS (2011)			+		
WAN, CHEUNG & SHEN (2012)				+	

	SERVICE CHARACT.	RECYCLING BINS	INCENTIVES	CONVENIENCE	PRODUCT CHARACT.
WHEELER & GLUCKSMAN (2014)				+	
WHITE & HYDE (2013)				+	
WIKSTROM, WILLIAMS & VENKATESH (2016)					+
WILLIAMS & COLE (2013)	+				
WILSON & WILLIAMS (2007)	+				
WOODARD, BENCH & HARDER (2005)	+				
WOODARD, HARDER & BENCH (2006)	+				
WOODARD, HARDER, BENCH & PHILIP (2001)	+				
XU, LIN, GORDON, ROBINSON & HARDER (IN PRESS)	+				
YANG & INNES (2006)	+		+		
YAU (2010)	no		+	no	
YUAN & YABE (2015)	+		+		
ZLATOW & KELLIHER (2007)		+			
TOT.	91	12	47	77	5

APPENDIX B.

SYNTHESIS OF THE MAIN RESEARCH FINDINGS REGARDING THE INTERVENTIONS USED TO PROMOTE HOUSEHOLD RECYCLING.

TABLE B.1. Prompts and information.

PROMPTS AND INFORMATION								
STUDY	TYPE OF INTERVENTION	TYPE OF RECYCLING	PARTICIPANTS	OUTCOME MEASURE(S)	DURATION	EFFECTIVENESS DURING INTERVENTION	LONG-TERM EFFECTIVENESS	EFFECT SIZE
BERNSTAD (2014)	Informative leaflets	Drop-off	1632 households (two experimental conditions)	Amount of recyclables; contamination	10 mo	No significant differences in the outcome measures after the intervention	No (measured after 7 mo)	Hedge's g = -.043
BERNSTAD ET AL. (2013)	Door-stepping campaign	Drop-off	630 households (two experimental conditions)	Amount of recyclables; contamination; self-report	26 mo	No significant differences in the outcome measures after the intervention	No (measured after 18 mo)	Hedge's g = .132
BOWMAN ET AL. (1998)	Informative fliers	Curbside	1500 residents (two experimental conditions + control group)	Participation rate; amount of recyclables	5 mo	Participation: +3.9% Amount of recyclables: +.07 bag/household, wk	Participation: +5.6% Amount of recyclables: +.07 bag/household, wk (measured after 6 wk)	Hedge's g = .478
BUIL ET AL. (2014)	Informative campaign through SMS	Drop-off	432 adolescents	Self-report	2 wk (+ 3 preliminary focus group)	Better knowledge of recycling rules	Not measured	Not measured
BURN (1991)	Informative leaflets	Curbside	213 households (two experimental conditions)	Participation rate	18 wk	Participation rate: +8% with respect to control group	Participation rate: +8% with respect to control group (measured after 10 wk)	Hedge's g = .649
CHASE ET AL. (2009)	Communication campaign	Not specified	258 college students and community members	Self-report	1 mo	Increased self-reported recycling behavior +88.4% self-reported awareness	Not measured	Not measured

PROMPTS AND INFORMATION								
STUDY	TYPE OF INTERVENTION	TYPE OF RECYCLING	PARTICIPANTS	OUTCOME MEASURE(S)	DURATION	EFFECTIVENESS DURING INTERVENTION	LONG-TERM EFFECTIVENESS	EFFECT SIZE
CHONG ET AL. (2014)	Persuasive leaflets (different types of messages)	Curbside	5250 non-recyclers (two experimental conditions + control group)	Participation rate; amount of recyclables	1 mo	No significant differences in the outcome measures after the intervention	Not measured	Not measured
CHONG ET AL. (2014)	SMS reminders	Curbside	5250 non-recyclers (two experimental conditions + control group)	Participation rate; amount of recyclables	1 mo	No significant differences in the outcome measures after the intervention	Not measured	Not measured
COTTERILL ET AL. (2009)	Door-stepping campaign (oral information)	Curbside	6580 households	Participation rate	15 wk	+5.4% (compared to control group)	+1.7% (measured after 3 mo)	Hedge's g = .223
DAI ET AL. (2015)	Door-stepping campaign	Drop-off	986 households	Amount of recyclables; self-report	Approximately 2 wk	+12.5% No effect on knowledge of recycling consequences	+4.2 (measured after 1 year)	Hedge's g = .134
DUPRÉ (2014)	Informative brochure	Drop-off	111 students living in a university campus (three experimental conditions)	Self-report	Approximately 5 min	No significant differences in the outcome measure after the intervention	Not measured	Not measured
EBERL ET AL. (2009)	Informative campaign through the use of social networking sites	Drop-off	131 college students	Amount of recyclables; self-report	3 mo	+133 pound of recyclables collected	Not measured	Hedge's g = .279
GOLDENHAR & CONNELL (1991)	Informative posters	Drop-off	1619 students living in eight university halls (two experimental conditions)	Self-report	5 mo	No significant differences in the outcome measure after the intervention	Not measured	Not measured
GRODZINSKA-JURCZAK ET AL. (2006)	Door-stepping campaign	Both curbside and drop-off	687 households	Amount of recyclables	14 mo	+1.6 tons/mo	+11.5 tons/mo (measured after 1 year)	Hedge's g = .179
HOPPER & NIELSEN (1991)	Informative fliers	Curbside	167 residents (three experimental conditions)	Participation rate; self-report	24 mo	+.55 out of a total of 7 recycling opportunities, with respect to control group	Not measured	Hedge's g = .450

PROMPTS AND INFORMATION								
STUDY	TYPE OF INTERVENTION	TYPE OF RECYCLING	PARTICIPANTS	OUTCOME MEASURE(S)	DURATION	EFFECTIVENESS DURING INTERVENTION	LONG-TERM EFFECTIVENESS	EFFECT SIZE
HOPPER & NIELSEN (1991)	Written prompts delivered before each scheduled pickup date	Curbside	167 residents (three experimental conditions)	Participation rate; self-report	24 mo	+1.31 out of a total of 7 recycling opportunities, with respect to control group	Not measured	Hedge's *g* = .808
IYER & KASHYAP (2007)	Information dissemination program (demonstrations + written brochures)	Drop-off	Approximately 1400 students living in two university halls (two experimental conditions)	Amount of recyclables; contamination; self-report	9 wk	Amount of recyclables: +65.49% No effects on contamination)	Amount of recyclables: +72.71% and +46.13% (measured after 2 and 4 wk)	Hedge's *g* = .055
LORD (1994)	Informative door-hangers	Curbside	140 households (two experimental conditions)	Amount of recyclables; self-report	Approximately 10 days	Amount of recyclables: +3.93/wk More favorable attitudes toward recycling	Not measured	Hedge's *g* = .341
MEE (2005)	Marketing communications campaign	Curbside	46.000 residents	Amount of recyclables	Not specified	+17%	+37,3% (measured after 3 years)	Hedge's *g* = .919
MORELAND & MELSOP (2014)	Informative posters	Drop-off	400 students living in a residence hall (four experimental conditions)	Amount of recyclables; contamination; self-report	1 mo + 1mo preliminary ethnographic data collection	Amount of recyclables: no significant change Contamination: 82% sorting accuracy	Not measured	Hedge's *g* = .221
READ (1999)	Informative door-to-door campaign	Residential recycling behavior	Approximately 78.600 households	Amount of recyclables	18 mo	---	+19% (measured after 18 mo)	Hedge's *g* = .014
RHODES ET AL. (2014)	Informative brochures	Drop-off	176 householders	Self-report	8 wk	Self-reported recycling increased significantly from baseline to four weeks	No (measured after 8 wk)	Not measured
SCHULTZ G. (2011)	Persuasive posters + online information	Drop-off	Approximately 960 students living in four residence halls (experimental condition + control group)	Amount of recyclables	Approximately 10 wk	No significant differences in the outcome measure between experimental and control group after the intervention	Not measured	Hedge's *g* = -.016

PROMPTS AND INFORMATION								
STUDY	TYPE OF INTERVENTION	TYPE OF RECYCLING	PARTICIPANTS	OUTCOME MEASURE(S)	DURATION	EFFECTIVENESS DURING INTERVENTION	LONG-TERM EFFECTIVENESS	EFFECT SIZE
SCHULTZ P. W. (1999)	Plea and informative door-hangers	Curbside	605 residents of single-family dwellings (four experimental conditions + control group)	Amount of recyclables; participation rate; contaminatio n	4 mo	No significant differences in the outcome measures after the intervention	No (measured after 1 mo)	Hedge's *g* = .070
TIMLETT & WILLIAMS (2008)	Door-stepping campaign	Curbside	Approximate ly 15.000 households (three experimental conditions)	Participation rate; contaminatio n	18 wk	No significant differences in the outcome measures after the intervention	Not measured	Hedge's *g* = -.019
WHITE ET AL. (2011)	Informative door-hangers (loss/gain and why/how messages)	Curbside	390 households (four experimental conditions + control group)	Participation rate; amount of recyclables	Approximate ly 3 wk + follow up after 6 mo	Statistically significant difference in both the outcome measures after the interventions. Differences in effects due to different types of messages	Statistically significant difference with respect to baseline sustained over time (measured after 6 mo)	Hedge's *g* = .279
WILLMAN (2015)	Door-stepping campaign (oral + written information)	Curbside	260 households (two experimental conditions + control group)	Bin adoption; participation rate	2 mo	Bin adoption: +40 vs. +2 (control group) No differences on participation rate	Not measured	Hedge's *g* = .587

TABLE B.2. Feedback.

