

Transform Encouraging Recycling Behaviors in the Global South

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Sector

Recycling Sustainability Waste Management



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Behavioral Theme

Social Norms Gamification Peer Effects Theory of Planned Behavior



Dedicated Team

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SUMMARY

Plastic waste chokes both environmental and human health. The chemical composition of plastics is associated with contamination of land and sea, risk of consumption by organisms as well as developmental and cognitive illnesses. Yet the management of such waste is severely under-priced, meaning its consequential costs are not fully understood and waste disposal is preferred. With the lack of proper waste management systems, poor recycling infrastructure, low human awareness and participation, the world is beginning to accept that the problem of plastic waste is a big one and it is high time we tackle it. While this change has been prevalent in more developed economies, the challenge of plastic waste remains understudied and understated in low infrastructure, low resources economies of the global south.

The proposed project addresses the gap of understanding context in sustainability and recycling literature and explores the equally pressing behavioral barriers of social norms, habit formation, mental models, goal setting and more around waste management practices and participation.

Introduction

"Plastic is a life-changing resource, but the same qualities that make it useful—alongside poor waste management—have created a global waste challenge" - Alliance to End Plastic Waste. Replacing plastics is not a straightforward solution, since alternatives may not be as durable or have equally large environmental footprints. But as we observe a global shift towards circular economies, studies and interventions globally agree that the problem of plastics is a waste management one.

Research on understanding waste segregation and recycling behavior and understanding public perceptions towards recycling have just begun noticing the importance of local contexts (Mavropoulos, 2015). Within these local contexts, waste management encounters several structural factors such as lack of authoritative action regarding sustainable practices, limited number of recycling initiatives, inaccessibility to recycling centers, limited and costly waste management solutions. While limited access to plastic recycling services remains a challenge, equally pressing are behavioral problems relating to social norms, habit formation, salience, and mental models about waste management. Barriers such as social stigma often associated with participation in waste collection or resistance to forming habits of recycling, can be addressed using behavioral science strategies grounded in salience, habit formation, informational awareness, social influence and behavior change communication.

To achieve circularity, the management of waste, development of waste infrastructure, participation and engagement of communities and authorities, and understanding individual recycling behaviors is crucial. And behavior science is essential in bridging this gap, encouraging recycling participation by creating a demand for recycling and consequently catalysing a structural and behavioral change towards recycling.

Building on this, the aim of the project was to increase the cost-effectiveness of existing recycling schemes by addressing cognitive barriers that hinder recycling participation and leveraging community knowledge and expertise to co-design solutions. The project approach centered on human-centered design and infusing behavioral science in the problem definition, ideation, design, and prototyping processes. The strategy included 4 phases of research, across 2 countries - India and Kenya.

To gain a deeper understanding of the context specific barriers to recycling behavior (e.g. stigma, effort, awareness, accessibility) and opportunities to increase recycling participation, Busara conducted an investigative research across different Indian and Kenyan communities. This research builds on previous behavior change work conducted by Busara such as identifying barriers to plastic recycling for Mr. Green Africa, market research for recycled and upcycled products for Takazuri in Kenya and Understanding consumer behaviors in the circular economy for Better Future CoLabs in Kenya. Using literature reviews and in-depth qualitative interviews, focused-group discussion and co-creation workshops, our research looked to involve different stakeholders like potential recycling clientele, experts and partner enterprises to understand the barriers and levers to recycling behaviors. This was used as foundational research to develop journey maps and behavioral personas of recyclers and non-recyclers, ideate and design intervention solutions and test them at scale using a field and lab experiment setting in India and Kenya, respectively.

The evidence generated by the project is to be widely disseminated using a playbook, academic publications and targeted media events. The study provides recommendations for interventions and

policies around plastic recycling behaviors and bridging the action gap which prevents effectiveness of recycling interventions and recycling participation.

Literature Review

Plastic waste recycling poses a critical challenge, particularly in countries like Kenya and India. The lack of industrial standards, inadequate infrastructure, low market demand for recycled products, heavy reliance on the informal sector, the irrational selection of media channels for disseminating information on plastics are just a few significant barriers to effective plastic waste recycling that have been identified (<u>Oguge et al., 2021</u>; <u>Hossainet al., 2022</u>). Alarmingly, studies suggest limited or almost no segregation of waste at the household level presenting challenges with quality due to contamination and sorting of the recyclables (<u>Joshi & Ahmed, 2016</u>; <u>Gall et al., 2020</u>). Technical barriers are always mentioned but are not always sufficient to sustain a gap in action. There are larger behavioral barriers at play which prevent actual translation of recycling motivations into behaviors and affect the response towards recycling and how these positive or negative feelings influence the willingness to recycle.

