

# Waste not want not: a sequential social marketing pilot to reduce landfill destined e-waste

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## Abstract

**Purpose** – This paper aims to report a solution-focused case study, demonstrating application of the Co-create—Build—Engage framework (CBE™). CBE™ was applied to diagnose, design, implement and evaluate an electronic and electrical waste (e-waste) recycling pilot in one university setting.

**Design/methodology/approach** – During the Co-creation phase, the Capability, Opportunity, Motivation and Behaviour (COM-B) theory was applied delivering insights to guide campaign design, implementation and evaluation. The pilot aimed to encourage staff, students and local community members to dispose of unwanted electronic and electrical items at a promoted drop-off point to reduce e-waste from going to landfill.

**Findings** – The six-week campaign and pilot evaluation period (June — August 2023) diverted 570.5 kg of e-waste from landfill, with collection peaking immediately after the campaign at 453.2 kg (Aug-Sep 2023). By October 2025, cumulative diversion reached 2,055.56 kg. The evaluation revealed a strong correlation between promotional intensity and engagement, with post-campaign decline demonstrating the necessity of sustained social marketing efforts to maintain behaviour change.

**Practical implications** – This study provides a replicable CBE™ – guided model demonstrating how universities can lead e-waste reduction initiatives through social marketing interventions, addressing a literature gap in consumer focused behaviour change approaches and supporting Sustainable Development Goals.

**Originality/value** – This study advances e-waste management research by demonstrating how the CBE™ framework, incorporating seven Social Marketing Benchmark Criteria (including COM-B as the theoretical foundation), guides the intervention development. This integrated approach provides a replicable model for translating behavioural insights into measurable outcomes.

**Keywords** Sustainable behaviour, Environmental behaviour change, University sustainability, COM-B model, Social marketing benchmark criteria, Theory-informed intervention, E-waste, Disposal behaviour, Social marketing, Theory, CBE™

**Paper type** Research paper



## 1. Background

Rapid technological progress, limited access to cost-effective repair solutions, shorter product life cycles, inadequate e-waste management infrastructures, and escalating consumer demand for constantly new devices have become the top contributors to the growing problem of e-waste (Baldé *et al.*, 2024). Growth in e-waste accelerated following the COVID-19 pandemic with higher demand for electronic devices for remote work and education (Botelho Junior *et al.*, 2024; Xin *et al.*, 2023). The increasing adoption of artificial intelligence has worsened the e-waste crisis with more frequent smart device turnover to access the greater capacity offered by these advanced applications (Scientific American, 2024; Zhuk, 2023).

Despite e-waste becoming one of the fastest-growing global waste streams, significantly affecting public health and the environment (Baldé *et al.*, 2024), existing research primarily focuses on diagnosing causes or advancing e-waste recycling and recovery technologies (Islam *et al.*, 2024; Vuppaladadiyam *et al.*, 2024; Le *et al.*, 2023). A substantial research gap remains in practical solutions, particularly in social science contexts aimed at promoting responsible disposal behaviours and engaging diverse stakeholders. The Global E-waste Monitor report addresses a gap between public awareness and the effectiveness of existing recycling initiatives, emphasising the necessity for solution-oriented social science research to enhance public engagement and responsibility (Baldé *et al.*, 2024; Cao *et al.*, 2024; Shahabuddin *et al.*, 2023). This study aims to address this gap and contributes to existing literature, outlining a practical example of the ability for the social sciences (in this case, social marketing) to change individual disposal behaviours.

Policy initiatives, such as the European Battery Regulation (European Parliament, 2023), stress the critical role citizens play in recycling processes, emphasising the importance of public education and accessible collection systems. Acuti *et al.* (2024) offer evidence demonstrating the role of effective communication and strategically placed collection points in recycling efforts. Universities, integrating beyond environmental sciences and engineering curricula, are increasingly embracing sustainability through integrated education and operational practices. Such efforts include reducing carbon footprints, establishing eco-friendly campuses, and strengthening community partnerships (Basheer *et al.*, 2024; Hallinger and Chatpinyakoo, 2019). Hence, universities serve as vital bridges between institutional policy and individual responsibility, implementing initiatives that raise sustainability awareness among students, staff, and local community members, and encourage the adoption of sustainable practices both on campus and in their personal lives (Disterheft *et al.*, 2012). Yet, existing university-based sustainability initiatives often lack sufficient design regarding intervention methodologies and durations, limiting the replicability and transparency of outcomes (Nikoloudakis and Rangoussi, 2025).

## 2. Research purpose

Addressing the complexity of e-waste management demands systemic, multi-faceted solutions (Luo *et al.*, 2025). Social science research plays an essential role in understanding and identifying effective strategies that can divert e-waste from landfills (Acuti *et al.*, 2024; Koshta *et al.*, 2022). Social marketing offers a solution-oriented approach by leveraging voluntary behaviour change to achieve desired social outcomes (Campbell *et al.*, 2023; Dietrich *et al.*, 2022; Flaherty *et al.*, 2020). While the effectiveness of social marketing is evident in health (Lee *et al.*, 2022), environmental conservation (Rundle-Thiele *et al.*, 2023; Kim *et al.*, 2019), and wildlife protection (David *et al.*, 2019), the application of social marketing in e-waste management remains limited and often lacks the integration of core social marketing benchmark criteria (SMBC). Evidence suggests that behaviour change is

more likely when more of the SMBC are applied (Carins and Rundle-Thiele, 2014; Dietrich *et al.*, 2022). Yet, theory use, one of the core SMBC, remains underutilised and under-reported in e-waste management research (Kim *et al.*, 2019; Willmott and Rundle-Thiele, 2022; Dhir *et al.*, 2021a; Dhir *et al.*, 2021b).