FEEDBACK								
STUDY	TYPE OF INTERVENTION	TYPE OF RECYCLING	PARTICIPANTS	OUTCOME MEASURE(S)	DURATION	EFFECTIVENESS DURING INTERVENTION	LONG-TERM EFFECTIVENESS	EFFECT SIZE
BOWMAN, GOODWIN, JONES & WEAVER (1998)	Newsletters containing group feedback	Curbside	1500 residents (two experimental conditions + control group)	Participation rate; amount of recyclables	5 mo	Participation: +4.8% Amount of recyclables: +.08 bag/household, wk	Participation: +6.1% Amount of recyclables: +.09 bag/household, wk (measured after 6 wk)	Hedge's *g* = .569
DE LEON & FUQUA (1995)	Posted group feedback	Curbside	76 university households	Amount of recyclables	11 wk	+25.47%	Not measured	Hedge's *g* = .340
DE YOUNG ET AL. (1995)	Posted individual feedback	Drop-off	98 multi-family complexes (three experimental conditions)	Amount of recyclables; contamination	2 mo	Effect only with regard to contamination and only when complex size was taken into consideration	Not measured	Hedge's *g* = .412
DE YOUNG ET AL. (1995)	Posted group feedback	Drop-off	98 multi-family complexes (three experimental conditions)	Amount of recyclables; contamination	2 mo	Effect only with regard to contamination and only when complex size was taken into consideration	Not measured	Hedge's *g* = .441
GOLDENHAR & CONNELL (1991)	Public group feedback	Drop-off	1619 students living in eight university halls (two experimental conditions)	Self-report	5 mo	Statistically significant increase in self-reported recycling behavior	Not measured	Not measured
LYAS ET AL. (2004)	Posted group feedback	Curbside	680 households (two experimental conditions)	Participation rate; contamination; self-report	2 mo	No significant differences in the outcome measure after the intervention	Not measured	Hedge's *g* = .044
MILFORD ET AL. (2015)	Posted individual + group feedback (% of waste sorted)	Curbside	8981 households (two experimental conditions + control group)	Amount of recyclables	1 year + 1 year baseline	+2% with respect to control group	Not measured	Hedge's *g* = .135

FEEDBACK								
STUDY	TYPE OF INTERVENTION	TYPE OF RECYCLING	PARTICIPANTS	OUTCOME MEASURE(S)	DURATION	EFFECTIVENESS DURING INTERVENTION	LONG-TERM EFFECTIVENESS	EFFECT SIZE
MILFORD ET AL. (2015)	Posted individual + group feedback (amount of waste produced)	Curbside	8981 households (two experimental conditions + control group)	Amount of recyclables	1 year + 1 year baseline	+1.5% with respect to control group	Not measured	Hedge's *g* = .049
MORELAND & MELSOP (2014)	Online group feedback	Drop-off	400 students living in a residence hall (four experimental conditions)	Amount of recyclables; contamination; self-report	1 mo + 1mo preliminary ethnographic data collection	Amount of recyclables: no significant change Contamination: 76% sorting accuracy	Not measured	Hedge's *g* = .154
NOMURA ET AL. (2010)	Posted group feedback	Curbside	9082 households (experimental condition + control group)	Participation rate	6 wk	+2.8% compared to control group	Not measured	Hedge's *g* = .057
PERRIN & BURTON (1991)	Posted individual feedback	Curbside	145 households	Participation rate	Not specified	+7.9%	Not measured	Hedge's *g* = .177
SCHULTZ P. W. (1999)	Posted individual feedback	Curbside	605 residents of single-family dwellings (four experimental conditions + control group)	Amount of recyclables; participation rate; contamination	4 mo	Participation rate: + 7% compared to baseline; Amount of recyclables: statistically significant difference; No significant decrease in contamination level	Participation rate: +6% compared to baseline; Amount of recyclables: statistically significant difference; No significant decrease in contamination level (measured after 1 mo)	Hedge's *g* = .145
SCHULTZ P. W. (1999)	Posted group feedback	Curbside	605 residents of single-family dwellings (four experimental conditions + control group)	Amount of recyclables; participation rate; contamination	4 mo	Participation rate: + 4% compared to baseline; Amount of recyclables: statistically significant difference; No significant decrease in contamination level	Participation rate: +8% compared to baseline; Amount of recyclables: statistically significant difference; No significant decrease in contamination level (measured after 1 mo)	Hedge's *g* = .065

FEEDBACK								
STUDY	TYPE OF INTERVENTION	TYPE OF RECYCLING	PARTICIPANTS	OUTCOME MEASURE(S)	DURATION	EFFECTIVENESS DURING INTERVENTION	LONG-TERM EFFECTIVENESS	EFFECT SIZE
TIMLETT & WILLIAMS (2008)	Posted individual feedback	Curbside	Approximately 15.000 households (three experimental conditions)	Participation rate; contamination	18 wk	Effective only with regard to contamination, from 36.1 to 18.9%	Not measured	Hedge's g = .077

TABLE B.3. Commitment.

COMMITMENT								
STUDY	TYPE OF INTERVENTION	TYPE OF RECYCLING	PARTICIPANTS	OUTCOME MEASURE(S)	DURATION	EFFECTIVENESS DURING INTERVENTION	LONG-TERM EFFECTIVENESS	EFFECT SIZE
BRYCE ET AL. (1997)	Verbal individual commitment	Curbside	401 households (three experimental conditions + control group)	Participation rate; amount of recyclables	14 wk	Participation rate: +.72% wk out of a total of 12 wk	Not measured	Hedge's g = -.096
BRYCE ET AL. (1997)	Financial individual commitment	Curbside	401 households (three experimental conditions + control group)	Participation rate; amount of recyclables	14 wk	No significant differences in the outcome measures after the intervention	Not measured	Hedge's g = -.480
BRYCE ET AL. (1997)	Verbal + financial individual commitment	Curbside	401 households (three experimental conditions + control group)	Participation rate; amount of recyclables	14 wk	No significant differences in the outcome measures after the intervention	Not measured	Hedge's g = -.090
COBERN ET AL. (1995)	Written individual commitment	Curbside	558 household (two experimental conditions)	Nr of grass bags	16 wk	-.012 (bags/wk with respect to control condition)	-.144 and -.110 (measured after 4 wk and again after 1 year)	Hedge's g = .157
DE LEON & FUQUA (1995)	Written public commitment	Curbside	76 university households (two experimental conditions)	Amount of recyclables	11 wk	No significant differences in the outcome measure after the intervention	Not measured	Hedge's g = .048

COMMITMENT								
STUDY	TYPE OF INTERVENTION	TYPE OF RECYCLING	PARTICIPANTS	OUTCOME MEASURE(S)	DURATION	EFFECTIVENESS DURING INTERVENTION	LONG-TERM EFFECTIVENESS	EFFECT SIZE
DE YOUNG ET AL. (1995)	Written individual commitment	Drop-off	98 multi-family complexes (three experimental conditions)	Amount of recyclables; contamination	2 mo	Effect only with regard to contamination and only when complex size was taken into consideration	Not measured	Hedge's *g* = .388
DUPRÉ (2014)	Written individual commitment	Drop-off	111 students living in a university campus (three experimental conditions)	Self-report	Approximately 5 min	Improved self-reported sorting frequency and quality	Not measured	Not measured
WANG & KATZEV (1990)	Written group commitment (study 1)	Drop-off	24 elderly residents of a retirement home	Participation rate	11 wk	+3.4 pounds/resident, wk	+3.2 pounds/resident, wk (measured after 1 mo)	Hedge's *g* = .622
WANG & KATZEV (1990)	Written group commitment (study 2)	Drop-off	87 college students living in 4 dormitory rooms (three conditions + control group)	Participation rate; amount of recyclables	7 wk	Participation rate: +39% Amount of recyclables: +2.68 pounds/person, wk with respect to control group	No (measured after approximately 5 wk)	Hedge's *g* = .519
WANG & KATZEV (1990)	Written individual commitment (study 2)	Drop-off	87 college students living in 4 dormitory rooms (three conditions + control group)	Participation rate; amount of recyclables	7 wk	Participation rate: +58% Amount of recyclables: +3.77 pounds/person, wk with respect to control group	Participation rate: +31% Amount of recyclables: +2.05 pounds/person, wk with respect to control group (measured after approximately 5 wk)	Hedge's *g* = .815
WERNER ET AL. (1995)	Written individual commitment	Curbside	309 households	Participation rate; self-report	Approximately 6 mo	---	Participation rate: 40% More favorable attitudes	Hedge's *g* = .380

TABLE B.4. Incentives.

INCENTIVES								
STUDY	TYPE OF INTERVENTION	TYPE OF RECYCLING	PARTICIPANTS	OUTCOME MEASURE(S)	DURATION	EFFECTIVENESS DURING INTERVENTION	LONG-TERM EFFECTIVENESS	EFFECT SIZE
BOONROD ET AL. (2015)	Community business incentives	Drop-off	2172 households	Amount of recyclables	1 mo	+51%	Not measured	Hedge's g = .093
BOONROD ET AL. (2015)	Economic incentives	Drop-off	2172 households	Amount of recyclables	1 mo	+58%	Not measured	Hedge's g = .080
DIAMOND & LOEWY (1991)	Probabilistic reward (lottery)	Drop-off	Students living in 4 university dormitories (three experimental conditions)	Participation rate; self-report	Approximately 2 wk	60% No correlation between attitudes change and recycling behavior	Not measured	Hedge's g = 1.112
DIAMOND & LOEWY (1991)	Certain reward (cash)	Drop-off	Students living in 4 university dormitories (three experimental conditions)	Participation rate; self-report	Approximately 2 wk	33.6% No correlation between attitudes change and recycling behavior	Not measured	Hedge's g = .677
DIAMOND & LOEWY (1991)	Group reward	Drop-off	Students living in 4 university dormitories (three experimental conditions)	Participation rate; self-report	Approximately 2 wk	31.6% No correlation between attitudes change and recycling behavior	Not measured	Hedge's g = .652
FULLERTON & KINNAMAN (1996)	Unit pricing	Curbside	75 households	Amount of recyclables	2 mo	+16%	Not measured	Hedge's g = .191
HARDER & WOODARD (2007)	Shop and leisure vouchers	Curbside	9444 households	Set out rate; participation rate	1 mo	Set out rates: 21.5% Participation rate: 21%	Not measured	Hedge's g = .057
IYER & KASHYAP (2007)	Non-monetary reward (invitation to a party)	Drop-off	Approximately 1400 students living in two university halls (two experimental conditions)	Amount of recyclables; contamination; self-report	9 wk	Amount of recyclables: +55.81% No effects on contamination	Amount of recyclables: +75.35% and +28.52% (measured after 2 and 4 wk)	Hedge's g = .102

INCENTIVES								
STUDY	TYPE OF INTERVENTION	TYPE OF RECYCLING	PARTICIPANTS	OUTCOME MEASURE(S)	DURATION	EFFECTIVENESS DURING INTERVENTION	LONG-TERM EFFECTIVENESS	EFFECT SIZE
MENESES & PALACIO (2003)	Gift	Not specified	246 householders (two experimental conditions)	Self-report	10 days	No significant differences in the outcome measures after the intervention	Not measured	Not measured
TIMLETT & WILLIAMS (2008)	Score + lottery (£25)	Curbside	Approximately 15.000 households (three experimental conditions)	Participation rate; contamination	18 wk	Effective both on participation rate, and on contamination (from 60.3 to 29.1%)	Not measured	Hedge's g = .148
WANG & KATZEV (1990)	Monetary incentive (discount coupons), distributed on the basis of the performance of the whole group (study 2)	Drop-off	87 college students living in 4 dormitory rooms (three conditions + control group)	Participation rate; amount of recyclables	7 wk	Participation rate: +45% Amount of recyclables: +1.43 pounds/person, wk with respect to control group	No (measured after approximately 5 wk)	Hedge's g = .545

TABLE B.5. Environmental alterations.