Over the years, numerous theoretical models have been developed to understand and explain human behavior within the context of recycling. Specifically, the Theory of Planned Behavior (Ajzen, 1991), Theory of Reasoned Action (Ajzen & Fishbein, 1975) and Peer Effects theory (Cialdini, 1990: Sherif, 1936; Sumner, 1906) have provide unique insights into the psychological, social, and environmental determinants of recycling behavior among individuals and have shaped our study. According to Theory of Planned Behavior (TPB), individuals with positive attitudes who think that there is adequate normative support and perceive that they can easily engage in the activity should have strong intentions to perform the behavior Ajzen (1991). Meanwhile, the stronger these intentions are, the higher will be the likelihood for people to behave according to these intentions. Several studies have explored the predictors of recycling interventions by implementing this model (Nigbur et al. 2010; Miafodzyeva & Brandt, 2013; Oztekin et al., 2017; Wan et al., 2017; Paul et al., 2016).

The application of behavioral science is crucial in addressing these behavioral and cognitive challenges to recycling. This does not only ensure that intention is created, but also that intention translates to actual actions and participation in recycling initiatives. <u>Mavropoulos (2009)</u>, identifies the 'present-focused brain' as a key driver of recycling behavior, highlighting how immediate benefits and a personal connection to recycling can motivate individuals. <u>Thomas et al., (2013</u> leveraged on social influence and normalising recycling behaviors and found that the visibility of recycling, and the 'social pressure' exerted by the knowledge that others recycle, have a positive effect on recycling behavior and enables new norms to become established. Given these insights, it becomes clear that recycling interventions must harness the power of social influence while ensuring that adequate facilities and opportunities for recycling are readily available.

Other studies have leveraged Intrinsic motivation as a strong driver of recycling behavior when designing for interventions. Those with higher self-efficacy levels are found to be more inclined towards pro-environmental behaviors (Tabernero & Hernández, 2011). Moreover, intrinsic motivation, stemming from internal rewards such as personal satisfaction or a sense of responsibility, significantly influences environmental behavior, while higher social trust in institutions is linked to increased recycling (Scafuto et al., 2018). Novel approaches to waste segregation such as gamification and sensory cues have also been utilised to make the process more experiential and enjoyable as recycling has been largely viewed as boring. Novel approaches such as modified

bins, smartphone apps, badges, points, and leaderboards have been shown to increase recycling activity, highlighting the potential of technology in promoting sustainable behaviors <u>Bonino et al.</u>, <u>2016</u>: <u>Mozo-Reyes et al.</u>, <u>2016</u>: <u>Keramitsoglou & Tsagarakis</u>, <u>2018</u>; <u>Helmefalk</u>, <u>2019</u>; <u>Sailer et al.</u>, <u>2017</u>; <u>Helmefalk & Rosenlund</u>, <u>2020</u>].

Our proposed strategy therefore when designing for the interventions pegged on the comprehensive understanding of human behavior and specifically behavioral levers that have the potential to influence recycling behavior. Specifically these frameworks underscore the pivotal roles of attitudes, subjective norms, perceived behavioral control, social influence, gamification and visual cues and contextual factors in moulding individuals' intentions and actions towards recycling.

A Behavioral Science Approach

The overall objective of this study is to understand the factors that influence plastic recycling behavior and to in turn design solutions to increase the behavior. The specific objectives of the study include:

- To gain a deep contextual understanding of specific barriers to recycling behavior (e.g., stigma, awareness, access) and opportunities to increase recycling participation
- To design behaviorally informed strategies or interventions that address barriers to plastic recycling
- To inform and test the efficacy of the interventions and deploy them at scale to encourage recycling behaviors
- To develop a broadly applicable playbook of best practices to promote uptake of plastic recycling

A Behavioral Science Approach

Behavioral science is the systematic study of the factors that impact human behavior and decision-making, including cognitive processing, socio-cultural influences, and judgement, amongst many others.

The world of studying human behavior is growing rapidly enough that it outpaces any attempts to classify and organise it. Human behavior has always been a focal part in a wide range of academic disciplines, such as psychology, economics, anthropology, sociology, business and others. Relatedly, behavioral insights and tools have extensively been used within the private sector, especially in organisational psychology, marketing, and advertising for the better half of the last century.

However, behavioral science as a discipline that in the public policy space is relatively new yet burgeoning in terms of novel tools, methodologies, and applications. Moreover, using behavioral science in the Global South is a growing focus of researchers who seek to understand how the same behavioral mechanisms may be similar or differ based on the developing world context looking at the effects of poverty, stress, negative affective states on, among other things, risk-seeking decision-making (Haushofer, 2014)



Diagnostic Research

This phase was focused on gaining a deep contextual understanding of specific barriers to recycling behavior (e.g., stigma, awareness, access) and opportunities to increase recycling participation in the context of partner enterprises and clientele. Busara conducted qualitative research with key players to diagnose structural and behavioral barriers in plastic recycling. The purpose of this qualitative study was to gain a deep contextual understanding of specific barriers to recycling behavior and opportunities to increase recycling participation in India and Kenya.