The Co-create—Build—Engage (CBE<sup>TM</sup>) framework provides a systematic and iterative social marketing approach that effectively addresses complex societal issues such as reducing koala deaths, enhancing vaccination rates, and minimising food waste (Rundle-Thiele, 2022; Lee *et al.*, 2022, 2024). Building on this, the present study applies seven SMBC through the CBE<sup>TM</sup> process, integrating the Capability, Opportunity, Motivation and Behaviour (COM-B) model (Michie *et al.*, 2011) to examine whether this approach can enhance e-waste disposal practices in a university setting. The research team addresses one research question below:

RQ. Can social marketing be applied to increase rates of e-waste disposal?

To address this research question, the study provides a theory-informed, solutions-focused example, demonstrating practical application of seven SMBC, a mixed-methods design and the importance of broad stakeholder engagement and transparent reporting in first-time e-waste pilot programme development.

### 3. Method

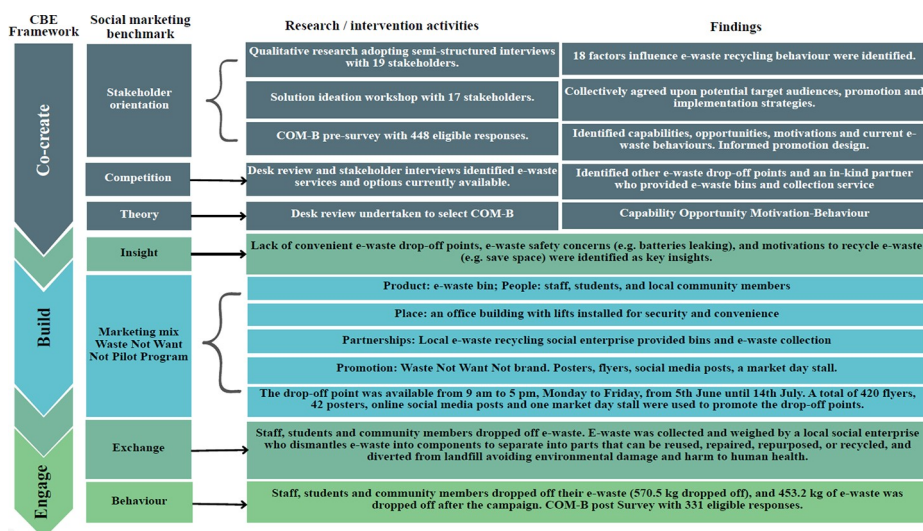
Following ethical approval (Reference #2022/078), this study implemented a campus-based intervention to evaluate the effectiveness of a social marketing e-waste pilot programme at one Australian university. The pilot took place from 5<sup>th</sup> June to 14<sup>th</sup> July 2023, with in-kind support from a university research centre and a local e-waste recycling social enterprise. The programme was designed using the Co-create—Build—Engage (CBE<sup>TM</sup>) framework, a systematic approach for behaviour change interventions that emphasises continuous improvement and application of social marketing principles (Rundle-Thiele *et al.*, 2021; French and Blair-Stevens, 2005). Seven out of eight social marketing benchmark criteria (SMBC) were incorporated: stakeholder orientation, competition, theory (COM-B; Michie *et al.*, 2011), insight, marketing mix, exchange, and behaviour. See Figure 1 below for an overview.

#### 3.1 Co-create

The Co-create phase aimed to understand community needs, barriers, and enablers regarding e-waste recycling through mixed methods. The Co-create phase in this study was guided by the Capability, Opportunity, Motivation, and Behaviour (COM-B) theoretical framework (Michie *et al.*, 2011). COM-B (2011) proposes that behaviour change occurs when individuals equipped with Capability (knowledge and skills involved in e-waste disposal and recycling from both psychological and physical perspectives), Opportunity (physical and social factors such as access to the drop-off points, and local community support), and intrinsic or extrinsic Motivation (the fear of data leaking or environmental concern) to act or shape on a desired behaviour. In the initial stage of the Co-create method design, Xi *et al.* (2025) applied the COM-B (2011) theoretical framework in a qualitative study interviewing experts, e-waste management professionals, and consumers to identify factors influencing e-waste recycling rates across all three COM-B domains (see Figure 2).

The Co-create phase included four key activities:

- (1) In-depth interviews – building on previous qualitative research (Xi *et al.*, 2025), 18 factors influencing e-waste recycling behaviour (see Figure 2) were identified.