ENVIRONMENTAL ALTERATIONS								
STUDY	TYPE OF INTERVENTION	TYPE OF RECYCLING	PARTICIPANTS	OUTCOME MEASURE(S)	DURATION	EFFECTIVENESS DURING INTERVENTION	LONG-TERM EFFECTIVENESS	EFFECT SIZE
BOONROD ET AL. (2015)	Provision of public recycling bins for organic waste	Drop-off	2172 households	Amount of recyclables	1 mo	+19%	Not measured	Hedge's g = .064
CHONG ET AL. (2014)	Provision of personal recycling bins	Curbside	1785 residents (two experimental conditions + control group)	Participation rate; amount of recyclables	1 mo	Increase in both outcome measures after the intervention	Not measured	Not measured

ENVIRONMENTAL ALTERATIONS								
STUDY	TYPE OF INTERVENTION	TYPE OF RECYCLING	PARTICIPANTS	OUTCOME MEASURE(S)	DURATION	EFFECTIVENESS DURING INTERVENTION	LONG-TERM EFFECTIVENESS	EFFECT SIZE
LIN ET AL. (IN PRESS)	Colored bin with flowers designed on the cover	Drop-off	Residents in 6 buildings of Shanghai (two experimental conditions + control group)	Amount of recyclables	1 mo	Amount of recyclables: +.25 capture rate with respect to control group	Not measured	Hedge's g = 2.079
ROUSTA ET AL. (2015)	Shorter distance to the waste collection point	Drop-off	447 residents (experimental condition + control group)	Contamination	Approximately 2 wk	Miss-sorted packaging: 30%	Not measured	Hedge's g = .122

TABLE B.6. Social modeling.

SOCIAL MODELING								
STUDY	TYPE OF INTERVENTION	TYPE OF RECYCLING	PARTICIPANTS	OUTCOME MEASURE(S)	DURATION	EFFECTIVENESS DURING INTERVENTION	LONG-TERM EFFECTIVENESS	EFFECT SIZE
BURN (1991)	Neighboring block leaders	Curbside	213 households (two experimental conditions)	Participation rate	18 wk	Participation rate: +23% with respect to control group	Participation rate: +25% with respect to control group (measured after 10 wk)	Hedge's g = 1.330
DUPRÉ (2014)	Neighboring block leaders	Drop-off	111 students living in a university campus (three experimental conditions)	Self-report	Approximately 5 min	Improved self-reported sorting frequency and quality	Not measured	Not measured
HOPPER & NIELSEN (1991)	Neighboring block leaders	Curbside	167 residents (three experimental conditions)	Participation rate; self-report	24 mo	+1.78 out of a total of 7 recycling opportunities, with respect to control group	Not measured	Hedge's g = .933

SOCIAL MODELING								
STUDY	TYPE OF INTERVENTION	TYPE OF RECYCLING	PARTICIPANTS	OUTCOME MEASURE(S)	DURATION	EFFECTIVENESS DURING INTERVENTION	LONG-TERM EFFECTIVENESS	EFFECT SIZE
LIN ET AL. (IN PRESS)	Volunteer advisers standing beside the communal food waste bin	Drop-off	Residents in 6 buildings of Shanghai (two experimental conditions + control group)	Amount of recyclables	1 mo	Amount of recyclables: +.27 capture rate with respect to control group	Not measured	Hedge's g = 2.363
MADDOX ET AL. (2011)	Educational school-based campaign (children as social models to change their parents lifestyle)	Curbside	129 children and their families	Amount of recyclables; participation rate; self-report	3 wk + 1 year baseline measurements before the intervention and 1 year follow-up measurements after it	---	Participation rate +8.6% Amount of paper collected: +4.3% Collected cans, glass and textile +8.7% Residual waste: -4.5%. Increase in the children's and their families' knowledge about recycling (measured for a year after the intervention)	Hedge's g = .629
MORELAND & MELSOP (2014)	Diffusion of recycling practices through social influence	Drop-off	400 students living in a residence hall (four experimental conditions)	Amount of recyclables; contamination; self-report	1 mo + 1mo preliminary ethnographic data collection	Amount of recyclables: no significant change Contamination: 85% sorting accuracy	Not measured	Hedge's g = .439

TABLE B.7. Combined interventions.

COMBINED INTERVENTIONS								
STUDY	TYPE OF INTERVENTION	TYPE OF RECYCLING	PARTICIPANTS	OUTCOME MEASURE(S)	DURATION	EFFECTIVENESS DURING INTERVENTION	LONG-TERM EFFECTIVENESS	EFFECT SIZE
BERNSTAD (2014)	Installation of home equipment for sorting food waste	Drop-off	1632 households (two experimental conditions)	Amount of recyclables; contamination	10 mo	Amount of recyclables: +.33 kg/household, wk	Amount of recyclables: +.30 kg/household, wk (measured after 7 mo)	Hedge's *g* = .141
BOONROD ET AL. (2015)	Educational campaign + provision of personal recycling bins + non-economic rewards	Drop-off	2172 households	Amount of recyclables	1 mo	+36%	Not measured	Hedge's *g* = .108
CHONG ET AL. (2014)	Provision of personal recycling bins + informative stickers	Curbside	1785 residents (two experimental conditions + control group)	Participation rate; amount of recyclables	1 mo	Increase in both outcome measures after the intervention	Not measured	Not measured
COBERN ET AL. (1995)	Written individual commitment + neighboring block leaders	Curbside	558 household (two experimental conditions)	Nr of grass bags	16 wk	-.200 (bags/wk with respect to control condition)	-.319 and -.241 (measured after 4 wk and again after 1 year)	Hedge's *g* = .532
DE LEON & FUQUA (1995)	Written public commitment + posted group feedback	Curbside	76 university households (two experimental conditions)	Amount of recyclables	11 wk	+40%	Not measured	Hedge's g = .542
MENESES & PALACIO (2003)	Written individual commitment + social modelling (neighboring block leaders)	Not specified	246 householders (two experimental conditions)	Self-report	10 days	No significant differences in the outcome measures after the intervention	Not measured	Not measured
MORELAND & MELSOP (2014)	Provision of new public recycling bins + instructional posters	Drop-off	400 students living in a residence hall (four experimental conditions)	Amount of recyclables; contamination; self-report	1 mo + 1mo preliminary ethnographic data collection	Amount of recyclables: no significant change Contamination: 76% sorting accuracy	Not measured	Hedge's *g* = .379
ROUSTA ET AL. (2015)	Provision of new bins with stickers reporting sorting instructions	Drop-off	447 residents (experimental condition + control group)	Contamination	Approximately 2 wk	Miss-sorted packaging: 70%	Not measured	Hedge's *g* = .107

APPENDIX C.

ONLINE SURVEY

E tu, quanto ne sai?

Metti alla prova le tue conoscenze sulla raccolta differenziata: compila il questionario, è veloce e divertente!

Sfida i tuoi amici e familiari all'ultimo punto e col tuo contributo aiuta i ricercatori dell'Università di Padova a studiare questo fenomeno.

Informativa e consenso informato

Benvenuto!

L'obiettivo del presente studio è quello di esplorare le conoscenze delle persone in materia di raccolta differenziata. Il tuo compito consisterà nel rispondere a tutte le domande presenti nel questionario. La compilazione richiederà circa 20 minuti. Al termine del questionario riceverai il punteggio totalizzato e l'indicazione delle risposte corrette e sbagliate.

Tieni conto che è necessario completare il questionario in un'unica sessione (il sistema non permette di salvare una bozza, effettuare il logout e riaccedere più tardi al questionario parzialmente compilato). È tuo diritto interrompere la compilazione in qualsiasi momento, senza fornire alcuna motivazione né subire penalità; questo tuttavia equivarrà a rinunciare a partecipare a questa ricerca e comporterà il non utilizzo dei dati raccolti.

Lo studio è condotto da HTLab (Dipartimento di Psicologia Generale - Università degli Studi di Padova), sotto la responsabilità della Dr.ssa Alessandra Varotto (alessandra.varotto.3@phd.unipd.it). I dati saranno raccolti in forma anonima e verranno utilizzati in maniera aggregata per soli scopi di ricerca, in conformità alla legislazione italiana vigente in materia di privacy (D.Lgs. 196/2003). Il tuo indirizzo email viene raccolto facoltativamente e serve solo per inviarti i risultati.

Selezionando "sì" acconsenti:

- a compilare il questionario secondo le modalità sopra descritte;
- all'utilizzo da parte di HTLab, per soli fini di ricerca, delle risposte anonime fornite al questionario.

Selezionare l'opzione "sì" se in accordo con quanto scritto sopra.
Selezionando l'opzione "no" si uscirà dal questionario.

☐ Sì
☐ No

Per iniziare… facci sapere qualcosa su di te!

NB: Ricordati di rispondere a tutte le domande! In caso di mancata risposta ad una o più domande, il sistema segnalerà le risposte mancanti evidenziandole in rosso, prima di permetterti di proseguire.

1.1. Come sei venuto a conoscenza di questo questionario?

☐ Facebook
☐ Sito web di un'associazione dei consumatori
☐ Sito web che tratta tematiche ambientali
☐ Altro - es.: durante una lezione universitaria, consiglio di amici, etc. (specificare) Fare clic qui per immettere testo.