To this extent, Busara designed interview guides for Focus Group Discussions (FGDs) and In-Depth Interviews (IDIs). A total of 92 people in India and 74 people in Kenya across 4 different target groups - plastic consumers, waste pickers, scrap dealers and partner enterprises - were interviewed. The key findings are delineated below.

Journey of Plastic Waste Through the Ecosystem

According to literature and our findings, plastic originates from the plastic producer, travels through the hands of plastic consumers, waste pickers, scrap dealers and partner enterprises. The journey is not linear since there exists different interrelationships between these key players.



I. Plastic consumers

Busara found that in Kenya, most people do not recycle their plastic waste regularly but for those that do, they typically give their plastic waste to the waste pickers, as opposed to recycling themselves.

In India, those who recycled their waste did so on a regular basis. However, this practice was limited to just waste segregation. Further, plastic consumers in India believed that as long as recycling initiatives educate communities about how to recycle, even those with lower levels of education can engage in recycling.

Levers:

- Spreading awareness and education about plastic waste and recycling.
- Infrastructural changes by installing waste disposal and recycling bins in public places.
- Social norms play an important role in motivating people to recycle, with people learning about recycling from their social networks and being eager to be perceived positively by those in their social network.
- Communicating the need for behavior change.
- **Children** are perceived to be easily influenced by recycling-related initiatives, with them being interested to support the recycling process.

The barriers to recycling faced by plastic consumers were:

- **High perceived cost of recycling**, with a large amount of time, labour and technical expertise required.
- Lack of knowledge and awareness of the recycling process individuals were not aware of the different kinds of items that can be recycled and do not have insight into the recycling process.
- There are **misconceptions** around recycling, where it is perceived to be a dirty, degrading job to be carried out by low-income communities.
- Most people **do not have the time to recycle** and are busy with other responsibilities.
- Limited accessibility to disposal and garbage collection facilities.

II. Waste Pickers

Busara found that there are two different types of waste pickers in both Kenya and India - those that are self or informally employed and those that are formally employed by organisations. The former's schedules are flexible and their earnings depend on the amount of waste they are able to collect and sell regularly. The latter have fixed schedules, are more satisfied with their earnings and working conditions as compared to those who are informally employed.

Waste pickers are motivated to work at disposal sites due to:

- The need for daily income.
- They **do not require prior training or experience** to begin working as waste pickers.
- Most waste pickers come from low income neighbourhoods where waste picking is the **primary mode of employment.**
- Waste pickers have a say in deciding the hours and days they would like to work.

Waste pickers face a number of barriers in their work:

- There are **no formal labour laws** that protect waste pickers. They are often underpaid and neglected by local municipal organisations.
- Waste pickers are **negatively perceived** by society and are actively looked down upon.
- Waste pickers **do not have access to protective equipment**, making them vulnerable to hazardous waste and disease.

III. Scrap Dealers

Scrap Dealers consist of individuals that buy scrap metal, plastic and other materials from individuals or businesses and then sell it to recycling facilities for processing. Most individuals develop an interest in scrap dealing due to the influence of their family where scrap dealing is a

common form of business. The need to create a source of livelihood, coupled with limited job opportunities serve as key motivators for individuals to become scrap dealers, as well.

The following points are the levers barriers available to influence recycling behavior -

Levers:

- Scrap dealers learn the art of recycling by imitating and watching others. This presents an opportunity to **leverage social norms** to drive increased recycling.
- Awareness and education campaigns are likely to encourage people to recycle.

Barriers:

- **Standardised waste disposal mechanisms do not exist**, making the waste segregation process especially difficult for scrap dealers.
- There is a **lack of information** on how to properly recycle and the information that does exist is often difficult to grasp.

IV. Partner Enterprises

Partner enterprises are organisations that purchase recyclable items from scrap dealers, recycle these items and sell them to end users.

Generally, partner enterprises have a good understanding of recycling. Most enterprises in India and Kenya believe that recycling is important, although the major reasons provided for its importance are quite different in both countries. In India, most partner enterprises believe that recycling is important because it is economically beneficial, as the industry creates employment. Meanwhile, in Kenya, partner enterprises consider recycling to be important because it helps the environment.

The following are the opportunities or levers available to positively influence recycling among partner enterprises and the barriers that partner enterprises face in their work:

Opportunities:

- Partner enterprises have a good understanding of the recycling process.
- Saving the environment and reducing pollution are motivating factors for being a part of the recycling industry.
- **Government incentives** like tax cuts and grants that subsidise the cost of operations and helps partner enterprises to remain in the industry.
- There is an **increased demand for end products made by partner enterprises**. This motivates partner enterprises to continue to process recycling materials.