**Figure 1.** Waste not want not pilot programme summary

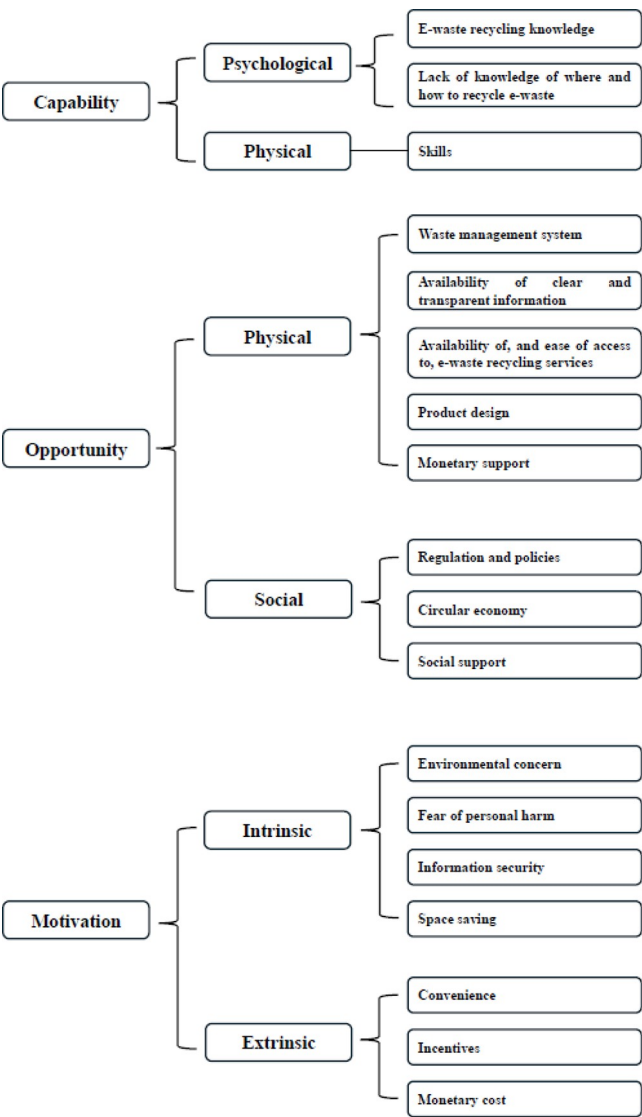
Source: Authors' own work; figure adapted from [Lee et al. \(2022\)](#)

- (2) Baseline survey – these COM-B aligned factors were used to design the baseline survey. The baseline study served two purposes. First, the survey quantitatively examined the factors identified in the qualitative interview study. This quantification enabled key drivers to be identified to inform intervention design. Over 60% of participants (n=446) reported storing e-waste at home, and more than 90% of survey respondents agreed that removing e-waste reduces toxic metal risk and saves space, thus validating personal harm and space-saving as motivators. Second, the survey delivered the baseline for programme evaluation.
- (3) Solution ideation workshop — seventeen stakeholders (including campaign managers, industry partners, and researchers) co-designed the intervention. Discussions focused on problem identification, target audience selection, convenient campus drop-off locations, and crafting key messages.
- (4) Campus poll — during the Environmental Week, over 80 staff and students voted on proposed campaign logos, ensuring the programme's visual identity was shaped by stakeholder input. The chosen logo was featured on all campaign materials during the Build phase (see [Figure 3](#)).

### 3.2 Build

Informed by Co-creation insights, the pilot programme established a secure e-waste drop-off point in accessible campus locations, provided by a local recycling partner specialising in repairing, reusing, repurposing and recycling. Acknowledging that behavioural change is more likely when the marketing mix is applied ([Lahtinen et al., 2022](#)). The marketing mix was given full consideration during the solution ideation workshop, which encompassed:

- Product: two clearly labelled e-waste bins (standard 240L capacity).



**Figure 2.** 18 factors influenced e-waste recycling behavior  
Source: [Xi et al. \(2025\)](#)

- Place: an office building with lifts installed for security and convenience.
- People: staff, students, and local community members are the target audience. The e-waste collection point was supervised, acknowledging information safety concerns identified in the qualitative study. A pick-up service was offered for staff and students, providing further ease.



**Figure 3.** Campaign log  
Source: Authors' own work

- Partnership: collaboration with a local social enterprise, with continued support post the six-week campaign.
- Promotion: a multi-channel approach including posters, flyers, university email, social media (LinkedIn, Facebook, Instagram), double-sided A-frame signages, and a door-to-door collection service to reduce barriers for participants. Motivational messages were tailored to address validated drivers (space-saving and avoiding hazardous battery leaks), as shown in [Figure 4](#).

A pre-existing library bin from a private company was recognised as direct competition, and all activities were designed to position the new service as the preferred alternative.

### 3.3 Engage

The Engage phase focused on boosting awareness and participation. The drop-off bins were available during business hours, Monday to Friday, with an additional bin provided as needed to accommodate high volumes. Engagement strategies included targeted communication, both online and offline, which began one week prior to the campaign launch. Over 420 flyers were distributed to parked cars, 42 posters were displayed across campus, market day stalls were held, and more than 200 direct interactions were reached. A pick-up service was provided for a few staff and students.

### 3.4 Data collection and analysis

To enhance the accuracy of the data measurement records, e-waste volumes collected during and after the campaign were quantified using a dual verification process ([Cropley et al., 2022](#)). The research team initially measured all collected items, which were then independently measured and verified by the recycling partner. All collected e-waste items were recorded by weight in kilograms (kg). A post-campaign cross-sectional survey was sent via email and social media to participants (students and staff) and those who agreed to be recontacted. Sampling involved both convenience ([Etikan et al., 2016](#)) and purposive ([Palinkas et al., 2015](#)) methods. Quantitative data were analysed using descriptive statistics and chi-square tests ([Nowacki, 2017](#)), while qualitative feedback was analysed using content analysis.

## 4. Results

A mixed-method approach was employed to evaluate the effectiveness and impact of the “Waste Not Want Not” e-waste social marketing pilot programme. This section presents results, highlighting overall outcomes, behavioural shifts, participant awareness, and a process evaluation of intervention delivery.



