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## **The impact of communication and proximity on citizens' sustainable disposal of e-waste**

**Purpose** – This paper demonstrates how decision-makers can enhance citizens' sustainable e-waste disposal through bin proximity and ad hoc communication. Specifically, we discuss a 2-year research project in Northern Italy where we documented the number of products disposed sustainably in four towns.

**Design/methodology/approach** – The project involved five main groups of stakeholders: i) four municipalities, ii) one social purpose organization employing people with disabilities (i.e., Andromeda), iii) one provider of bins (i.e., PubliCittà), iv) another social purpose organization entity (i.e., Fondazione CRT) and v) the University of Portsmouth. After conducting three online pilot tests to confirm our expectations regarding enhancing citizens' sustainable e-waste disposal, we successfully implemented the field pilot program in a small municipality and three other towns. Finally, we measured our program's impact on citizens' actual recycling rate for the three target municipalities.

**Findings** – We found that the positioning of drop-off bins in such a way as to reduce their distance from as many households as possible, along with the use of communication that facilitates the understanding of information related to sustainable disposal schemes, can improve the citizens' sustainable disposal of e-waste. After the intervention, the sustainable disposal of exhausted batteries, toners, and electronics significantly improved in the three municipalities that adopted the disposal scheme (Saluggia, San Benigno Canavese, and Santhiá).

**Research limitation** – We believe it would be cautious to consider potential differences in recycling cultures and facilities before implementing the program in other countries.

**Practical implications** – Our contribution shows decision-makers how to design disposal schemes to enhance citizens' sustainable behavior effectively. We demonstrate how the thoughtful and responsible use of marketing levers can improve environmental sustainability and social development.

**Social implications** - This paper impacts society by changing citizens' disposal behavior, reducing harm to the environment and human wellbeing, and supporting the inclusion of disadvantaged people in sustainability-oriented programs.

**Originality** – The structured and equitable engagement of scholars with multiple stakeholders can lead to the co-creation of societal value and knowledge and improve the well-being of numerous stakeholders. The collaboration between academics and practitioners enables the definition of effective strategies by observing the actual disposal behavior of individuals (i.e., citizens). It offers a direct and measurable impact on society. The involvement of social purpose organizations reinforces the shared primary aim of achieving measurable social and environmental impact.

**Keywords:** sustainable disposal; social purpose organisation; e-waste; impact; citizen behaviour; social change

### **1. Background and impact to be achieved**

The 12<sup>th</sup> Sustainable Development Goal urges us to learn how to use and produce sustainably to minimize the harm we inflict on our planet. As part of this learning process, the sustainable management of chemicals and other heavy materials that can pollute soil and water and harm living organisms is a priority. In this sense, electronic waste, especially batteries, is a lingering issue (Gibbons, 2021). In fact, batteries contain heavy metals such as lead, mercury, cadmium, and nickel, which can seep into the soil and groundwater. The contamination of the soil changes its composition, harming micro-organisms, plants, and animals that rely on these plants for survival. Harmful substances in freshwater sources harm the health of people who ingest water supplied by such sources.

Lithium can also react and cause landfill fires that burn underground for years. This process releases toxic chemicals into the air, increasing the potential for human exposure (Mrozik et al., 2021). Once released, the pollutants precipitate the deterioration of air quality, leading to adverse consequences for human health, including neurological, developmental, and reproductive disorders, as well as potential carcinogenic effects. Inappropriate disposal of batteries and the resulting lack of effective recycling also accentuate the need to extract new resources. As the metals contained in batteries are often scarce, failure to reuse them exacerbates the depletion of finite resources. It amplifies the need for increased mining activities, with further environmental consequences. The improper management of e-waste has adverse implications in terms of occupational safety and labor issues as well. 80 percent of the e-waste generated in developed countries ends up being shipped - often illegally - for recycling to developing countries such as India or Ghana, which employ hazardous recycling methods, jeopardizing people's health and the environment (International Labour Office, 2012).