1.2. Età (in anni compiuti)

Fare clic qui per immettere testo.

1.3. Genere

☐ F ☐ M

1.4. Nazionalità

Fare clic qui per immettere testo.

1.5. Comune di residenza

Fare clic qui per immettere testo.

1.6. Titolo di studio

☐ Licenza elementare
☐ Licenza media
☐ Diploma di scuola superiore
☐ Laurea
☐ Specializzazione post-laurea (master, dottorato di ricerca, etc.)

1.7. Occupazione

☐ Lavoratore
☐ Studente
☐ Inoccupato
☐ Pensionato
☐ Altro (specificare) Fare clic qui per immettere testo.

1.8. Sei membro di una o più associazioni ambientaliste?

Se sì, specificare quale(i). In caso negativo, scrivere "no" nella casella sottostante.

Fare clic qui per immettere testo.

1.9. Fai la raccolta differenziata dei rifiuti?

Rispondere sì se differenzi abitualmente almeno un materiale.

☐ Sì

☐ No

1.10. Se hai risposto no, puoi indicare i motivi per cui non fai la raccolta differenziata dei rifiuti?

È possibile selezionare al massimo 3 risposte.

☐ Nel mio comune di residenza non è presente un sistema di raccolta differenziata

☐ Nel mio comune di residenza la raccolta differenziata non è organizzata bene

☐ Ritengo che fare la raccolta differenziata sia inutile

☐ Ritengo che fare la raccolta differenziata sia complicato

☐ Ritengo che fare la raccolta differenziata faccia perdere troppo tempo

☐ Non ho lo spazio sufficiente in casa

☐ Ritengo di non avere informazioni sufficienti

☐ Altro (specificare) Fare clic qui per immettere testo.

1.11. Se hai risposto sì, puoi indicare i motivi per cui fai la raccolta differenziata?

È possibile selezionare al massimo 3 risposte.

☐ Ritengo che fare la raccolta differenziata permetta di conservare energia e risorse naturali

☐ Ritengo che fare la raccolta differenziata permetta di ridurre l'utilizzo delle discariche

☐ Ritengo che fare la raccolta differenziata permetta di salvaguardare l'ambiente

☐ Ritengo che fare la raccolta differenziata abbia delle ricadute positive sulla mia comunità

☐ Fare la raccolta differenziata mi fa sentire bene

☐ Fare la raccolta differenziata mi permette di ottenere una riduzione sulla relativa tassa

☐ Ci sono delle sanzioni se non faccio la raccolta differenziata

☐ Altro (specificare) Fare clic qui per immettere testo.

1.12. Quali tipologie di rifiuti differenzi abitualmente?

È possibile selezionare tutte le opzioni pertinenti.

☐ Carta e cartone

☐ Vetro

☐ Plastica

☐ Metallo

☐ Rifiuti organici/umido (incluso compostaggio domestico)

1.13. In aggiunta a quelli elencati precedentemente, differenzi anche alcuni dei materiali seguenti?

È possibile selezionare tutte le opzioni pertinenti.

☐ Verde e ramaglie

☐ Tessili

☐ Pile usate

☐ Olii alimentari usati

☐ Farmaci scaduti

☐ Piccoli componenti elettrici o elettronici

☐ Tappi in plastica
☐ Tappi in sughero
☐ Imballi di legno
☐ Altro (specificare) Fare clic qui per immettere testo.
☐ Nessuna delle precedenti

1.14. Chi si occupa della raccolta differenziata in casa?

☐ Me ne occupo prevalentemente io
☐ È un compito condiviso in egual misura da tutti
☐ Se ne occupa prevalentemente qualcun altro

Ben fatto!
33% completo

Selezionare "continua" per proseguire con la compilazione del questionario.

E tu, quanto ne sai? Scoprilo completando il quiz!

Rispondi alle domande che seguono, indicando su una scala da 1 a 4 (dove 1 = completamente in disaccordo e 4 = completamente d'accordo) il tuo grado di accordo o disaccordo con ciascuna delle affermazioni proposte.

2.1. So quali sono i diversi oggetti e materiali accettati per la raccolta differenziata nella mia città.

completamente in disaccordo	in disaccordo	d'accordo	completamente d'accordo
1	2	3	4
☐	☐	☐	☐

2.2. So quali sono le operazioni da compiere per preparare adeguatamente i prodotti per la raccolta differenziata.

completamente in disaccordo	in disaccordo	d'accordo	completamente d'accordo
1	2	3	4
☐	☐	☐	☐

2.3. So che cosa succede ai materiali che vengono raccolti con la raccolta differenziata.

completamente in disaccordo	in disaccordo	d'accordo	completamente d'accordo
1	2	3	4
☐	☐	☐	☐

Di seguito ti verranno mostrate delle immagini che illustrano alcuni oggetti da conferire nei rifiuti. Ti chiediamo di indicare, per ogni oggetto, in che bidone deve essere differenziato fra quelli elencati.

2.4. Bottiglietta di acqua

In quale bidone deve essere conferito questo oggetto?

Carta	Vetro	Plastica	Metallo	Organico	Indifferenziato
☐	☐	☐	☐	☐	☐

2.5. Scatoletta di tonno

In quale bidone deve essere conferito questo oggetto?

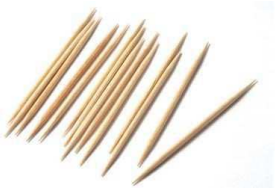
Carta	Vetro	Plastica	Metallo	Organico	Indifferenziato
☐	☐	☐	☐	☐	☐

2.6. Tovagliolo usato

In quale bidone deve essere conferito questo oggetto?

Carta	Vetro	Plastica	Metallo	Organico	Indifferenziato
☐	☐	☐	☐	☐	☐

2.7. Stuzzicadenti



In quale bidone deve essere conferito questo oggetto?

Carta	Vetro	Plastica	Metallo	Organico	Indifferenziato
☐	☐	☐	☐	☐	☐

2.8. Rivista patinata

In quale bidone deve essere conferito questo oggetto?

Carta	Vetro	Plastica	Metallo	Organico	Indifferenziato
☐	☐	☐	☐	☐	☐

2.9. Bicchiere rotto

In quale bidone deve essere conferito questo oggetto?

Carta	Vetro	Plastica	Metallo	Organico	Indifferenziato
☐	☐	☐	☐	☐	☐

2.10. Tubetto di dentifricio

In quale bidone deve essere conferito questo oggetto?

Carta	Vetro	Plastica	Metallo	Organico	Indifferenziato
☐	☐	☐	☐	☐	☐

2.11. Penna biro

In quale bidone deve essere conferito questo oggetto?

Carta	Vetro	Plastica	Metallo	Organico	Indifferenziato
☐	☐	☐	☐	☐	☐

2.12. Confezione di panna da cucina

In quale bidone deve essere conferito questo oggetto?

Carta	Vetro	Plastica	Metallo	Organico	Indifferenziato
☐	☐	☐	☐	☐	☐

2.13. Bucce di mandarino

In quale bidone deve essere conferito questo oggetto?

Carta	Vetro	Plastica	Metallo	Organico	Indifferenziato
☐	☐	☐	☐	☐	☐

2.14. Scontrino

In quale bidone deve essere conferito questo oggetto?

Carta	Vetro	Plastica	Metallo	Organico	Indifferenziato
☐	☐	☐	☐	☐	☐

2.15. Imballo di merendina

In quale bidone deve essere conferito questo oggetto?

Carta	Vetro	Plastica	Metallo	Organico	Indifferenziato
☐	☐	☐	☐	☐	☐

2.16. Bottiglia di vino

In quale bidone deve essere conferito questo oggetto?

Carta	Vetro	Plastica	Metallo	Organico	Indifferenziato
☐	☐	☐	☐	☐	☐

2.17. Tappo a corona

In quale bidone deve essere conferito questo oggetto?

Carta	Vetro	Plastica	Metallo	Organico	Indifferenziato
☐	☐	☐	☐	☐	☐

Selezionare "continua" per proseguire con la compilazione del questionario.

Cosa ne pensi? Dacci la tua opinione, per noi è importante!

Rispondi alle domande che seguono nella maniera più accurata e completa possibile.

3.1 Cosa pensi che succeda ai materiali che vengono raccolti con la raccolta differenziata?

Fare clic qui per immettere testo.

3.2 Secondo te, su chi ricadono i benefici della raccolta differenziata?

Fare clic qui per immettere testo.

Ti chiediamo infine di osservare attentamente i 25 oggetti illustrati nella figura qui sotto, e di rispondere alle domande proposte.

4.1. Secondo te, quali di questi oggetti da buttare hanno ancora un valore, e perché?

Indica 3 oggetti, e specifica brevemente per ognuno il perché della tua scelta.

Oggetto: Fare clic qui per immettere testo. **Perché ha valore?** Fare clic qui per immettere testo.

Oggetto: Fare clic qui per immettere testo. **Perché ha valore?** Fare clic qui per immettere testo.

Oggetto: Fare clic qui per immettere testo. **Perché ha valore?** Fare clic qui per immettere testo.

4.2. Secondo te, quali di questi oggetti da buttare al contrario NON hanno più un valore, e perché?

Indica 3 oggetti, e specifica brevemente per ognuno il perché della tua scelta.

Oggetto: Fare clic qui per immettere testo. **Perché NON ha valore?** Fare clic qui per immettere testo.

Oggetto: Fare clic qui per immettere testo. **Perché NON ha valore?** Fare clic qui per immettere testo.

Oggetto: Fare clic qui per immettere testo. **Perché NON ha valore?** Fare clic qui per immettere testo.

Selezionare "continua" per terminare la compilazione del questionario.

Per conoscere i tuoi risultati al quiz, ti preghiamo di immettere di seguito le informazioni per contattarti. Al termine del questionario, il sistema ti invierà automaticamente un'email contenente il punteggio totalizzato e l'indicazione delle risposte corrette e sbagliate. Non useremo la tua email per nessun altro motivo.

Se non sei interessato a conoscere i tuoi risultati, non compilare il campo sottostante e seleziona "fine" per uscire dal questionario.

Inserisci qui il tuo indirizzo email per ricevere i tuoi risultati al quiz: Fare clic qui per immettere testo.

APPENDIX D.

DETAIL OF THE ONLINE SURVEY'S RESULTS

TABLE D.1. Profile of the clusters.