**Figure 4.** Poster example  
**Source:** Authors' own work

4.1 E-waste diversion: quantitative outcomes

The intervention employed a six-week, theory-informed social marketing campaign (1st June – 14th July 2023) to increase e-waste diversion from landfill on a university campus. During the pilot evaluation period (June – August 2023), 570.5 kg was collected at the designated drop-off point. Notably, e-waste drop-off participation peaked immediately after the campaign concluded (453.2 kg, Aug – Sep 2023), suggesting delayed behavioural response and/or continued social influence. Collection subsequently declined to 187.56 kg over six months before stabilising, with cumulative diversion reaching 2,055.56 kg by October 2025. The results revealed a strong correlation between promotional intensity and engagement, with post-intervention decline demonstrating the necessity of sustained social marketing efforts to maintain behaviour change.

#### 4.2 Behaviour and awareness: quantitative outcomes

**4.2.1 Campaign awareness and e-waste drop-off.** The post-campaign survey results indicated that the e-waste campaign was effective in raising e-waste recycling awareness and encouraging students and staff to drop off their e-waste. Table 1 presents a statistically significant relationship between aided awareness and e-waste drop-off status. Of the 331 respondents, 82.6% of those who were aware of the campaign ( $n = 257/311$ ) dropped off their e-waste, whereas none of the unaware participants did ( $n = 0/20$ ). A Pearson chi-square test confirmed that awareness was strongly associated with drop-off behaviour,  $\chi^2$  (1,  $n = 331$ ) = 73.93,  $p < 0.001$ ,  $\phi = 0.47$ . A Fisher's exact test yielded the same conclusion, indicating the effect of awareness on e-waste drop-off.

**4.2.2 Changes in home storage of e-waste.** Table 2 shows a significant association between time (pre vs. post campaign) and whether respondents had ever stored their e-waste at home,  $\chi^2$  (1,  $n = 757$ ) = 74.35,  $p < 0.001$ . Prior to the pilot, 60.1% of participants ( $n = 268/446$ ) reported storing e-waste at home, compared with only 28.3% ( $n = 88/311$ ) post campaign. Conversely, those who did not store at home increased from 39.9% pre-campaign ( $n = 178$ ) to 71.7% post-campaign ( $n = 223$ ), indicating a substantial shift away from home storage following the campaign.

Survey respondents were asked to report sources of awareness. The poster message that was most frequently recalled was the poster indicating bin location (52%) (Opportunity), followed by the poster highlighting the motivation of stop leaky batteries (48.3%) (Motivation), and the poster explaining types of e-waste (46.8%) (Capability). Channels that were recalled most frequently were Facebook (48.5%), email (43%), Instagram (33%) and posters (27.2%).

#### 4.3 Qualitative insights: participant experience

Qualitative analysis of open-ended survey responses and feedback provides a deeper understanding of how the campaign was experienced and perceived.

**4.3.1 Awareness and recall of campaign elements.** Participants highlighted the visibility and reach of the campaign across multiple channels:

I saw the *flyers and posters* on campus, and received emails about it also.

I got a *flyer* on my car, so I dropped off a broken item.

Participants commonly recalled seeing A-frame signs, posters in prominent campus locations, and market day stalls.

**Table 1.** Chi-square test and measures for the association between aided awareness and drop status ( $n = 331$ )

| Aided awareness | No drop    | Drop        |                                          |
|-----------------|------------|-------------|------------------------------------------|
| Yes             | 54 (17.4%) | 257 (82.6%) | $\chi^2(1, n = 331) = 73.93$ $p < 0.001$ |
| No              | 20 (100%)  | 0 (0%)      |                                          |

**Source(s):** Authors' own work

**Table 2.** Pre vs. post campaign (store e-waste at home)

| Stored e-waste at home | Pre ( $n = 446$ ) | Post (311)  |                                          |
|------------------------|-------------------|-------------|------------------------------------------|
| Yes                    | 268 (60.1%)       | 88 (28.3%)  | $\chi^2(1, n = 757) = 74.35$ $p < 0.001$ |
| No                     | 178 (39.9%)       | 223 (71.7%) |                                          |

**Source(s):** Authors' own work

4.3.2 *Improved convenience encouraging disposal behaviour.* Feedback indicated that the campaign succeeded in motivating action:

I was able to take a lot of stuff there which normally would have gone to landfill or be sitting in a room.

Very convenient and clearly marked. Much quicker than waiting for these items to be picked up.

4.3.3 *Campaign experience.* Overall, the campaign was well received, with an average satisfaction score of 72 out of 100 ( $M = 72$ ,  $SD = 18$ ). Respondents particularly valued the convenience and clarity of the process. Larger posters and A-frame signs were frequently mentioned as effective promotional tools, with some suggesting even more frequent or prominent placement in future campaigns. Participants also reported that Facebook was more effective for raising awareness than platforms like LinkedIn, indicating that future interventions could benefit from focusing resources on the most impactful channels.

Analysis (see Figure 5) demonstrated that peaks in e-waste drop-off were associated with periods of intensified campaign communications, suggesting that regular reminders and visible promotions are essential to maintaining high participation rates. The initial six-week campaign established a foundation for ongoing behaviour change, as evidenced by continued use of drop-off points and sustained engagement after the formal campaign ended. The qualitative and quantitative findings together reinforce the value of a theory-informed, multi-channel, and stakeholder-engaged approach. Notably, the campaign not only increased immediate diversion of e-waste but also shifted underlying norms and practices, reducing home storage and normalising responsible disposal on campus.



Figure 5. E-waste pick-up and measurements  
Source: Authors' own work

## 5. Discussion

This study demonstrates the effectiveness of a theory-driven social marketing intervention, employing the CBE<sup>TM</sup> framework and COM-B theory in increasing e-waste disposal within a university context. The results provide clear evidence demonstrating the effectiveness of a social marketing pilot programme. When systematically planned, implemented, and evaluated using the CBE<sup>TM</sup> framework, the measurable outcomes are evident.