If, on the one side, the impact of e-waste can be detrimental to nature and humans, on the other one, the volume of units of obsolescent electronics continues to grow. E-waste is recently around 10.100 thousand tons per year in China and 6.900 thousand tons per year in the US. It accounts for approximately 54 million metric tons globally and is expected to increase further in the coming years (Statista, 2023). Given the significant risks these substances pose to ecosystems and human health, it is essential to appropriately collect and recycle the exhausted batteries - and other types of e-waste (Mossali et al., 2020). A significant example is the fires in dustcarts and waste-processing centers caused by the disposal of lithium batteries in general household bins - instead of recycling bins. UK authorities report that the incorrect disposal of lithium batteries causes around 700 fires every year in the UK (Gill & Stephens, 2022).

The new regulation adopted recently by the European Parliament and the Council, set to replace the old directive 2006/66/CE gradually, has highlighted the critical aspect of e-waste. The collection targets set out in the new regulation have been raised from the current 45% to 63% by 2027 and 73% by 2030. The new regulations also include an obligation to inform citizens (European Commission, 2023). This information for citizens is crucial because, with their involvement, waste collection is possible. In the case of batteries, citizens' awareness is even more critical, as collection points are located outside the household and require an additional effort from the citizens to collect and bring their exhausted batteries to the designated collection point. Therefore, citizens must fully understand the importance and necessity of waste collection.

This project has the dual objective of raising consumer awareness and increasing the recycling rate. We wanted to develop a battery recycling program that would provide citizens with adapted information about the potentially negative effects of e-waste and encourage them to participate actively in recycling. The aim was, therefore, to identify aspects that could influence citizens' understanding of the information and their willingness to take action. In this context, we have worked with several stakeholders to optimize battery collection and promote favorable disposal behaviors among citizens.

After a thoughtful review of the literature and a discussion with the involved stakeholders, we hypothesized that the proximity of drop-off bins and the use of metaphors in communication would affect citizens' sustainable disposal. We first tested these hypotheses in three online studies with varied respondent samples. Once we obtained these initial results, we contacted a Piedmont region (Italy) municipality to implement the program under real-life conditions. Italy has actively embraced battery recycling and has made substantial progress in achieving recycling targets. The country is often presented as a top-performing European country in terms of circular economy, with a high waste recycling rate (around 52% - EEA, 2022), including exhausted batteries. It has implemented several initiatives and measures to promote responsible battery disposal and recycling. Italy has transposed the 2006 EU Battery Directive into national law, establishing regulations that govern the batteries' collection, treatment, and recycling. Italy has also developed an advanced recycling infrastructure to process used batteries efficiently. The recycling facilities employ innovative technologies to recover valuable materials from batteries while ensuring the safe disposal of hazardous substances. In parallel, Italy has established a comprehensive network of collection points for exhausted batteries, including drop-off locations at retail stores, municipal collection centers, and dedicated collection entities. This widespread accessibility should facilitate the proper disposal and recycling of batteries nationwide.

To test our findings in the field, we contacted a pilot municipality that was the first stakeholder involved in the project (thereafter ‘pilot municipality’). An initial meeting was held with municipality officials to plan the strategies for achieving our goals. The municipality needed to send letters to citizens to inform them about installing new bins and encourage their use. We suggested this information would be more effective if presented illustratively, using metaphors that citizens could easily understand. We reasoned that the more the info used references to things that citizens could easily understand, the easier it would have been for them to process the information and the higher the impact it would have on their behavior. We also wanted to highlight the effect of proximity (vs. distance) from the collection points on the effectiveness of these messages and, therefore, citizens' disposal behavior. Consequently, we needed to gather information about the distance separating them from the collection point.