Barriers:

- High operational costs of maintaining and running recycling plants.
- Partner enterprises are **unwilling to take part in campaigns** that raise awareness about recycling.
- **Government policies** such as needing a license to transport recycling materials and the lack of subsidies provided by the government serve as barriers to recycling.
- Due to the **limited knowledge of good recycling practices**, partner enterprises find it very difficult to obtain quality materials for recycling as these materials are most of the time mixed with trash.

Persona-based Segmentation

Busara developed 4 segments of plastic consumers using persona-based segmentation. This entailed determining the characteristics that a proportion of plastic consumers within a particular segment share and distinguishing them from consumers in other segments. The four personas were:

Changemaker

They tend to be young, educated, middle-high income earners that live in urban areas and are informed about recycling practices. This prioritises environmental persona consciousness, and is committed to recycle and reduce plastic waste consumption. Providing non-monetary incentives – recognition, awards or badges, sending them timely reminders to recycle, and providing the required infrastructure to enable them to take part in the recycling process are effective methods to engage this persona to recycle.

The Uninformed Consumer

They tend to belong to low income households and reside in informal settlements. This persona does not have adequate information about the recycling process, recycle on an irregular basis, and are influenced by social perceptions around recycling. Create positive social norms around recycling, usina commitment devices to get them to start and recycling, making recycling commit to infrastructure easily accessible and holding dissemination and awareness campaigns are effective methods to engage this persona to recycle

The Money Minded Consumer

They tend to be young, unemployed individuals or casual labourers that reside in urban informal settlements or rural areas and are usually the head of a single income household. This persona recycles in order to earn additional income and since they are incentivised by money, they prioritise recycling materials that will make them more money. Framing - highlight the benefits of recycling, making recycling infrastructure accessible and providing monetary incentives for recycling are effective methods to engage this persona to recycle.

The Uninspired Consumer

They tend to be employed, middle-high income earners that utilise plastic in large quantities and commit to recycling but never actually follow through with it. This persona typically hoards plastic due to its potential for reuse and does not perceive recycling to be particularly important. Framing: highlight the negative effects of overusing the same plastic items, using commitment devices, making recycling infrastructure easily accessible, dissemination holding and awareness campaigns and creating positive social norms around recycling are effective methods to engage this persona to recycle

Co-Design & Validation

This phase focused on applying learnings from the behavioral mapping to fine-tune how we motivate different behavioral archetypes to participate in plastics recycling. Busara applied a human-centered design approach which is enhanced by infusing behavioral science in the problem definition, ideation, design, and prototyping processes. At the end of the co-design process, we prioritised ideas (according to costs, timeliness, and perceived impact) for quick testing.

Co-Creation of Solutions

Busara facilitated 7 co-design workshops in 5 different locations across Kenya and India with consumers, scrap dealers, waste pickers and partner enterprises to inform and co-create interventions to increase recycling behavior. The workshops were conducted using human-centered design principles where ideas were crowdsourced through individual and group brainstorms. This ensured that the interventions were designed with the communities/stakeholders that they would impact and were rooted in people's actual needs.

The activities in the co-design sessions focused on exploring the key thematic areas and diving deeper into perceptions of our target audience. Areas of exploration included: communication channels, social norms, community influence, recycling perceptions and future aspirations.

The key insights from the workshop were as follows:

- 1. Consumers expressed a desire to recycle but were inconsistent in their efforts due to the perceived inconvenience of recycling.
- 2. Alternatives to plastic were perceived as expensive while reusing plastic for profit or storage was a popular solution in most households. Gender was not a factor in recycling expectations, with women often managing recycling.
- 3. Government bodies and local municipal corporations are integral to create awareness, enforce mandates, and make recycling mandatory in order to improve waste management.

Based on the insights from the workshop, the following intervention ideas were developed with key stakeholders:

	Name of Intervention	Description	Target Audience
1	Leverage social influence to educate about recycling	 Highlighting successful recycling stories from people are similar to the target audience. Run a myth- busting campaign or game that debunks incorrect beliefs and perceptions about recycling. 	Consumers Waste Pickers
2	Encouraging collaboration between waste pickers and the wider community	 Conduct educational training programs for waste pickers to equip them with tools to further communicate with households on waste management and segregation. Have waste pickers and NGO's host interactive, community-level programs to demonstrate and educate about recycling practices at home. Run campaigns to highlight the personal stories of waste pickers, their role, and importance in the recycling process through public recognition. Make salient the list of recycling entities and the kinds of waste they accept. 	Waste Pickers
3	Incentivise Shopkeepers to Host Recycling Schemes	• C"Bring your own box": Implement a scheme that encourages customers to bring reusable boxes when purchasing food	Consumers