	Total	Cluster 1 (GROUP A) *n* = 264	Cluster 2 (GROUP B) *n* = 397	Cluster 3 (GROUP C) *n* = 465	Test statistic
GENDER					
Female	63.9%	65.2%	66.0%	61.5%	χ^2 (2) = 2.03, n.s.
Male	36.1%	34.8%	34.0%	38.5%	
AGE					
<=24	21.9%	28.8%	23.7%	16.6%	χ^2 (8) = 28.84, p < .01 Cramer's V = .11
25-39	33.5%	31.2%	36.5%	32.7%	
40-54	26.7%	20.3%	24.5%	35.3%	
55-69	14.6%	15.8%	14.5%	13.5%	
>=70	2.3%	3.9%	0.8%	1.9%	
EDUCATION					
Primary school	0.2%	0.4%	0.3%	0.0%	χ^2 (8) = 13.48, p = .04 Cramer's V = .06
Middle school	7.5%	8.0%	7.1%	7.5%	
High school	40.5%	46.2%	39.8%	37.8%	
Univ. degree	41.4%	36.4%	43.3%	42.9%	
Higher degree	10.4%	9.0%	9.5%	11.8%	
EMPLOYMENT STATUS					
Employed	53.8%	48.5%	52.8%	57.4%	χ^2 (8) = 18.01, p = .02 Cramer's V = .09
Unemployed	12.5%	10.2%	12.1%	14.2%	
Student	25.0%	29.9%	28.0%	19.8%	
Retired	6.1%	8.7%	4.7%	5.8%	
Other	2.6%	2.7%	2.4%	2.8%	
BELONGING TO ENVIRONMENTAL GROUPS					
Yes	6.4%	9.2%	16.8%	11.7%	χ^2 (2) = 20.84, p < .01 Cramer's V = .14
No	93.6%	90.8%	83.2%	88.3%	
MOTIVATIONS					
To protect environment	36.7%	37.1%	35.9%	37.2%	χ^2 (6) = 20.17, p < .01 Cramer's V = .10
To protect human society/future generations	29%	26.9%	31.1%	29.0%	
To do one's duty	19.9%	8.0%	20.0%	31.8%	
To reduce fees/avoid fines	16.3%	34.0%	13.0%	2.0%	
PROCEDURAL KNOWLEDGE (14-ITEM SIMULATION TASK)					
M (SD) *out of a maximum of 14 points*	9.94 (±2.0)	7.21 (±1.0)	9.51 (±.50)	11.83 (±.90)	F (2,1105) = 2721.80, p < .01, η^2 = .91 group A vs B, p < .01 group A vs C, p < .01 group B vs C, p < .01

	Total	Cluster 1 (GROUP A) n = 264	Cluster 2 (GROUP B) n = 397	Cluster 3 (GROUP C) n = 465	Test statistic
KNOWLEDGE OF ITEMS COLLECTED FOR RECYCLING (SELF-REPORTED)					
Good	37.9%	29.6%	32.5%	47.1%	
Fair	54.3%	59.8%	58.0%	48.1%	χ^2 (6) = 36.85, p < .01
Poor	4.9%	7.6%	6.3%	2.2%	Cramer's V = .13
None	2.9%	3.0%	3.2%	2.6%	
KNOWLEDGE OF OPERATIONS TO PREPARE ITEMS FOR RECYCLING (SELF-REPORTED)					
Good	34.5%	27.3%	30.6%	41.7%	
Fair	54.3%	58.7%	54.6%	51.4%	χ^2 (6) = 28.70, p < .01
Poor	7.9%	9.8%	10.8%	4.5%	Cramer's V = .11
None	3.3%	4.2%	4.0%	2.4%	
KNOWLEDGE OF RECYCLING PROCESS (SELF-REPORTED)					
Good	12.5%	6.9%	10.6%	17.4%	
Fair	33.1%	29.9%	30.1%	37.4%	χ^2 (6) = 45.85, p < .01
Poor	38.2%	42.0%	38.2%	35.7%	Cramer's V = .14
None	16.2%	21.2%	21.1%	9.5%	
SKEPTICAL VIEW OF RECYCLING PROCESS					
Yes	24.8%	33.0%	24.5%	20.4%	χ^2 (2) = 14.18, p < .01
No	75.2%	67.0%	75.5%	79.6%	Cramer's V = .11

TABLE D.2. Procedural knowledge - sorting errors.

Percentages of correct answers for each item, reported for the entire sample as well as for each of the three clusters.

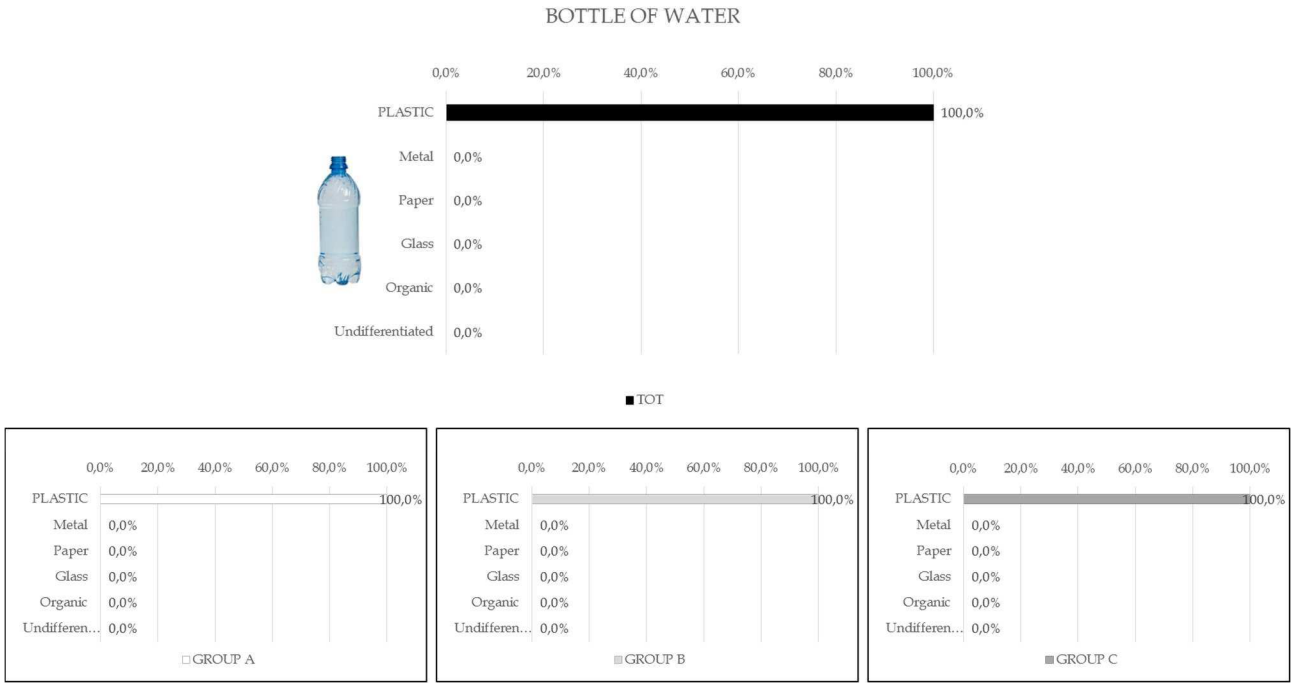
BOTTLE OF WATER			
	Correct (%)	**Wrong (%)**	**Pearson's Chi-square**
GROUP A	100.0%	0.0%	
GROUP B	100.0%	0.0%	-
GROUP C	100.0%	00%	
TOT	100.0%	0.0%	
SNACK PACKAGING			
	Correct (%)	**Wrong (%)**	**Pearson's Chi-square**
GROUP A	61.0%	39.0%	
GROUP B	79.4%	20.6%	χ^2 (2) = 89.28, p < .01
GROUP C	90.3%	9.7%	Cramer's V = .28
TOT	79.6%	20.4%	
TOOTHPASTE TUBE			
	Correct (%)	**Wrong (%)**	**Pearson's Chi-square**
GROUP A	17.4%	82.6%	
GROUP B	23.0%	77.0%	χ^2 (2) = 106.37, p < .01
GROUP C	49.9%	50.1%	Cramer's V = .31
TOT	32.9%	67.1%	

PEN			
	Correct (%)	**Wrong (%)**	**Pearson's Chi-square**
GROUP A	60.6%	39.4%	
GROUP B	76.0%	24.0%	χ^2 (2) = 91.20, p < .01
GROUP C	90.5%	9.5%	Cramer's V = .29
TOT	78.4%	21.6%	
TUNA CAN			
	Correct (%)	**Wrong (%)**	**Pearson's Chi-square**
GROUP A	85.2%	14.8%	
GROUP B	95.8%	4.2%	χ^2 (2) = 194.48, p < .01
GROUP C	99.6%	0.4%	Cramer's V = .42
TOT	94.9%	5.1%	
CROWN CAP			
	Correct (%)	**Wrong (%)**	**Pearson's Chi-square**
GROUP A	56.8%	43.2%	
GROUP B	81.0%	19.0%	χ^2 (2) = 144.85, p < .01
GROUP C	93.6%	6.4%	Cramer's V = .36
TOT	80.5%	19.5%	
WINE BOTTLE			
	Correct (%)	**Wrong (%)**	**Pearson's Chi-square**
GROUP A	100.0%	0.0%	
GROUP B	100.0%	0.0%	-
GROUP C	100.0%	0.0%	
TOT	100.0%	0.0%	
BROKEN GLASS			
	Correct (%)	**Wrong (%)**	**Pearson's Chi-square**
GROUP A	6.0%	94.0%	
GROUP B	12.1%	87.9%	χ^2 (2) = 129.17, p < .01
GROUP C	37.6%	62.4%	Cramer's V = .34
TOT	21.4%	78.6%	
GLOSSY MAGAZINE			
	Correct (%)	**Wrong (%)**	**Pearson's Chi-square**
GROUP A	50.4%	49.6%	
GROUP B	69.7%	30.3%	χ^2 (2) = 95.19, p < .01
GROUP C	84.3%	15.7%	Cramer's V = .29
TOT	%	%	
BRICK OF COOKING CREAM			
	Correct (%)	**Wrong (%)**	**Pearson's Chi-square**
GROUP A	35.2%	64.8%	
GROUP B	59.1%	40.9%	χ^2 (2) = 206.72, p < .01
GROUP C	86.9%	13.1%	Cramer's V = .43
TOT	65.1%	34.9%	
RECEIPT			
	Correct (%)	**Wrong (%)**	**Pearson's Chi-square**
GROUP A	38.6%	61.4%	
GROUP B	63.9%	36.1%	χ^2 (2) = 246.98, p < .01
GROUP C	92.9%	7.1%	Cramer's V = .47
TOT	70.0%	30.0%	

