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A Literature Review on Solid Waste Management and Disposal Behavior at the Base of the Pyramid

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Abstract: Consumer behavior in disposing of products has substantial consequences for the environment that affect all of us. Waste management is a major challenge faced by many developing countries, underlining the relevance of this literature review. Even when academia tries to shed light on this field, it often fails to consider that waste management must be approached differently in less developed countries, which differ dramatically from advanced countries, especially with regard to consumers' behavioral characteristics. Further, limited effort has been made to systematize the existing literature by highlighting areas of interest in the scholarly discussion. This literature review contributes to the field by illuminating focal points in scholarly research on the background of solid waste management and the disposal behavior of people living at the base of the pyramid. It explores how scholarly research results can guide scholars and practitioners who are contributing to a positive shift in waste management practices. Its novelty arises from annotating scholarly theories and managerial approaches that promise to advance the understanding of sustainable waste management in developing countries. Additionally, the utilization of VOSviewer's network visualization involving cluster building and keyword occurrences, contributes to the methodological originality of the study. Selective keyword research in the Web of Science database identified 124 pertinent articles for review. This underscores the importance of this literature review, especially in light of the significant increase in publications in this research domain, with approximately 70% (87 of 124 articles) published since 2019. The results show that knowledge, participation, and the active involvement of the local communities are key components in achieving sustainable waste management. Shaping individuals' attitudes and awareness is vital for promoting pro-environmental behaviors in developing countries. The results also show a prominent focus on recycling behavior and an extensive use of the theory of planned behavior.

Keywords: solid waste management; disposal behavior; household waste; base of the pyramid; low-income countries; poverty.

Introduction

Solid waste management presents a major challenge in less developed countries. The continuous growth in population and waste production, coupled with decreasing poverty and subsequent increased consumption, exacerbates this issue (Raab, Salem, & Wagner, 2021a; UNCTA, 2022; World Bank, 2022). The population of those living at the base of the pyramid (BoP) has grown significantly over the past 25 years. As this growth persists, it triggers an escalating demand for food and consumer goods, leading to increased exploitation of natural resources, extreme waste generation, and excessive environmental pollution (UNCTA, 2022). In low-income countries, the common practice for waste disposal often involves open landfills, with 93% of waste generated in low-income nations ending up in them (Méndez-Lazarte et al., 2023); the problem is worsened by local people's common daily behaviors of open burning and littering (Raab et al., 2021a). This literature review aims to contribute to the solid waste management discussion with an emphasis on the disposal behavior of consumers living at the BoP.

Waste emergence and its disposal, especially in private households, is a point of high interest in tackling the global waste problem. People living on a day-to-day basis at the

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poverty line of less than US\$2.15 per day (World Bank, 2022) can afford only single-use packages, which contributes substantially to the problem of waste. The big brands' marketing experts are the drivers of sales to the poor and promote single-use packages, yet they try to sell a good conscience (Iannuzzi, 2017). Marketers should temper their concern for making money and be much more involved in sustainable waste development, which affects all of us.

We can change consumers' behavior by raising awareness (Borthakur & Singh, 2022; Farage et al., 2021; Shyamal et al., 2023) and knowledge (Celestino et al., 2022; Oduro-Appiah et al., 2022; Zand et al., 2020) in communities, by including communities in the process, and by making them feel they are a part of the solution. Private households are the most promising and important sector (Shyamal et al., 2023; Vinti & Vaccari, 2022), because change starts there with the next generation growing up, who can practice recycling (Conke, 2018; Oduro-Appiah et al., 2022; Raab et al., 2021a) and waste separation at the source (Oduro-Appiah et al., 2022; Slavík et al., 2021), leading to a new generation with more awareness and consequently less littering behavior.

The author defined four research questions in advance, which are discussed in the article and briefly recapitulated in the conclusion: 1. What are the most significant solid waste management challenges faced by developing countries, particularly in urban settings? 2. To what extent do environmental awareness and knowledge impact individual waste disposal behaviors? 3. Which theories and management-based solutions can be used to enhance pro-environmental behaviors among consumers living at the BoP? 4. What strategies and interventions can enhance the willingness of impoverished populations to actively participate in the circular economy aspects of waste management?

To answer these research questions, the author opted for the Web of Science scientific search engine to identify pertinent scholarly articles. The utilization of VOSviewer data served as a method to evaluate and visualize the findings, and through carefully selected keywords and article scanning process, yielded a total of 124 relevant articles. The interpretation of results ended up in highlighting relevancies within each of the five clusters and providing the author's recommendations on theories and managerial-based solutions.