		 rations, emphasising the savings achieved by avoiding packaging costs. Incentivise shopkeepers by recognising and rewarding those who collect plastic waste items. Highlight their contribution through social media, advertisements and a 'most products recycled' certificate. Use regularly visited shops as touchpoints for collection of used plastic waste. 	
4	Consumer Sensitisation to Recycling Labels and Packaging	 Standardise the labelling of dustbins across neighbourhoods and cities. For proper disposal of plastic products that have sustainable alternatives, introduce labels which highlight the impact of purchasing the plastic and the loss to them from using plastics. 	Consumers
5	Highlight Model Citizens and Communities for Recycling Action	 Reward and recognise residences or neighbourhood communities with a "Neighbourhood of the Month" award for those that meet their waste management goals 	Consumers
6	Optimising Messaging to Promote an Environmental Mindset	• Leverage messages which highlight the environmental loss from polluting to one's environment as well as the gain from keeping the environment clean.	Consumers
7	Tangible At-Home Recycling Guides	 Creating informative guides that highlight recyclable plastics, ways to dispose and reuse plastic within their homes. Leverage schools and colleges to conduct educational and demonstrative activities on how to recycle and include visits to recycling centers. 	Consumers
8	Gamification of the Recycling Experience	 Interactive dustbins: Leverage games like the cigarette butt disposal game where individuals dispose of their cigarette butts by selecting which football player they preferred - Ronaldo or Messi, effectively ""voting"" for that player. Have a few footsteps drawn leading up to a bin with a sign that states "Just 5 steps away from throwing your waste correctly." 	Consumers
9	Make Recycling A Social Activity	• Have recurring community events such as a plastic collection/recycling drive where individuals can come together to clean up their surroundings.	Consumers
10	Make Recycling Information More Visual:	 Provide pictorial instructions on the effect of plastic waste, what to do with their plastic waste, how to recycle at home. Provide consumers and their communities with feedback on how their current recycling practices and how to recycle better. 	Consumers
11	Connect Recycling to Tangible Rewards:	 Discount coupons redeemable against a government-provided service such as electricity/water bills can be given to those who return/recycle plastic at recycling points. Localise the solution by creating a digital application where citizens have direct involvement in the collection process. 	Consumers

Rapid Prototyping and Validation

Busara mapped the average journey of a user to 4 stages - Purchase of a plastic product, Using of the product and Considering recycling, Recycling the product, Follow up/Feedback on what became of the plastic waste, and mapped interventions against each stage of the journey. Busara leveraged the Impact (which intervention would have the most positive impact?) vs. Influence matrix (which intervention is feasible?) to prioritise interventions that were co-created with stakeholders in the co-design workshops, with a focus on interventions that could be practically implemented to the unique recycling contexts of India and Kenya.

The shortlisted interventions included:

- Leveraging Social Influence to Educate about Recycling
- Sensitising Consumers to Recycling Labels and Packaging
- Tangible and At-home Recycling Guides
- Make Recycling Information More Visual
- Gamification of the Recycling Experience

From the shortlisted interventions, the research team developed and rapidly tested a set of prototypes in India and Kenya. Feedback from consumers and waste pickers was incorporated and the following prototypes were finalised:

India

- 1. Modified Waste Bins: A four-category multi-part bin with colour-coded sections for easy identification and association: red for paper, blue for plastic, green for organic, and black for metal. Each waste bin underwent a modification by adding a clear compartment on top, which contained real samples of waste items being generated at the location of the experiment. This served as a visual nudge for participants, simplifying the process of matching items in their hand with those displayed against each type of bin. The goal was to make waste segregation visually intuitive, effortless, and as a result, requiring less cognitive effort.
- 2. Social and behavior Change Messaging: Three distinct posters with messaging that incorporated key behavioral principles. The first poster featured informative nudges on utilising the modified waste bin and emphasised the community's role in sustainability. The second utilised cultural symbols from the festival to underscore the significance of recycling. The third poster highlighted the steps for waste segregation, celebrating recyclers as heroes. The posters contained text in both Hindi and English to cater to the local context.

Kenya

- 1. **Waste Bins:** a multi-part waste bin system, segmented into four colour-coded and labelled sections to facilitate straightforward identification: red for paper, blue for plastic, green for organic waste, and black for metal. The design aimed to simplify waste segregation through clear, visual cues.
- 2. Social and behavior Change Messaging: Two distinct posters with messaging that incorporated key behavioral principles.
- 3. **Recycling Game:** Busara created an interactive recycling game which involved accurately sorting different waste items into the appropriate waste categories. The game intentionally simulated the items that were generated at the location of the experiment.

4. **Peer effects Signalling:** The goal of this intervention was to signal correct recycling behaviors of peers. This was done by pre-filling the recycling bins with correctly sorted waste items. This approach allowed participants to observe the waste items already present in the bin and correctly segregate their waste as they approached the bins, with the general waste bin remaining empty to emphasise the focus on recycling.

The final interventions incorporated discussions from the co-design workshops, insights from the previous qualitative phases and problem statements identified in our research.