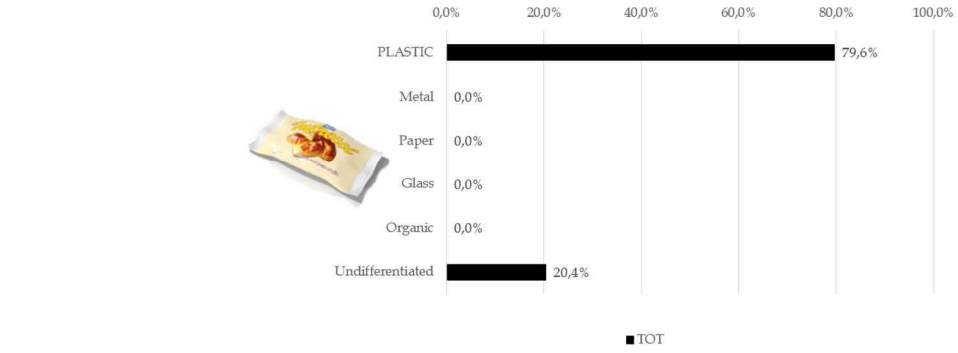
TANGERINE PEELS			
	Correct (%)	**Wrong (%)**	**Pearson's Chi-square**
GROUP A	94.0%	6.0%	
GROUP B	100.0%	0.0%	χ^2 (2) = 3.40, n.s.
GROUP C	99.8%	0.2%	
TOT	98.5%	1.5%	
TOOTHPICK			
	Correct (%)	**Wrong (%)**	**Pearson's Chi-square**
GROUP A	26.9%	73.1%	
GROUP B	56.5%	43.5%	χ^2 (2) = 210.06, p < .01
GROUP C	81.3%	18.7%	Cramer's V = .44
TOT	59.8%	40.2%	
USED NAPKIN			
	Correct (%)	**Wrong (%)**	**Pearson's Chi-square**
GROUP A	25.0%	75.0%	
GROUP B	51.5%	48.5%	χ^2 (2) = 233.96, p < .01
GROUP C	81.9%	18.1%	Cramer's V = .46
TOT	57.9%	42.1%	

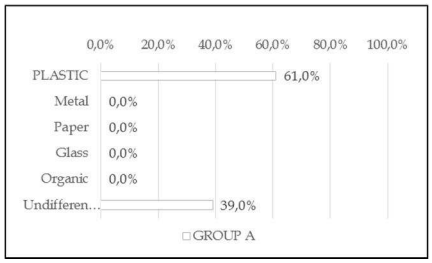
FIGURE D.1. Procedural knowledge - sorting errors.

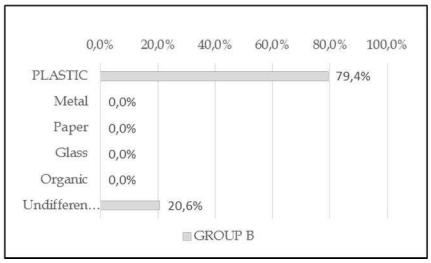
Detail of errors committed by respondents for each of the proposed items, reported for the entire sample as well as for each of the three clusters (option in capital letters corresponds to the correct one).

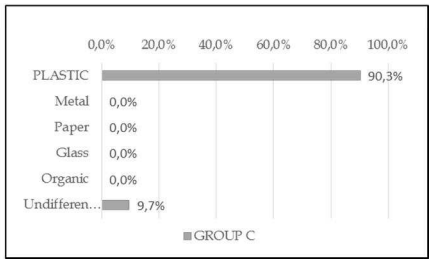


SNACK PACKAGING

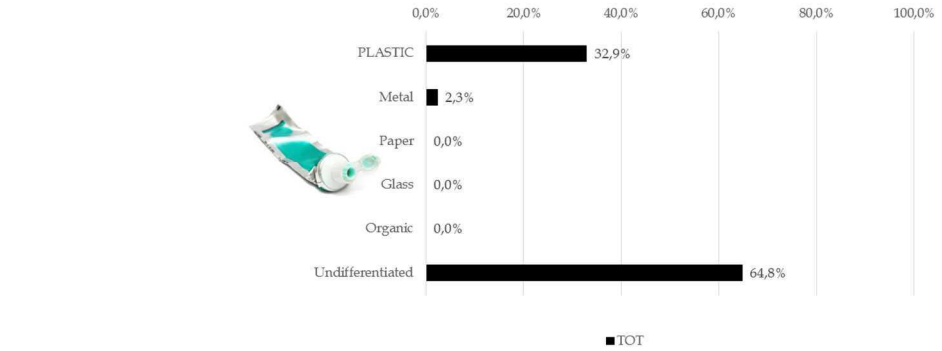


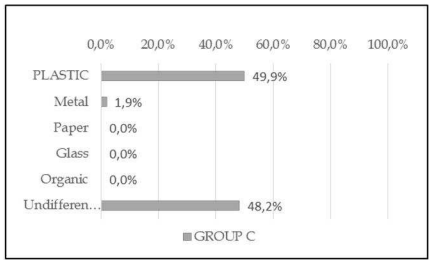




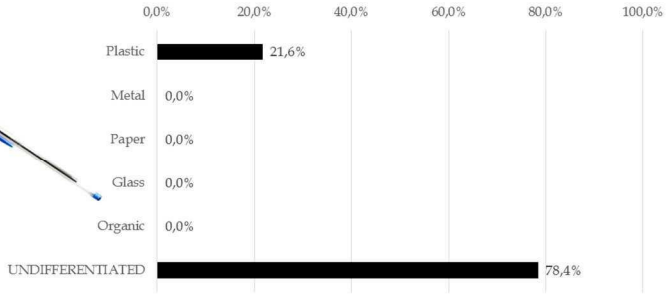


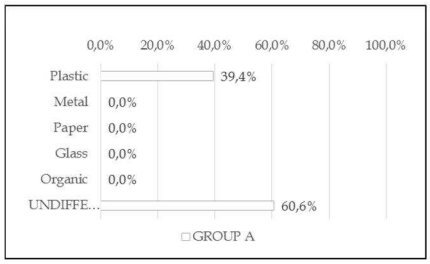
TOOTHPASTE TUBE



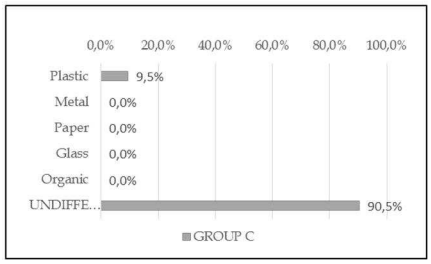


PEN


0,0%
20,0%
40,0%
60,0%
80,0%
100,0%
Plastic
21,6%
Metal
0,0%
Paper
0,0%
Glass
0,0%
Organic
0,0%
UNDIFFERENTIATED
78,4%
TOT


0,0%
20,0%
40,0%
60,0%
80,0%
100,0%
Plastic
39,4%
Metal
0,0%
Paper
0,0%
Glass
0,0%
Organic
0,0%
UNDIFFE…
60,6%
GROUP A


0,0%
20,0%
40,0%
60,0%
80,0%
100,0%
Plastic
24,0%
Metal
0,0%
Paper
0,0%
Glass
0,0%
Organic
0,0%
UNDIFFE…
76,0%
GROUP B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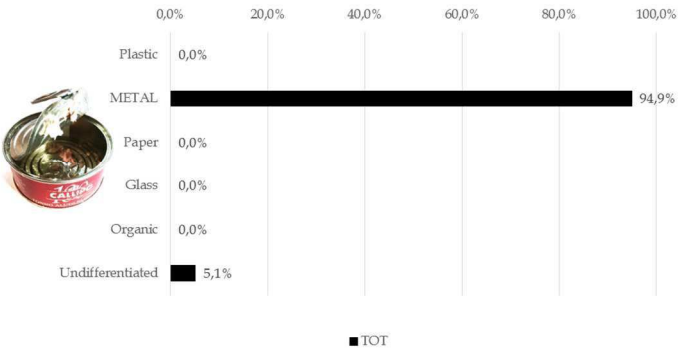
20,0%
40,0%
60,0%
80,0%
100,0%
Plastic
9,5%
Metal
0,0%
Paper
0,0%
Glass
0,0%
Organic
0,0%
UNDIFFE…
90,5%
GROUP C

TUNA CAN


0,0%
20,0%
40,0%
60,0%
80,0%
100,0%
Plastic
0,0%
METAL
94,9%
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Glass
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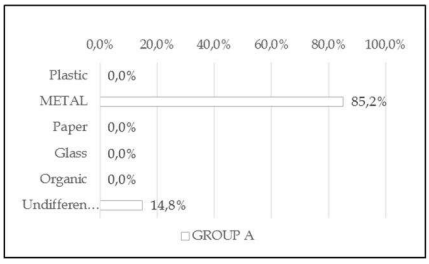
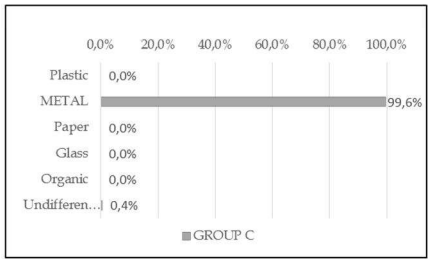
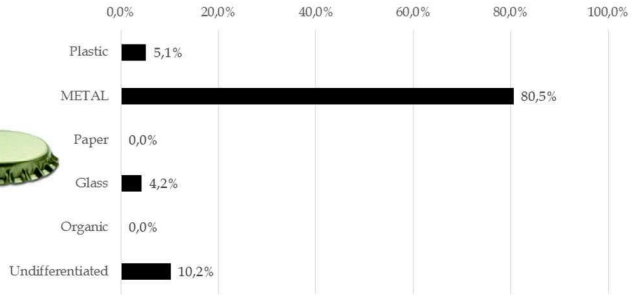
Organic
0,0%
Undifferentiated
5,1%
TOT