### 5.1 Reinforcing CBE<sup>TM</sup> application

This study reinforces the adoption of CBE<sup>TM</sup> for structuring stakeholder engagement, programme design, and reporting in an e-waste context, adding to the existing knowledge base of case studies on the application of CBE<sup>TM</sup>. In this pilot, the use of seven out of eight social marketing benchmark criteria (SMBC), namely stakeholder orientation, competition, theory, insight, marketing mix, exchange, and behaviour, ensured a participatory-focused and contextually relevant approach.

### 5.2 Theory application

The integration of the COM-B model represents a theoretical advancement over many previous e-waste and social marketing interventions, which often lack systematic theoretical guidance (Willmott and Rundle-Thiele, 2022; Mathew *et al.*, 2023). In this study, theory guided every phase, from identifying barriers and enablers (e.g., lack of opportunity or knowledge) to designing motivational campaign materials (e.g., avoid leaky batteries). Evidence of substantial shifts in both awareness and disposal behaviours confirms the practical utility of theory in informing effective solutions.

### 5.3 Social marketing benchmark criteria application

This study provides empirical evidence of behavioural change, showcasing application of seven out of the eight social marketing benchmark criteria (SMBC). This paper aimed to describe how seven SMBC were applied within an initial CBE<sup>TM</sup> sequence. This paper demonstrates how the CBE<sup>TM</sup> sequence can be applied within any context to achieve behavioural change at the individual level. The pilot programme benefitted from comprehensive Co-creation, a multi-channel marketing mix, and evidence-based message development, resulting in wide campaign recall and engagement.

### 5.4 Achieving intended outcomes

The pilot diverted over 1.2 tonnes of e-waste from landfill while achieving strong campaign awareness immediately post the six-week communication promotion period. Lasting behavioural outcomes have been observed for 29 months. By focusing on practical, replicable actions such as installing accessible drop-off points and implementing an evidence-based communications campaign, the intervention provides a roadmap for higher education institutions. Importantly, the campaign's ongoing outcomes and participants' feedback demonstrate that well-designed interventions can drive both immediate and sustained behaviour change, supporting progress towards Sustainable Development Goals.

### 5.5 Limitations and future research directions

Three limitations arise in this study. First, the study did not apply all eight SMBC. This represents an opportunity for future research. Second, only one theoretical model (COM-B) was applied; future studies should test additional theoretical frameworks and directly compare the explanatory potential of COM-B (2011) with that of alternative behaviour change frameworks (e.g., AIDA (Ghirvu, 2013)). Third, the intervention was limited to a single campus in Queensland, Australia. University populations in developed countries often have higher sustainability awareness and

greater access to recycling infrastructure, which may bias the results and limit generalisability. By reporting the intervention design, implementation, and evaluation process, this study provides a concrete foundation for future adaptation in broader contexts.

It is recommended that future research should focus on longitudinal and multi-site designs, implement SMBC, and incorporate participatory design approaches in the Co-creation phase, such as the seven-step co-design (Trischler *et al.*, 2019) or Creating Collective Solutions (Rundle-Thiele *et al.*, 2023). Grey and systematic literature reviews as well as utilisation of participatory design approaches are also recommended to gain a deeper understanding of the array of e-waste solutions and to build a stronger evidence base for identifying scalable e-waste reduction interventions capable of driving systemic change.

## 6. Conclusion

This study contributes to the advancement of social marketing by extending its application into the underexplored domain of e-waste management. By systematically applying the Co-create—Build—Engage (CBE<sup>TM</sup>) framework and integrating seven Social Marketing Benchmark Criteria (SMBC), the research demonstrates how theory-informed, stakeholder-engaged interventions can drive measurable environmental behaviour change. The use of the COM-B theoretical framework (Michie *et al.*, 2011) throughout the intervention design and evaluation phases represents a methodological innovation, addressing longstanding calls for more rigorous theory application in social marketing. Importantly, this pilot expands the scope of social marketing beyond its traditional health focus, offering a replicable model for sustainability initiatives in higher education settings. The findings reinforce the value of participatory design, transparent reporting, and multi-channel engagement, contributing empirical evidence to support the scalability and effectiveness of social marketing in achieving Sustainable Development Goals.

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## References

- Acuti, D., Lemarie, L. and Viglia, G. (2024), "The impact of communication and proximity on citizens' sustainable disposal of e-waste", *European Journal of Marketing*, Vol. 58 No. 7, pp. 1681-1690, doi: [10.1108/EJM-06-2023-0454](https://doi.org/10.1108/EJM-06-2023-0454).
- Baldé, C.P., Kuehr, R., Yamamoto, T., McDonald, R., D'Angelo, E., Althaf, S., Bel, G., Deubzer, O., Fernandez-Cubillo, E., Forti, V., Gray, V., Herat, S., Honda, S., Iattoni, G., Khetriwal, D.S., Cortemiglia, V.L., Lobuntsova, Y., Nnorom, I., Pralat, N., and Wagner, M. (2024), *The Global E-Waste Monitor 2024*, International Telecommunication Union (ITU), and International Solid Waste Association (ISWA), United Nations University (UNU).
- Basheer, N., Ahmed, V., Bahroun, Z. and Anane, C. (2024), "Exploring sustainability assessment practices in higher education: a comprehensive review through content and bibliometric analyses", *Sustainability*, Vol. 16 No. 13, p. 5799, doi: [10.3390/su16135799](https://doi.org/10.3390/su16135799).
- Botelho Junior, A.B., da Silva, M.D.C.R., Camargo, P.S.S., Munchen, D.D., Cenci, M.P., Bertuol, D.A., ... Espinosa, D.C.R. (2024), "Electronic waste in emerging countries: current scenario of generation, policies, and recycling technologies regarding the coronavirus pandemic", *International Journal of Environmental Science and Technology*, Vol. 21 No. 1, pp. 1121-1140, doi: [10.1007/s13762-023-05128-9](https://doi.org/10.1007/s13762-023-05128-9).