Experimentation

After the co-design and validation, Busara tested the efficacy of 2-5 of the designed nudges in an experimental setting in both Indian and Kenya. Conducting an experiment allowed us to not only allow us to draw inferences on the success of the interventions but also enabled us to find insights at a rigorous and scalable level.

Field Experiment in India

To validate and address the barriers to recycling behavior in India, Busara designed a field experiment. The field experiment took place during the five-day 'Durga Puja' festival season in New Delhi, India where large amounts of waste are generated during the community festival celebrations. Busara established partnerships with waste pickers, the festival committee and a data collection firm to support the study.

The first day was used to pilot the experiment. Day 2 and 3 were the control days and Day 4 and 5 were the treatment days. The control and treatment interventions were as follows:

- Control: Standard Label Waste Bins and No Messaging Intervention
- Treatment: Modified Waste Bins and behavior Change Messaging Intervention

The festival-goers or consumers were the primary target audience. During the course of the experiment, the actions of 1000+ festival attendees were observed using three methods of data collection -

- Weight waste measurement: To analyse changes in bin usage and the accuracy of waste segregation, the total weight of waste items in each bin – plastic, organic, paper and metal – was measured. The items were then sorted into correctly and incorrectly segregated items and the weight of both categories was measured.
- 2. Quantitative surveys: To assess variations in recycling attitudes, intention to recycle and recycling behavior on the days of the control and treatment, field officers conducted short digital surveys with festival-goers.
- **3. Observation:** Field officers implemented participant-style observation wherein they discreetly observed participants' waste-related behaviors, conversations and engagement with the intervention.

Results

- **1. Marked improvement in waste segregation after exposure to the treatment:** paper waste items were more accurately segregated after exposure to the treatment as compared to plastic and organic waste items.
- 2. Social influence shapes recycling behavior: Observations during the experiment revealed a phenomenon of "leaders" or first-movers and "followers" in recycling behavior. "Leaders" correctly segregated waste and influenced "followers" to mimic their actions, even if those actions were incorrect. This cascade effect highlighted the powerful role of social norms and peer influence in shaping recycling behaviors.
- **3.** Visual cues and nudges at the point of disposal promote correct recycling practices: The presence of visual cues, such as signage and properly segregated waste samples, reinforced recycling and segregation norms among festival attendees.
- **4.** Self-efficacy and positive attitudes towards recycling influence recycling behavior: Individuals with positive attitudes towards recycling and those that were confident in their ability to recycle, were significantly more likely to actively engage in recycling behaviors.
- **5.** The young and old embrace recycling: The children and elderly are more likely to recycle and engage with the intervention as compared to other age groups.

Recommendation for India

1. Identify impactful touchpoints

Future interventions should strategically focus on pivotal moments within the recycling journey that are salient and where behavioral interventions would have the most impact, recognising that these key touchpoints are dependent on context

2. Engaging local stakeholders for interventions

When designing interventions, it is crucial to involve local stakeholders in identifying barriers, refining solutions, and pre-testing them. In our experiment, we engaged local festival committee members, waste pickers through a non-profit organisation, and a local data collection team. This collaborative approach ensures that the intervention effectively addresses the unique needs of the community.

3. Leverage social influence

- a. The study's findings underscored the influential role of peer effects in shaping recycling behaviors. This dynamic highlights opportunities for community-driven recycling initiatives and waste segregation campaigns in public spaces, aimed at enhancing awareness and fostering collective participation.
- b. The strong impact of social influence hints at the possibility to establish recycling as a norm. This can be achieved via norm nudging - persuading individuals that the majority are already engaging in recycling and waste segregation. Highlighting widespread approval of these behaviors and disapproval of improper use of waste bins can help cement recycling and waste segregation as the norm.

4. Make Recycling Easy

Future initiatives should aim to simplify the recycling process, making it effortless and intuitive. Using visual cues, colour-coded labels and bins, displaying sample items to signify waste categories, ensuring bins are accessible, and providing clear guidance on segregation and recycling at the point of disposal can lead to marked improvements in waste segregation and recycling behavior

Laboratory Experiment in Kenya

The barriers identified in Kenya include a lack of detailed information on proper recycling methods, an insufficient understanding of the importance of recycling, and perceptions of waste segregation as being a tedious and unappealing task. We set up a randomised controlled trial (RCT) in a laboratory setting in Nairobi, Kenya grouped as follows:

- **Control**: Multi-part Waste Bin and Common Waste Bin, General Recycling Information Poster, Non-recycling game
- **Treatment 1**: Multi-part Waste Bin and Common Waste Bin, Social and Behavior Change Message Intervention, Non-recycling game
- **Treatment 2**: Multi-part Waste Bin and Common Waste Bin, Social and Behavior Change Message Intervention, Recycling game
- **Treatment 3**: Multi-part Waste Bin and Common Waste Bin, Social and Behavior Change Message Intervention, Non-Recycling game, Peer Effects Signalling Intervention

The participants were observed and analysed through the following approaches:

- 1. Waste Tally Measurement: To analyse bin usage and waste segregation measures, weight was tallied.
- 2. Quantitative surveys: To assess the recycling measures of attitudes, intention to recycle and recycling behavior of the control and treatment groups, a digital survey was employed.
- 3. Observations: To capture any qualitative information such as quotes or behaviors related to recycling, field officers were discreetly deployed.