In partnership with the municipality, we developed two letters informing citizens about the installation of the bins. One presented the information metaphorically, while the other presented it numerically. Concretely, instead of saying ‘we pollute approximately 354.000.000 liters of water every year’ for the numerical format, the metaphorical letter stated that ‘we pollute the equivalent of 140 Olympic swimming pools every year’. We expected this approach to facilitate understanding quantities that are difficult to represent mentally and consequently foster sustainable disposal. To determine the distance between the bin and the place of residence, the letter was accompanied by a small bag with a unique code corresponding to the household, which citizens had to use to dispose of their batteries in the collection bin. The municipality sent the entire, and we were responsible for gathering the data and conducting the analysis. The results were close to expectations and encouraging. Based on these promising pilot results, three other municipalities (i.e., Saluggia, San Benigno Canavese, and Santhiá) decided to adopt the program and extend it to other types of e-waste: toners and electronics (i.e., all sorts of electronic waste such as electric plugs, appliances, and components). These different types of e-waste have the same recycling prerogatives as batteries: the recycling site is outside the home, so recycling them requires an extra effort for the citizen, who has to collect and bring them to the nearest bin. In terms of sustainable development, this type of waste also has similar requirements to batteries and, if not treated specifically, can have deleterious effects on soil and groundwater. This extension was thoughtful, highlighting the multiple applications of the developed program.

## **2. Strategic and structured approach to stakeholder engagement**

We employed the five-step approach by Taylor and Morris (2019) to initiate and sustain constructive relationships over time and create shared value with our stakeholders (see Figure 1).

### **Figure 1. The Five-Step Approach to Stakeholder Engagement**



*Engagement strategy.* The scope of our research was understanding and enhancing sustainable disposal behavior. We were interested in investigating how to improve the sustainable disposal of harmful products. To infuse ecological value into our research and test our hypotheses in the field to enhance the robustness and validity of our results (Van Heerde et al., 2021), we talked with a pilot municipality to understand more about trends in sustainable disposal. Given the shared interest in enhancing citizen sustainable disposal, we decided to work together on the project and involve additional stakeholders to design and implement our program. Our priority was to understand which factors could enhance citizen sustainable disposal and share the results with other municipalities to expand the positive impact on the environment to other areas. Although we planned to offer results with high external validity, our pilot program was implemented in the Piedmont region, which stands out for the interest and resources invested in facilitating the sustainable disposal of e-waste. Consistently, we planned to engage with stakeholders operating in this area proactively. The engagement was not a one-off but a continuous and iterative process.

*Stakeholders mapping.* This step was critical to understanding our key stakeholders, how they could contribute to the project, and how our collaboration could impact them. We employed three main criteria to identify our stakeholders: geographical proximity, expertise/resources, and purpose. Given that the field pilot program occurred in Piedmont, we decided to focus on stakeholders in this geographical area. This choice facilitated their engagement both in terms of knowledge and proximity.

Regarding the second criterion, we considered if the stakeholder had expertise or resources that could be helpful to the project. We listed the knowledge and the resources we needed, and we started to search for potential stakeholders through the Internet and personal connections. Regarding stakeholders' expertise, we needed i) one actor providing the urban bins and ii) one actor experienced in collecting and recycling the exhausted batteries. In terms of resources, we were looking for i) monetary resources to fund the program and ii) strategic resources to involve the citizens and communicate to them the new disposal scheme. Finally, we selected diverse groups of stakeholders with different needs but similar

visions. We wanted to maximize the benefits for the stakeholders and the actionable impact on the project simultaneously. A shared orientation toward environmental and social purposes was key to facilitating the co-creation of societal impact.

*Preparation and engagement.* Consistently with our criteria, we had five groups of key stakeholders involved in the project, two of which consisted of social purpose organizations (see Figure 1 for their main characteristics and role in the project).