- Campbell, A., Deshpande, S., Rundle-Thiele, S. and West, T. (2023), "Social advocacy: a conceptual model to extend post-intervention effectiveness", *Journal of Strategic Marketing*, Vol. 32 No. 2, pp. 1-14, doi: [10.1080/0965254X.2023.2179653](https://doi.org/10.1080/0965254X.2023.2179653).
- Cao, D., Puntaier, E., Gillani, F., Chapman, D. and Dewitt, S. (2024), "Towards integrative multi-stakeholder responsibility for net zero in e-waste: a systematic literature review", *Business Strategy and the Environment*, Vol. 33 No. 8, pp. 8994-9014, doi: [10.1002/bse.3960](https://doi.org/10.1002/bse.3960).
- Carins, J. and Rundle-Thiele, S.R. (2014), "Eating for the better: a social marketing review (2000–2012)", *Public Health Nutrition*, Vol. 17 No. 7, pp. 1628-1639, doi: [10.1017/S1368980013001365](https://doi.org/10.1017/S1368980013001365).
- Cropley, M., Sprajcer, M. and Dawson, D. (2022), "Wastogram: validation of a new tool to measure household food waste", *Journal of Environmental Psychology*, Vol. 84, p. 101896, doi: [10.1016/j.jenvp.2022.101896](https://doi.org/10.1016/j.jenvp.2022.101896).
- David, P., Pang, B. and Rundle-Thiele, S. (2019), "Applying social marketing to koala conservation: the 'leave it'", *Pilot Program. In Social Marketing in Action*, Springer International Publishing, pp. 379-390, doi: [10.1007/978-3-030-13020-6\\_25](https://doi.org/10.1007/978-3-030-13020-6_25).
- Dhir, A., Koshta, N., Goyal, R.K., Sakashita, M. and Almotairi, M. (2021a), "Behavioral reasoning theory (BRT) perspectives on E-waste recycling and management", *Journal of Cleaner Production*, Vol. 280, p. 124269, doi: [10.1016/j.jclepro.2020.124269](https://doi.org/10.1016/j.jclepro.2020.124269).
- Dhir, A., Malodia, S., Awan, U., Sakashita, M. and Kaur, P. (2021b), "Extended valence theory perspective on consumers' e-waste recycling intentions in Japan", *Journal of Cleaner Production*, Vol. 312, p. 127443, doi: [10.1016/j.jclepro.2021.127443](https://doi.org/10.1016/j.jclepro.2021.127443).
- Dietrich, T., Hurley, E., Carins, J., Kassirer, J., Rundle-Thiele, S., Palmatier, R.W.,... Lee, N. (2022), "50 Years of social marketing: seeding solutions for the future", *European Journal of Marketing*, Vol. 56 No. 5, pp. 1434-1463, doi: [10.1108/EJM-06-2021-0447](https://doi.org/10.1108/EJM-06-2021-0447).
- Disterheft, A., da Silva Caeiro, S.S.F., Ramos, M.R. and de Miranda Azeiteiro, U.M. (2012), "Environmental management systems (EMS) implementation processes and practices in european higher education institutions—top-down versus participatory approaches", *Journal of Cleaner Production*, Vol. 31, pp. 80-90, doi: [10.1016/j.jclepro.2012.02.034](https://doi.org/10.1016/j.jclepro.2012.02.034).
- Etikan, I., Musa, S.A. and Alkassim, R.S. (2016), "Comparison of convenience sampling and purposive sampling", *American Journal of Theoretical and Applied Statistics*, Vol. 5 No. 1, pp. 1-4, doi: [10.11648/j.ajtas.20160501.11](https://doi.org/10.11648/j.ajtas.20160501.11).
- Flaherty, T., Domegan, C., Duane, S., Brychkov, D. and Anand, M. (2020), "Systems social marketing and macro-social marketing: a systematic review", *Social Marketing Quarterly*, Vol. 26 No. 2, pp. 146-166, doi: [10.1177/1524500420925188](https://doi.org/10.1177/1524500420925188).
- French, J. and Blair-Stevens, C. (2005), *Social Marketing Pocket Guide*, National Social Marketing Centre of Excellence, London.
- Ghirvu, A.I. (2013), "The AIDA model for advergaming", *The USV Annals of Economics and Public Administration*, Vol. 13 Nos 1-17, pp. 90-98.
- Hallinger, P. and Chatpinyakoo, C. (2019), "A bibliometric review of research on higher education for sustainable development, 1998–2018", *Sustainability*, Vol. 11 No. 8, p. 2401, doi: [10.3390/su11082401](https://doi.org/10.3390/su11082401).
- Islam, M.S., Kushwaha, A.K. and Misra, M. (2024), "Review on the recycling of anode graphite from waste lithium-ion batteries", *Journal of Material Cycles and Waste Management*, Vol. 26 No. 6, pp. 3341-3369, doi: [10.1007/s10163-024-02093-4](https://doi.org/10.1007/s10163-024-02093-4).
- Kim, J., Rundle-Thiele, S. and Knox, K. (2019), "Systematic literature review of best practice in food waste reduction programs", *Journal of Social Marketing*, Vol. 9 No. 4, pp. 447-466, doi: [10.1108/JSOCM-05-2019-0074](https://doi.org/10.1108/JSOCM-05-2019-0074).
- Koshta, N., Patra, S. and Singh, S.P. (2022), "Sharing economic responsibility: assessing end user's willingness to support E-waste reverse logistics for circular economy", *Journal of Cleaner Production*, Vol. 332, p. 130057, doi: [10.1016/j.jclepro.2021.130057](https://doi.org/10.1016/j.jclepro.2021.130057).