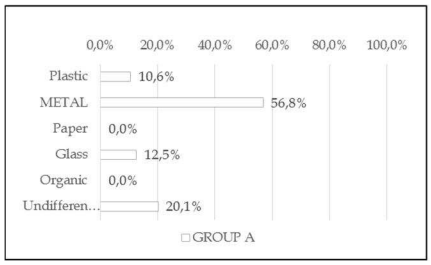

0,0%
20,0%
40,0%
60,0%
80,0%
100,0%
Plastic
0,0%
METAL
85,2%
Paper
0,0%
Glass
0,0%
Organic
0,0%
Undifferen…
14,8%
GROUP A

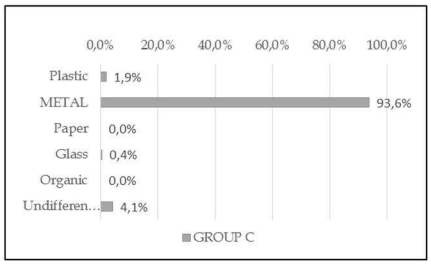

0,0%
20,0%
40,0%
60,0%
80,0%
100,0%
Plastic
0,0%
METAL
95,8%
Paper
0,0%
Glass
0,0%
Organic
0,0%
Undifferen…
4,2%
GROUP B


0,0%
20,0%
40,0%
60,0%
80,0%
100,0%
Plastic
0,0%
METAL
99,6%
Paper
0,0%
Glass
0,0%
Organic
0,0%
Undifferen…
0,4%
GROUP C