**Table 1. Key characteristics of the five stakeholder groups and their role in the project**

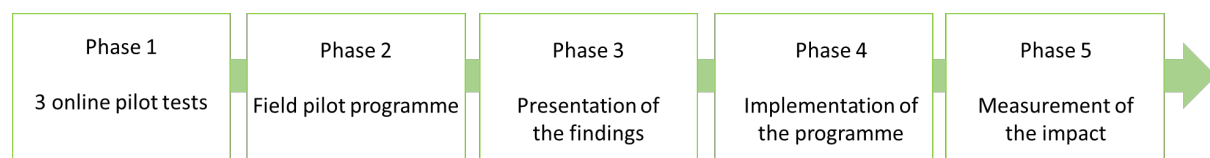
Stakeholder name	Stakeholder details	Main purpose	Role
Andromeda	Non-profit organisation, founded in 2002, 31% disadvantages employees, 18% disabled employees.	To employ disadvantaged people	To collect and recover the exhausted batteries
Fondazione CRT	Philanthropic entity, founded in 1991, it has granted more than €2 billion for over 42,000 projects	To support projects with societal impact	To provide financial resources
PubliCittà	Company, founded in 1982, it has 4 branches and has worked with 2.000 entities	To supply eco-friendly advertising services	To provide and install urban bins
University of Portsmouth	Public University, founded in 1992, 3.500 total staff	To create societal transformation through research	To provide financial resources and expertise
Saluggia, San Benigno Canavese, Santhiá, and the 'Pilot municipality'	Municipalities in Northern Italy, between 3.700 and 8.100 inhabitants	To enhance the sustainability of the territory	To offer strategic resources and implement the programme

Andromeda is a non-profit organization whose mission is the job placement of disadvantaged people. They pursue the promotion of human dignity and social and environmental sustainability. They do so through the integration and social inclusion of individuals in physical, mental, or economic-family disadvantaged situations and by creating ad hoc projects for job placement. For this project, Andromeda offered the collection and recovery of waste employing two disadvantaged people. Fondazione CRT is a philanthropic entity that supports projects that bring societal value to the territory. According to its mission, Fondazione CRT constantly engages in social entrepreneurship and assistance, protecting the environment and people, and training young and disadvantaged people. Each intervention area's programs and initiatives are consistently shaped per the '2030 Agenda', representing the basis for measuring their impact and building societal change. Fondazione CRT provided financial support to the project, given its primary environmental and social aims.

The University of Portsmouth also provided part of the funding to support the conduction of the preliminary studies. PubliCittà operates as a supplier of outdoor and indoor advertising services. It provided drop-off bins where to collect the exhausted batteries. The pilot municipality was included in the first stage of the project. The other three municipalities (i.e., San Benigno Canavese, Santhiá, and Saluggia) implemented the same scheme as the field pilot program. We employed three crucial principles in engaging with these key stakeholders. First, we took a *comprehensive approach* and ensured that all the engagement goals and expectations were focused, relevant, and realistic. This approach was essential to initiate a direct and unambiguous dialogue with stakeholders and ensure alignment and effective collaboration. Second, we worked to implement a *timely and iterative engagement* to ensure that stakeholders' perspectives and outcomes could inform the project's progress. Especially in the early stages, processes or risks involved in the project may be unclear to some stakeholders. Consequently, an iterative consultation is necessary to ensure the delivery solution is understood and acceptable to the stakeholders. Third, the engagement was *structured* to enable the needs and opinions of diverse stakeholders to be considered. We have communicated with one representative for each group to make the process smoother. The structured approach thus guaranteed stakeholder inclusivity and process efficiency but also facilitated the transparency and accountability of the program. After working through the necessary planning steps, we contacted our stakeholders and started working on the project together.

*Action plan.* In this final step, we developed an action plan to translate the insights from the planned stakeholder engagement into action with citizens. Our action plan included five main phases and was discussed with the stakeholders (see Figure 2). The stakeholder involvement in the process was constant during all the phases, but their role had different levels of responsibility depending on the journey phases.