- Lahtinen, V., Dietrich, T. and Rundle-Thiele, S.R. (2022), "Long live the marketing mix. Testing the effectiveness of the commercial marketing mix in a social marketing context", *Journal of Social Marketing*, Vol. 10 No. 3, pp. 357-375, doi: [10.1108/JSOCM-10-2018-0122](https://doi.org/10.1108/JSOCM-10-2018-0122).
- Le, M.H., Lu, W.M. and Chang, J.C. (2023), "Recycling E-Waste and the sustainable economy: a bibliometric exploration", *Sustainability*, Vol. 15 No. 22, p. 16108, doi: [10.3390/su152216108](https://doi.org/10.3390/su152216108).
- Lee, D., Rundle-Thiele, S., Fong, B.Y. and Li, G. (2022), "The application and outcome evaluation of a social marketing intervention to increase seasonal influenza vaccination among university students", *Vaccines*, Vol. 10 No. 10, p. 1671, doi: [10.3390/vaccines10101671](https://doi.org/10.3390/vaccines10101671).
- Lee, D., Wan, C., Leung, T.C.H., Rundle-Thiele, S. and Li, G. (2024), "Application of marketing to reduce consumer food waste in restaurants", *European Journal of Marketing*, Vol. 58 No. 7, doi: [10.1108/EJM-06-2023-0447](https://doi.org/10.1108/EJM-06-2023-0447).
- Luo, J., Yang, Y. and Jiang, Y. (2025), "Assessing the antecedents, processes, and consequences of sustainable electric vehicle battery recycling: a systematic literature review", *International Journal of Production Economics*, Vol. 282, doi: [10.1016/j.ijpe.2025.109551](https://doi.org/10.1016/j.ijpe.2025.109551).
- Mathew, A., Isbanner, S., Xi, Y., Rundle-Thiele, S., David, P., Li, G. and Lee, D. (2023), "A systematic literature review of voluntary behaviour change approaches in single use plastic reduction", *Journal of Environmental Management*, Vol. 336, p. 117582, doi: [10.1016/j.jenvman.2023.117582](https://doi.org/10.1016/j.jenvman.2023.117582).
- Michie, S., van Stralen, M.M. and West, R. (2011), "The behaviour change wheel: a new method for characterising and designing behaviour change interventions", *Implementation Science*, Vol. 6 No. 1, p. 42, doi: [10.1186/1748-5908-6-42](https://doi.org/10.1186/1748-5908-6-42).
- Nikoloudakis, N. and Rangoussi, M. (2025), "Sustainability in (engineering) education through reclaiming and reusing electronic components from e-waste: a last decade research review", *International Journal of Sustainability in Higher Education*, Vol. 26 No. 1, pp. 181-198, doi: [10.1108/IJSHE-09-2023-0405](https://doi.org/10.1108/IJSHE-09-2023-0405).
- Nowacki, A. (2017), "Chi-square and fisher's exact tests", *Cleveland Clinic Journal of Medicine*, Vol. 84 No. 9 suppl 2, pp. e20-e25.
- Palinkas, L.A., Horwitz, S.M., Green, C.A., Wisdom, J.P., Duan, N. and Hoagwood, K. (2015), "Purposeful sampling for qualitative data collection and analysis in mixed method implementation research", *Administration and Policy in Mental Health and Mental Health Services Research*, Vol. 42 No. 5, pp. 533-544, doi: [10.1007/s10488-013-0528-y](https://doi.org/10.1007/s10488-013-0528-y).
- Parliament, E. (2023), "Regulation (EU) 2023/1542 of the European parliament and of the council of 12 July 2023 concerning batteries and waste batteries, amending directive 2008/98/EC and regulation (EU) 2019/1020 and repealing directive 2006/66/EC", *Official Journal of the European Union, L*, Vol. 191, pp. 1-117, available at: <https://eur-lex.europa.eu/eli/reg/2023/1542/oj>
- Rundle-Thiele, S. (2022), "A reflection on motivating community action to protect an endangered species using marketing", *European Journal of Marketing*, Vol. 56 No. 9, pp. 2558-2572, doi: [10.1108/EJM-03-2022-0146](https://doi.org/10.1108/EJM-03-2022-0146).
- Rundle-Thiele, S., Dietrich, T. and Carins, J. (2021), "CBE: a framework to guide the application of marketing to behavior change", *Social Marketing Quarterly*, Vol. 27 No. 3, pp. 175-194, doi: [10.1177/15245004211021643](https://doi.org/10.1177/15245004211021643).
- Rundle-Thiele, S., Roemer, C., Mackay, M. and Williams, S. (2023), "Swimming against the stream: a systems approach to rebuilding fishing stocks", *Journal of Environmental Management*, Vol. 325, p. 116439, doi: [10.1016/j.jenvman.2022.116439](https://doi.org/10.1016/j.jenvman.2022.116439).
- Scientific American (2024), "Generative AI could generate millions more tons of e-waste by 2030", *Scientific American*, available at: [www.scientificamerican.com/article/generative-ai-could-generate-millions-more-tons-of-e-waste-by-2030/](https://www.scientificamerican.com/article/generative-ai-could-generate-millions-more-tons-of-e-waste-by-2030/)
- Shahabuddin, M., Uddin, M.N., Chowdhury, J.I., Ahmed, S.F., Uddin, M.N., Mofijur, M. and Uddin, M. A. (2023), "A review of the recent development, challenges, and opportunities of electronic waste (e-waste)", *International Journal of Environmental Science and Technology*, Vol. 20 No. 4, pp. 4513-4520, doi: [10.1007/s13762-022-04274-w](https://doi.org/10.1007/s13762-022-04274-w).