Results

- 1. Power of gamification on segregation: The gamification treatment significantly increased the accuracy of waste segregation compared to the control group. The visual and interactive nature of the game allowed participants to practise and visualise the segregation process, leading to increased confidence in their ability to segregate waste correctly
- 2. Impact of gamification and visual cues on self efficacy: Visual cues, such as games, that offer learning and feedback play a crucial role in shaping recycling behaviors. The experiment, games enhance self-efficacy by aiding participants in visualising the waste segregation process, providing clear instructions, and offering feedback on incorrect segregation practices.
- **3.** Strong influence of peer effects on segregation: The peer effects treatment significantly increased the accuracy of waste segregation compared to the control group, indicating the power of signalling and observational learning in promoting positive segregation behaviors. The observation of waste in the pre-filled bins likely facilitated the direct observation of good recycling practices, leading participants to avoid social disapproval by emulating the behavior of others.
- 4. Organic waste segregation was most accurate: The high accuracy in segregating organic waste suggests that this category is relatively easier for individuals to identify and separate. This may be due to the distinctive nature of organic waste, making it more recognizable compared to other waste types.

Recommendation for Kenya

1. Gamification as a tool for building recycling knowledge and engagement.

- a. Employing enjoyable and interactive methods as educational tools, particularly for audiences that may be less literate or traditionally disengaged offers a novel approach to capture their interest and involvement.
- b. Using the design of the game itself is critical to achieving these educational and motivational objectives. Incorporating specific features—such as auditory cues for correct and incorrect actions, leaderboards to foster a sense of social reward and recognition, and a points system to enhance self-assurance—is essential.
- c. Personalising the game's content to reflect the players' real-life context ensures relevance and increases engagement. This extends to identifying real-world incentives to motivate use of the game.

2. Leverage the role of peers to socially influence recycling behaviors

Despite the intentional signalling of peer effects in one specific treatment, our observations revealed that the impact of social influence and the tendency to emulate peers' recycling behaviors were pervasive across all treatment groups in Kenya. The findings suggest a strategic approach to intervention design that capitalises on these social dynamics

- a. Key behaviors noted included watching how others managed their waste, engaging in conversations about correct and incorrect recycling practices, and mirroring the recycling actions of peers. These can be used to drive social norms campaigns or peer testimonials around recycling.
- b. Creating opportunities for participants to observe their peers' recycling habits such as placing bins in prominent, communal areas.
- c. Facilitating recycling activities within social settings such as a community recycling activity, group pledges or social media challenges, we can harness the natural social influences present to promote recycling behavior.

3. Supplementing interventions with recycling education

Although the messaging intervention itself had limited impacts on behavior, it led to increased salience of recycling and confidence in segregation among our participants. This approach confirmed that to effectively foster recycling behaviors, it is imperative to bolster interventions with targeted awareness or messaging campaigns

Summary of Key Recommendations

How can we use behavioural insights to encourage recycling behaviour?



->D) Visual nudges at the

point of waste

. disposal

8000

interventions for all

demographics



Building pro-recycling

attitudes and self



effects





Providing feedback on good and bad recycling behaviour



Strategic placement of labels and waste bins



OOOO OOOO Using the same



efficacy

Educational interventions without directing individuals on how to act on it



Leverage social

influence and peer

Negative peer effects where individuals follow the behaviour of those that segregate waste incorrectly



Relying too much on common knowledge about waste items

Overload of information on how

to recycle

Conclusion & Next Steps

After validation in the field with actual consumers, we focused on sharing our insights on recycling behavior and its drivers. We plan to publish a playbook, paper, and reports, supplemented by articles and webinars, as part of a comprehensive dissemination strategy. This will help us reach a wider audience and promote increased recycling participation in various contexts in the Global South.

Conclusion

In conclusion, our research and experiments in India and Kenya have provided valuable insights into recycling behaviors in the Global South. By taking into account the diverse demographic groups and their specific needs—such as income, gender, mobility, and social status—we have crafted solutions that make recycling, reusing and waste management a practical, easy, cost-effective, and accessible practice.