**Figure 2. The action plan.**



### 3. The implementation of the action plan

*Phase 1.* In the first phase, we conducted three preliminary pilot tests via questionnaires to check the impact of physical proximity and information description on the intention to dispose of e-waste sustainably. The pilot tests were conducted between January and February 2022. Participants were recruited on Prolific Academic. Specifically, the first two pilot tests were helpful to understand the maximum distance between households and the drop-off bin that citizens are realistically willing to use to dispose of exhausted batteries and test if a reduced distance increases the intention to dispose of batteries in the specific bin. In pilot test 1, we asked 50 respondents to indicate the maximum distance between the drop-off bin and the home that they were willing to travel to dispose of exhausted batteries and their willingness to dispose of them sustainably at the distance they indicated plus 1 km. In pilot test 2, 100 participants were randomly assigned to one of the two treatment conditions - where proximity (high vs. low) was manipulated - and we measured their willingness to dispose of the batteries in the appropriate bins. The findings confirmed that proximity to the disposal location increases citizens' sustainable disposal intention.

The third pilot test aimed at testing if metaphorical information could help citizens quantify the size of the consequences of unsustainable disposal in their mind and, therefore, foster their intention to dispose

of exhausted batteries sustainably. The online experiment involved 60 participants. The information description of the message was manipulated by using metaphorical vs. numerical information to describe the consequences of unsustainable disposal. The results confirmed our expectations. In this phase, we used the University of Portsmouth's funds to recruit participants. We presented our results to an academic panel to check their rigor and relevance. We then showed and discussed the outcomes of the studies with 20 colleagues at an internal conference. The findings helped inform the subsequent field pilot program.

*Phase 2.* The pilot program took place in April 2022. Together with PubliCittà, we installed bins to collect exhausted batteries throughout the town and informed the citizens of the new scheme manipulating the information description (metaphor vs. numbers). After two weeks, together with Andromeda, we collected 360 observations, confirming that citizens who were closer to the drop-off bins showed a higher disposal rate when the message included metaphorical information. Given the pilot program's results, we sent a letter with the most effective information to the rest of the residents (see Acuti et al., 2022, for more details on the field pilot program). Before sending the letters to all the citizens, we increased the robustness of our findings by replicating the study online in May 2022. We recruited 189 participants, and the results confirmed the pilot tests and field experiment findings.

*Phase 3.* In June 2022, we presented the results of our studies to all the municipalities in the region to share our knowledge on how to promote sustainable disposal schemes to citizens. We developed a brochure to illustrate the project's goal, the participants and their expertise, the planned step, and the results of our preliminary studies. We individually emailed the brochure to the municipalities and invited them to participate in the project. We updated the brochure in the following months to inform the municipalities of the plan's progress.

*Phase 4.* In November 2022, the municipalities of San Benigno Canavese, Santhiá, and Saluggia implemented the program, installing the bins throughout the towns together with PubliCittà and referring to Andromeda for the collection, measurement in kilograms, and recycling of the e-waste. The municipalities sent a letter to citizens to inform them about the new recycling scheme, and they used metaphorical information to explain the potential negative consequences of the unsustainable disposal of e-waste products. The program was employed not just for collecting exhausted batteries but also for toners and electronics. The stakeholders expressed the need to enhance the sustainable disposal of these e-waste items as well, given the increasing number of toners and electronics wasted every year and the detrimental impact on the environment caused by their incorrect disposal.

*Phase 5.* In the last phase, we measured the impact of our project on stakeholders and society. Such impact occurred in terms of inclusion, reputation, and environmental sustainability. Although we acknowledge the priority of accounting for the positive impact of the recycling rate, it is also important to observe how the project has impacted vulnerable stakeholders.

#### **4. The impact of the project: inclusion, reputation, and environmental sustainability**

First, the funding provided by Fondazione CRT enabled Andromeda to pursue its mission of employing disadvantaged people through the management of services with environmental and social impact. Indeed, the project involved two disadvantaged employees for 31 and 185 days who contributed to the site inspections and to collect the e-waste.