- Trischler, J., Dietrich, T. and Rundle-Thiele, S. (2019), "Co-design: from expert-to user-driven ideas in public service design", *Public Management Review*, Vol. 21 No. 11, pp. 1595-1619, doi: [10.1080/14719037.2019.1619810](https://doi.org/10.1080/14719037.2019.1619810).
- Vuppaladadiyam, S.S.V., Thomas, B.S., Kundu, C., Vuppaladadiyam, A.K., Duan, H. and Bhattacharya, S. (2024), "Can e-waste recycling provide a solution to the scarcity of rare earth metals? An overview of e-waste recycling methods", *Science of The Total Environment*, Vol. 924, p. 171453, doi: [10.1016/j.scitotenv.2024.171453](https://doi.org/10.1016/j.scitotenv.2024.171453).
- Willmott, T. and Rundle-Thiele, S. (2022), "Improving theory use in social marketing: the TITE four-step theory application process", *Journal of Social Marketing*, Vol. 12 No. 2, pp. 222-255, doi: [10.1108/JSOCM-05-2021-0117](https://doi.org/10.1108/JSOCM-05-2021-0117).
- Xi, Y., Rundle-Thiele, S., Roemer, C., Kim, J. and Herat, S. (2025), "Identifying e-waste recycling solutions: a theory-guided approach", *Journal of Social Marketing*, doi: [10.1108/JSOCM-08-2023-0179](https://doi.org/10.1108/JSOCM-08-2023-0179).
- Xin, L., Xi, C., Sagir, M. and Wenbo, Z. (2023), "How can infectious medical waste be forecasted and transported during the covid-19 pandemic? A hybrid two-stage method", *Technological Forecasting and Social Change*, Vol. 187, doi: [10.1016/j.techfore.2022.122188](https://doi.org/10.1016/j.techfore.2022.122188).
- Zhuk, A. (2023), "Artificial intelligence impact on the environment: hidden ecological costs and Ethical-Legal issues", *Journal of Digital Technologies and Law*, Vol. 1 No. 4, pp. 932-954, doi: [10.21202/jdtl.2023.40](https://doi.org/10.21202/jdtl.2023.40).

### Further reading

- Davis, R., Campbell, R., Hildon, Z., Hobbs, L. and Michie, S. (2015), "Theories of behaviour and behaviour change across the social and behavioural sciences: a scoping review", *Health Psychology Review*, Vol. 9 No. 3, pp. 323-344, doi: [10.1080/17437199.2014.941722](https://doi.org/10.1080/17437199.2014.941722).
- Gilal, F.G., Shah, S.M.M., Adeel, S., Gilal, R.G. and Gilal, N.G. (2022), "Consumer e-waste disposal behaviour: a systematic review and research agenda", *International Journal of Consumer Studies*, Vol. 46 No. 5, pp. 1785-1803, doi: [10.1111/ijcs.12767](https://doi.org/10.1111/ijcs.12767).
- Parvez, S.M., Jahan, F., Brune, M.N., Gorman, J.F., Rahman, M.J., Carpenter, D.,... Sly, P.D. (2021), "Health consequences of exposure to e-waste: an updated systematic review", *The Lancet Planetary Health*, Vol. 5 No. 12, pp. e905-e920, doi: [10.1016/S2542-5196\(21\)00263-1](https://doi.org/10.1016/S2542-5196(21)00263-1).
- Roemer, C., Rundle-Thiele, S. and David, P. (2021), "Moving theory focus beyond individuals targeted for change: observing project stakeholder interactions", *Journal of Social Marketing*, Vol. 11 No. 2, pp. 148-166, doi: [10.1108/JSOCM-07-2020-0131](https://doi.org/10.1108/JSOCM-07-2020-0131).
- Roemer, C., Rundle-Thiele, S., Pang, B., David, P., Kim, J., Durl, J.,... Carins, J. (2020), "Rewiring the STEM pipeline-a CBE framework to female retention", *Journal of Social Marketing*, Vol. 10 No. 4, pp. 427-446, doi: [10.1108/JSOCM-10-2019-0152](https://doi.org/10.1108/JSOCM-10-2019-0152).
- Rundle-Thiele, S., David, P., Willmott, T., Pang, B., Eagle, L. and Hay, R. (2019a), "Social marketing theory development goals: an agenda to drive change", *Journal of Marketing Management*, Vol. 35 Nos 1-2, pp. 160-181, doi: [10.1080/0267257x.2018.1559871](https://doi.org/10.1080/0267257x.2018.1559871).
- Rundle-Thiele, S., Pang, B., Knox, K., David, P., Parkinson, J. and Hussennoeder, F. (2019b), "Generating new directions for reducing dog and koala interactions: a social marketing formative research study", *Australasian Journal of Environmental Management*, Vol. 26 No. 2, pp. 173-187, doi: [10.1080/14486563.2019.1599740](https://doi.org/10.1080/14486563.2019.1599740).

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