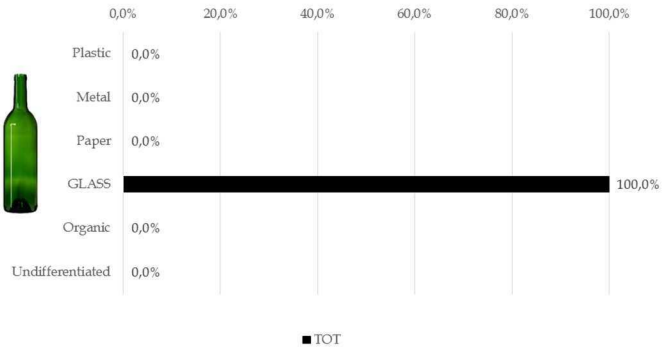
CROWN CAP

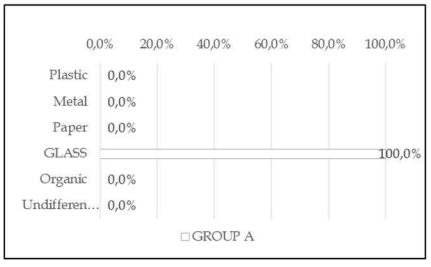


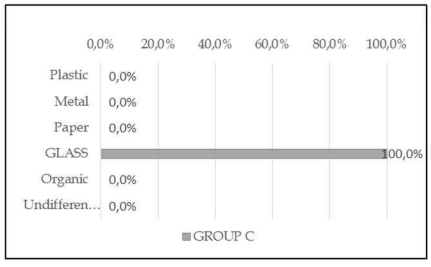




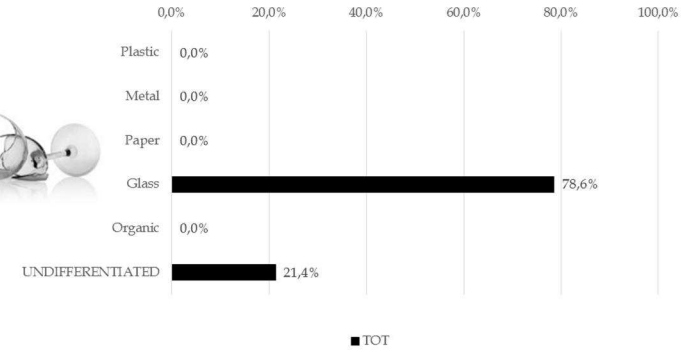
WINE BOTTLE

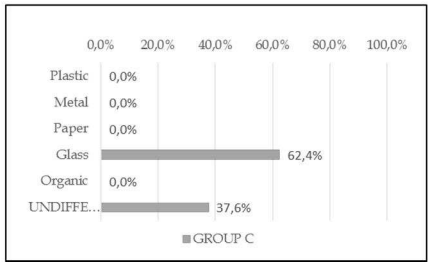




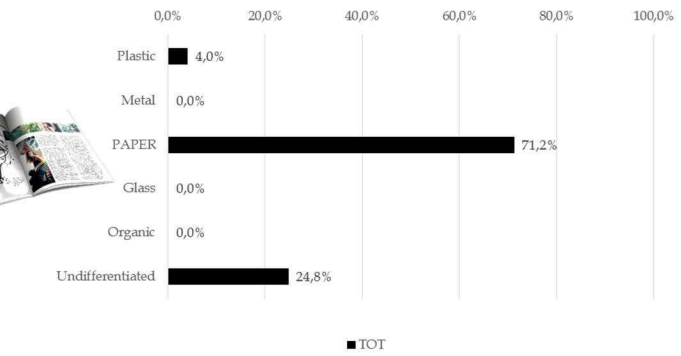


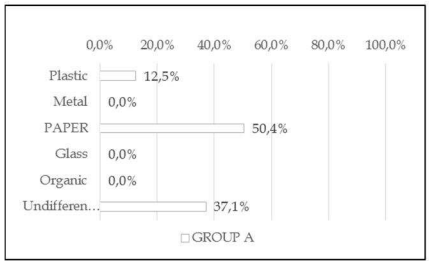
BROKEN GLASS

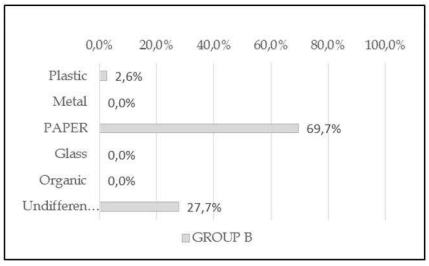


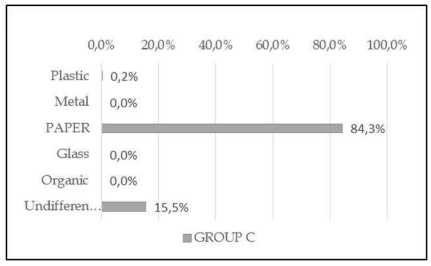


GLOSSY MAGAZINE

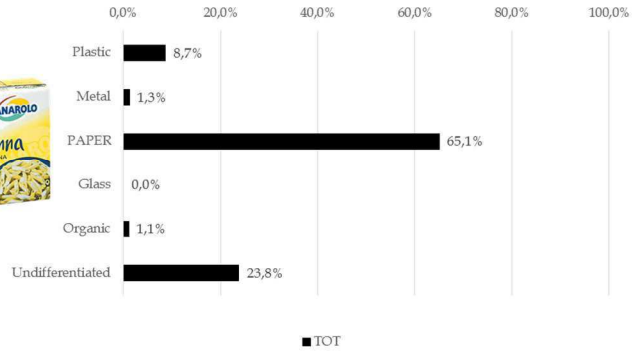


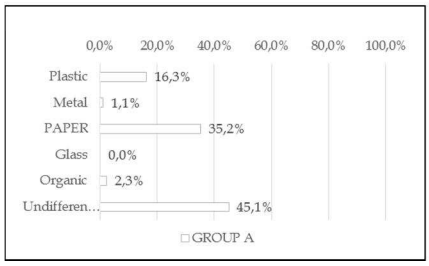


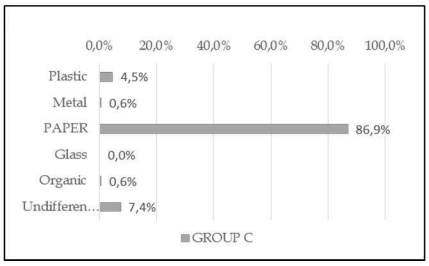




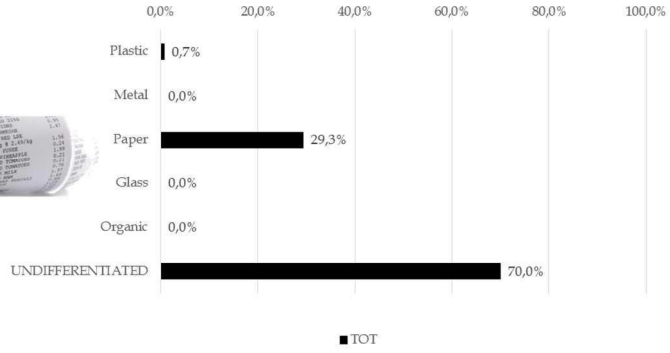
BRICK OF COOKING CREAM

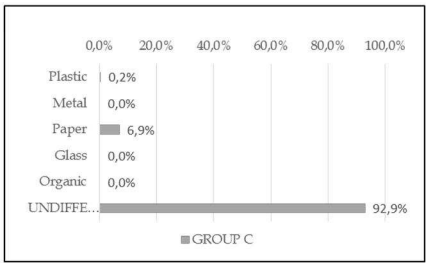




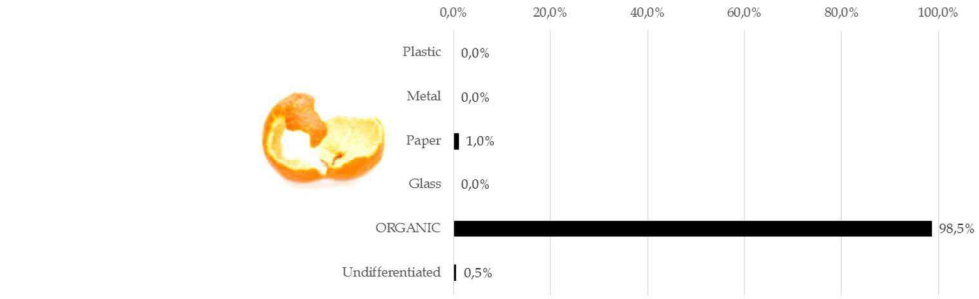


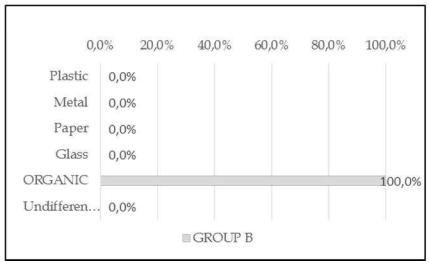
RECEIPT

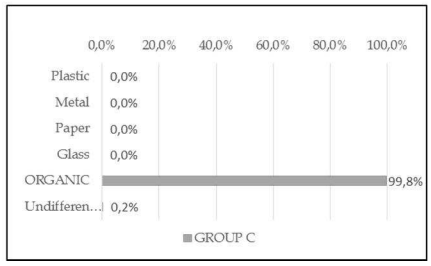




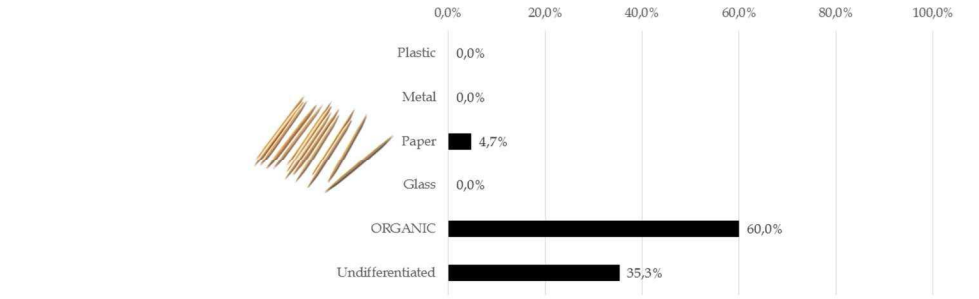
TANGERINE PEELS

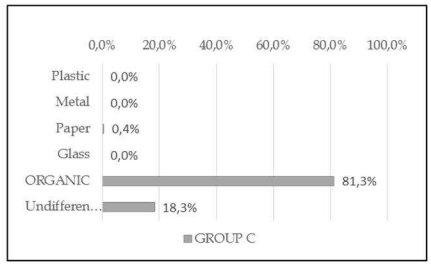






TOOTHPICK





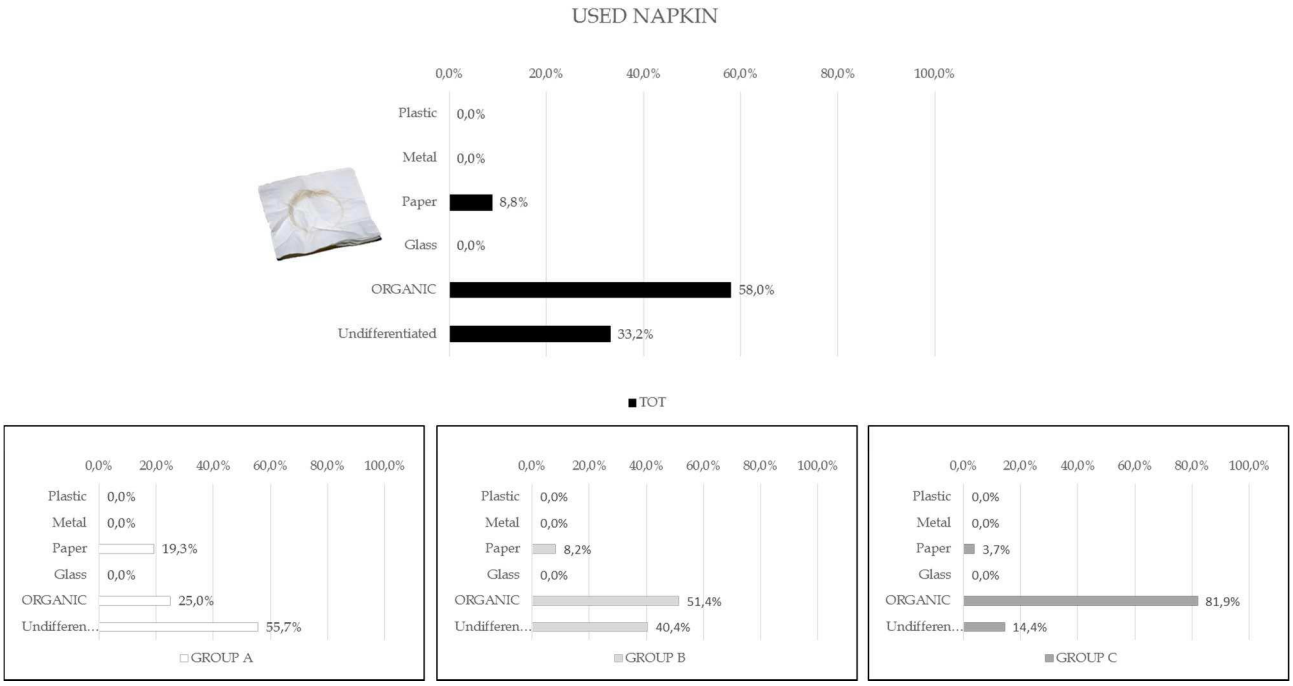

USED NAPKIN
0,0%
20,0%
40,0%
60,0%
80,0%
100,0%
Plastic
0,0%
Metal
0,0%
Paper
8,8%
Glass
0,0%
ORGANIC
58,0%
Undifferentiated
33,2%
TOT
Plastic
0,0%
Metal
0,0%
Paper
19,3%
Glass
0,0%
ORGANIC
25,0%
Undifferen…
55,7%
GROUP A
Plastic
0,0%
Metal
0,0%
Paper
8,2%
Glass
0,0%
ORGANIC
51,4%
Undifferen…
40,4%
GROUP B
Plastic
0,0%
Metal
0,0%
Paper
3,7%
Glass
0,0%
ORGANIC
81,9%
Undifferen…
14,4%
GROUP C

TABLE D.3. The value of waste - items.

Each cell corresponds to the difference between the percentage of respondents who indicated the item as still valuable and the percentage of those indicating it as valueless. Positive differences (i.e., a greater percentage of respondents indicated the object as still valuable) are reported in black. Negative ones (i.e., a greater percentage of respondents indicated the object as valueless) are reported in red. Data are reported for the entire sample as well as for each of the three clusters.

	% of respondents						
	WINE BOTTLE	USED CLOTHES	LEFTOVERS	CARTON	PLASTIC BOTTLE	TIN	WOODEN BOX
GROUP A	18.9%	12.4%	8.5%	9.0%	7.6%	3.2%	5.7%
GROUP B	19.4%	11.2%	10.0%	7.7%	7.4%	5.4%	6.1%
GROUP C	18.1%	10.5%	11.5%	8.8%	7.2%	7.3%	4.7%
TOT	18.8%	11.2%	10.2%	8.5%	7.3%	5.6%	5.4%
	% of respondents						
	NEWSPAPER	SHOPPING BAG	PLASTIC CAPS	BOTTLE WITH SPRAYER	BROKEN CELLPHONE	CORK	MILK CARTON
GROUP A	5.1%	4.2%	5.2%	2.5%	1.3%	0.4%	1.0%
GROUP B	4.1%	4.3%	4.3%	2.9%	2.3%	1.6%	0.6%
GROUP C	4.6%	4.0%	3.4%	2.9%	4.2%	1.8%	0.0%
TOT	4.6%	4.1%	4.1%	2.8%	2.2%	1.2%	0.5%
	% of respondents						
	STYROFOAM TRAY	BAG OF CHIPS	SNACK PACKAGING	DISPOSABLE DISH	TOOTHBRUSH	TOOTHPASTE TUBE	BROKEN UMBRELLA
GROUP A	2.4%	4.9%	5.6%	5.6%	3.5%	7.8%	6.9%
GROUP B	1.5%	4.0%	4.5%	5.4%	5.9%	7.1%	8.4%
GROUP C	1.3%	2.9%	3.2%	4.2%	7.7%	5.0%	9.8%
TOT	1.6%	3.7%	5.4%	4.9%	6.1%	6.4%	8.6%
	% of respondents						
	CD-ROM	USED BATTERIES	DISPOSABLE RAZOR	DIAPER			
GROUP A	5.2%	9.1%	10.0%	19.4%			
GROUP B	7.0%	10.1%	10.6%	21.1%			
GROUP C	12.1%	7.7%	12.9%	21.9%			
TOT	8.7%	8.9%	11.4%	21.1%			

TABLE D.4. The value of waste - motivations.

Percentages of respondents indicating each of the identified motivations as a reason why they assign (or not) a residual value to waste are reported for the entire sample, as well as for each of the three clusters.

RECYCLABLE			
	% of respondents indicating this reason	**% of respondents *NOT* indicating this reason**	**Pearson's Chi-square**
GROUP A	81.8%	12.2%	χ^2 (2) = 4.61, n.s.
GROUP B	83.1%	16.9%	
GROUP C	89.0%	11.0%	
TOT	85.3%	14.7%	
REUSABLE			
	% of respondents indicating this reason	**% of respondents *NOT* indicating this reason**	**Pearson's Chi-square**
GROUP A	76.9%	23.1%	χ^2 (2) = 2.81, n.s.
GROUP B	78.4%	21.6%	
GROUP C	73.5%	23.5%	
TOT	76.0%	24.0%	
A SOURCE OF POLLUTION			
	% of respondents indicating this reason	**% of respondents *NOT* indicating this reason**	**Pearson's Chi-square**
GROUP A	22.7%	77.3%	χ^2 (2) = 9.16, p = .01 Cramer's V = .09
GROUP B	24.3%	75.7%	
GROUP C	29.2%	70.8%	
TOT	26.0%	74.0%	
DIRTY			
	% of respondents indicating this reason	**% of respondents *NOT* indicating this reason**	**Pearson's Chi-square**
GROUP A	30.7%	69.3%	χ^2 (2) = 10.51, p < .01 Cramer's V = .10
GROUP B	26.1%	73.9%	
GROUP C	20.2%	79.8%	
TOT	24.7%	75.3%	

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