Second, the project enhanced the social responsibility performance and reputation of PubliCittà and Fondazione CRT. More specifically, PubliCittà fulfilled its mission to 'make institutions choose eco-friendly solutions.' By supporting the project (grant ID: 75531), Fondazione CRT could accomplish its goal of pursuing the fundamental Sustainable Development Targets of the United Nations 2030 Agenda. Specifically, the project adhered to the 12th Sustainable Development Goal (SGD), which calls for initiatives that prioritize waste management and reduce waste generation through reduction and



recycling. Regarding the University of Portsmouth, the project contributed to achieving the “transformation through research” goal by providing actionable levers for policy-makers to enhance citizens’ sustainable disposal of harmful products. The presentation of the findings to multiple international conferences and events showed the quality of the research conducted at the University and contributed to expanding its reputation globally.

Finally, the programs implemented in San Benigno Canavese, Santhiá, and Saluggia increased the sustainable disposal of e-waste. By comparing the disposal rate before and after the scheme's implementation in November 2022, we have measured the impact of our project on actual sustainable disposal. San Benigno Canavese and Santhiá installed bins to collect exhausted batteries, toners, and electronics. The comparison of the disposal rate in November 2021 – May 2022 with November 2022 – May 2022 shows an increase in e-waste sustainable disposal in both municipalities. Specifically, in San Benigno Canavese, the disposal increased by 206.2% (exhausted batteries), 204.0% (toners), and 318.7% (electronics).

Santhiá registered an increase of 111.9%, 138.7%, and 85.4%, respectively. In Saluggia, the disposal scheme was adopted to collect exhausted batteries and toners. Because we only have data on the disposal rate starting from April 2022, we compared the disposal of exhausted batteries and toners in the 7 months after the scheme's launch (November 2022 – May 2023) with the seven months before (April 2022 - October 2022). The disposal of batteries and toners increased by 87.8% and 200.0%, respectively. The increase in sustainable disposal is beneficial to all the citizens of the municipalities involved, as it reduces the potential pollution of drinkable water in the territory.

Besides enhancing the sustainable disposal of citizens and the safety of the water they drink, implementing this project has provided additional benefits to society. Locally, it has increased the awareness and interest of decision-makers on the disposal issue and changed their behavior. We hope this change will have a spillover effect and raise decision-makers' interest in further sustainability initiatives. The local recycling of e-waste has also led to indirect global implications. By assigning the task of recycling to Andromeda, the project limited the contribution to the globalization of e-waste, which has adverse environmental and health implications for developing countries.

## 5. The science-based co-creation process

The collaboration and contribution of each stakeholder involved were essential for the realization of this project. Their heterogeneity (in terms of expertise or access to particular resources) and aligned directedness, i.e., having a common goal to achieve through co-creation, were fundamental to building a generative relationship and creating societal impact. The co-creation journey was science-based, a collaborative approach involving multiple actors who shared resources to generate social and business value across science and society, where a single party cannot deliver independently (De Silva et al., 2021). The collaboration between the different actors contributed to *co-creating value* and *extending the value* expected in the initial plan. Indeed, the participative cooperation of each stakeholder broadened the boundaries of the actual and potential impact of the project. First, we started our project focusing on exhausted batteries because of the serious damage created by this waste on the environment and human health. Given the positive impact of proximity and communication on sustainable disposal obtained in the pilot program, the three municipalities involved decided to adopt the same scheme for additional products (i.e., toners and electronics). Second, thanks to the dissemination of the findings in multiple events, new municipalities expressed their interest in the project and are currently discussing with the group the implementation of the recycling scheme in their towns (Trino and Casale Monferrato). Figure 3 shows the new drop-off bins recently installed in Trino (May 2023). The involvement of new potential stakeholders would increase the extent of the environmental impact. Therefore, by continuing to share the project's findings at public events and through media, we seek to

enhance the sustainable disposal of harmful products in other geographical areas and expand the positive impact beyond the Italian boundaries.

**Figure 3. Drop-off bin installed in Trino in May 2023.**



The collaboration of multiple stakeholders led to the *co-creation of knowledge*. Indeed, the contribution of the various actors enabled us to test the actual behavior of citizens allowing us to generate robust results and enhance the external validity of our empirical study. The impact measurement, in particular, confirmed the reliability and validity of our findings. We could demonstrate that using metaphor (vs. numbers) can ease the citizens' understanding of information and, in turn, their disposal behavior. We also confirmed the effect of physical proximity on citizen disposal behavior that has been discussed in the scientific literature so far with contrasting results. To make citizens understand the urgency of changing their consumption and disposal behavior, decision-makers could start using metaphors to elicit visual representations in their minds and make abstract information more concrete and easier to understand. The adoption of such communication that facilitates citizens' understanding of information has been clearly shown to be able to change their disposal behavior.