The shift away from plastic by organisations in developing economies, combined with our behavioral strategies, underscores the vital role of households and enterprises in promoting recycling.Our identified strategies focus on leveraging behavioral levers to emphasise the personalised and localised aspects of recycling, particularly for consumers, scrap dealers, waste pickers and recycling enterprises in middle to low-income communities. By investigating the influence of social and environmental factors such as access, availability, convenience, norms etc., we aimed to understand what drives recycling participation. Employing human-centred design, we addressed the behavioral barriers to recycling and created interventions that encourage this practice.

Through this process, we have worked alongside key stakeholders in the circular economy to co-design and test these solutions, ensuring they are effective and sustainable. This study fills significant gaps in the literature by highlighting the importance of developing economies in recycling initiatives and by identifying the cognitive barriers individuals face due to contextual and social factors. Our rigorous qualitative research, coupled with contextualised experimental testing, paves the way for impactful interventions that support the circular economy and foster a more sustainable future.

For Further Research

Future research could focus on community-based interventions that harness social dynamics to promote recycling behavior, involving community members in designing and implementing these initiatives.

- Exploring the policy implications of our findings, particularly regarding waste management regulations and infrastructure development, is another promising avenue. For instance, studying changes in recycling behaviors when multi-part bins are installed could yield valuable insights.
- Additionally, effective educational strategies, such as gamification or peer education, should be examined to determine their impact on promoting recycling behavior. Developing and testing a real-life recycling game could offer a unique perspective on engagement and effectiveness.
- Comparing the effectiveness of various interventions—such as educational campaigns, incentives, and infrastructure improvements—across different contexts will help identify the most impactful approaches. Long-term studies on the sustainability and persistence of recycling behaviors post-intervention are essential to assess the enduring impact of our strategies. Conducting cross-cultural studies will allow us to compare behaviors and preferences across different cultural contexts, leading to culturally tailored intervention strategies.
- Investigating the role of normative nudging, social influence, and recognition in establishing recycling as the norm can further enhance participation rates. Additionally, identifying ways to effectively use messaging campaigns, leveraging first-mover demographic groups, and

employing strategic communication to encourage sustainable behaviors are critical areas for continued research.

Dissemination

Effective waste management in low-income countries presents a unique set of challenges due to various socio-economic, infrastructural, and cultural factors. While limited access to recycling services and infrastructure remains a challenge, equally pressing are cognitive and behavioral factors relating to social norms, high cognitive demands, competing priorities, and negative attitudes towards waste management. Most existing research on recycling habit formation focuses on the Global North, overlooking cultural, environmental, and behavioral factors unique to the Global South. The growth of consumerism and the rising middle class underscore the need for targeted and context-specific recycling solutions that are designed specifically for low-income communities. Our research aims to bridge this research gap. We employed a human-centred design approach to create nudge interventions to increase participation in recycling, particularly waste separation. We tested these interventions in two experiments in the emerging markets of India and Kenya, aiming to validate our findings in the lab and assess their applicability in the field.

In India, the perceived effort required for recycling and the prioritisation of other needs pose significant barriers to recycling both at home and in public spaces. Indian festivals, which generate substantial amounts of waste, offered an opportunity to test behaviorally-informed recycling interventions. In a controlled-field experiment at a local festival, we assessed the impact of salient visual nudges on waste disposal by modifying bins with a clear container on top showcasing real waste samples that belonged in the disaggregated bins. This was complemented by social and behavioral messaging that emphasised recycling as a norm and incorporated cultural festival symbols. The setup enabled data collection through surveys, observations, and measurements of waste volume and segregation. The intervention resulted in a significant improvement ((P<0.05) in paper waste segregation accuracy. It also significantly boosted reported confidence in their own ability to recycle, willingness to engage in recycling behaviors and recycling behaviors adherence of other festival-attendees.

In the Kenyan context, limited recycling knowledge and negative attitudes towards recycling have hindered participation. To address this, we assessed the efficacy of 3 behavioral nudges on recycling behavior of consumers, in a laboratory setting in Kenya: (1) recycling messaging, (2) playing a recycling game to segregate waste items into correct bins, and (3) signalling recycling behavior of peers by correctly pre-filling the waste bins. The randomised controlled trial enabled us to balance samples, assess changes in behavior against the control group, and collect data using survey, observation and waste count measurement before and after the treatment condition. We found that signalling the behavior of peers led to significant increase in waste segregation accuracy (p < 0.001). Playing the recycling game also led to a significant increase in waste segregation accuracy and self efficacy to recycle (p<0.001).

Our findings from the two experiments highlight the potential for recycling habit formation in both our study locations and provide strong evidence to support the premise that visual clues that reduce uncertainty and cognitive effort, along with signalling from peers, can effectively improve recycling participation. These findings have significant implications for the design of recycling programs in the Global South, suggesting that targeting specific barriers and contextual nudges to suit the context can lead to greater opportunity for sustained changes in good waste management behavior. **Keywords**: recycling behaviors, experimental testing, waste management, nudging, behavioral science