## **6. The ethics of impact**

The planning and implementation of this project didn't bring any challenges in terms of ethics. We believe this occurred for three main reasons. First, the stakeholders experienced shared values and shared commitment (CRIS Collective, 2023). The main goals of each stakeholder were mutual and pointed toward the same directions: i) enhancing environmental sustainability and ii) bringing societal change. This shared vision facilitated a collaborative environment, where each stakeholder had something worthwhile to contribute to and the others valued and trusted each expertise.

Moreover, the tight interaction enabled the group to neutralize potential challenges generated by simultaneously pursuing macro-social and micro-oriented goals. The constant dialogue among stakeholders ensured an equal awareness of the project's progress and outcomes and allowed each actor to make informed choices about the project. Second, the reporting of our activities was transparent,

readily digestible, and publicly available. This transparency was pivotal in shaping a balance of power in the group and making the information about the project accessible to the public. Ultimately, the employment of transparency in our reporting improved the reproducibility of our sustainable disposal program. Finally, the plurality of stakeholders engaged has been critical to reinforce transparency and reflect on the ethics of our project implementation and impact. The engagement of Fondazione CRT was a plus in ensuring and strengthening the achievement of an ethical impact. Indeed, to be granted the monetary support, the project – as indicated in the call for bids guidelines – had to be designed ‘in a sustainable way, inclusive for all, accessible for all, valuing the work of young people and gender equality.’ During the evaluation phase, the CRT Foundation assigned priorities to the interventions in line with these values; such values needed to be respected throughout the project. The University of Portsmouth played a similar role. Once the internal fund was granted, we had to report our progress in the mid and at the end of the project, ensuring that ethics of research was respected, and sustainability goals were pursued as the priority.

## **7. Final reflections**

The sustainable disposal of e-waste represents a major environmental challenge that can only be pursued with the active participation of citizens. Unlike household waste, e-waste cannot be collected at home due to the specific nature of its recycling. Numerous regulations are currently under discussion and should further reinforce companies' need to set up recycling facilities or use recycled materials to produce their products. However, these regulations will have only a minimal effect without the active participation of citizens.

We have shown that the proximity of drop-off bins is a critical factor in citizens' participation. This demonstrates that decision makers can impact their disposal behavior by simplifying people's actions. This point needed to be investigated carefully and confirmed empirically, and that is precisely what this project has done. We also clarified that this simplicity is a necessary but insufficient condition in that it should be complemented by appropriate information. If citizens find it difficult to understand in concrete terms the information they receive (i.e., information regarding the collection program), they will not act accordingly. This result further highlights the need for public authorities and decision-makers to put themselves in citizens' shoes to develop impactful and effective programs.

The program we developed was relatively simple, yet it was effective. Its actual impact encouraged other municipalities to implement it and even extend it to different types of e-waste besides exhausted batteries, with encouraging findings. The positive results are the greatest reward we could hope for from our work. As researchers, we aim to influence practices and help improve society positively. We interpret and use marketing to enhance lives, consumer well-being, and environmental sustainability (Rundle-Thiele et al., 2019). The program we have developed is a concrete example of how an organization-researcher partnership can contribute to developing positive spin-offs for a territory, as is the case with the Piedmont region. One unintended impact was the independent collaboration of stakeholders on sustainable initiatives even after the closure of this specific project. For instance, Andromeda and Fondazione CRT activated a new project to involve vulnerable workers with a disability.

The collection points will now stay in place. Currently, there are no planned extra-communication actions with citizens. However, we plan to involve other municipalities and extend the e-waste recycling program.

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