Literature review

For the past half-century, aid-based programs have been the primary approach to alleviate poverty in developing countries, but they have not resulted in sustained improvements for the impoverished. Prahalad and Hart's (2002) introduction of the "bottom/base of the pyramid" approach offered a promising avenue for multinational corporations to address poverty while pursuing growth and profits. The BoP approach has since garnered significant attention from researchers and practitioners.

In its initial form, the bottom/BoP approach, often referred to as BoP 1.0, centered on selling to impoverished communities. However, in response to ethical concerns that arose in 2008, the field transitioned to BoP 2.0, which prioritized collaborative business ventures. In recent developments, the literature in this field has introduced a third iteration of the BoP approach (BoP 3.0), which builds on the community engagement emphasized in BoP 2.0 and integrates concerns related to environmental sustainability (Dembek et al., 2020). Consequently, the BoP 3.0 approach fits this research context and provides answers on how waste management strategies in low-income countries contribute to finding a sustainable solution for increasing amounts of waste. The integration of environmental sustainability into the BoP 3.0 approach and its correlation with waste management in low-income countries represents a unique addition to the current literature. The study not only highlights a crucial gap but also emphasizes the author's contribution by underscoring the necessity of shedding light on waste management and disposal behavior at the BoP, as the existing literature does not explicitly

recognize the importance of this particular gap. The novelty of the study lies in its annotation of scholarly theories and managerial approaches, forging a significant contribution to the advancement of understanding sustainable waste management in developing countries.

Research on consumers' disposal behaviors, considered a natural component of the consumption cycle, has received insufficient scholarly attention (Raab & Wagner, 2019b; Raab et al., 2021a). Further, there is scarce empirical research investigating individuals' consumption behaviors and subsequent disposal decisions in their various forms, which have been found to be frequently guided by emotions (Raab et al., 2020) and religion (Raab & Wagner, 2019a). The nature of consumers' product disposal behavior differs from country to country and requires selective strategies for solid waste management at the BoP (Du & Kim, 2021; Halme et al., 2022), leading to the conclusion that a universal solution for waste management is not viable. Consequently, the focus should be placed on tailored approaches that consider cultural contexts, socio-demographic conditions, and geographical settings, as these have a significant influence on disposal behavior and thus on sustainable development (Raab et al., 2021b). Furthermore, the author acknowledges the challenge of generalizing results across different cultural contexts and emphasizes the need to adapt approaches within local contexts (Halme et al., 2022). To the author's best knowledge, there has been no literature review to date on solid waste management and disposal behavior at the BoP. Some studies dealing with the domain are described below.

Impoverished consumers' disposal behavior in less developed countries is highlighted in a qualitative study by Raab et al. (2021a). Interviews with private household members living in a suburban area near Guatemala City revealed that religion, social norms, and people's relationships in their community are essential for their well-being and influence their daily disposal behavior. Dembeck et al. (2020) conducted a systematic review of the BoP literature but lacked an explicit emphasis on disposal behavior or waste management. Salem, Raab, and Wagner (2020) highlighted challenges in solid waste management among poor people living in refugee camps, revealing a strong connection between individuals' well-being and sustainable waste disposal behavior. Participants in the study stated that they were aware of the negative consequences of improper waste disposal and expressed their willingness to pay for waste management services. Adriyanti et al. (2018) conducted a literature review on solid waste management models within the scope of sustainable urban planning in Indonesian villages. Raghu and Rodrigues (2020) performed a systematic review of behavioral aspects of solid waste management, but their focus excluded low-income countries. Notably, they highlighted the overrepresentation of high-income countries in the existing literature. Their observations align with the findings of the present literature review, emphasizing the prevalence of articles centered on recycling behavior and the extensive use of the theory of planned behavior in this context.

Research methodology

The Web of Science was chosen for the literature review due to its robust and curated content, ensuring high-quality metadata for reliable bibliometric analyses. While Google Scholar provides broader coverage, its metadata limitations and extraction challenges, as highlighted by Martín-Martín et al. (2021), make Web of Science a preferred choice for rigorous academic research. The research design involved a document search conducted on the Web of Science Core Collection on August 31, 2023. This search encompassed all available editions and embraced all documents. The article selection and screening process is described below and is depicted in Figure 1.

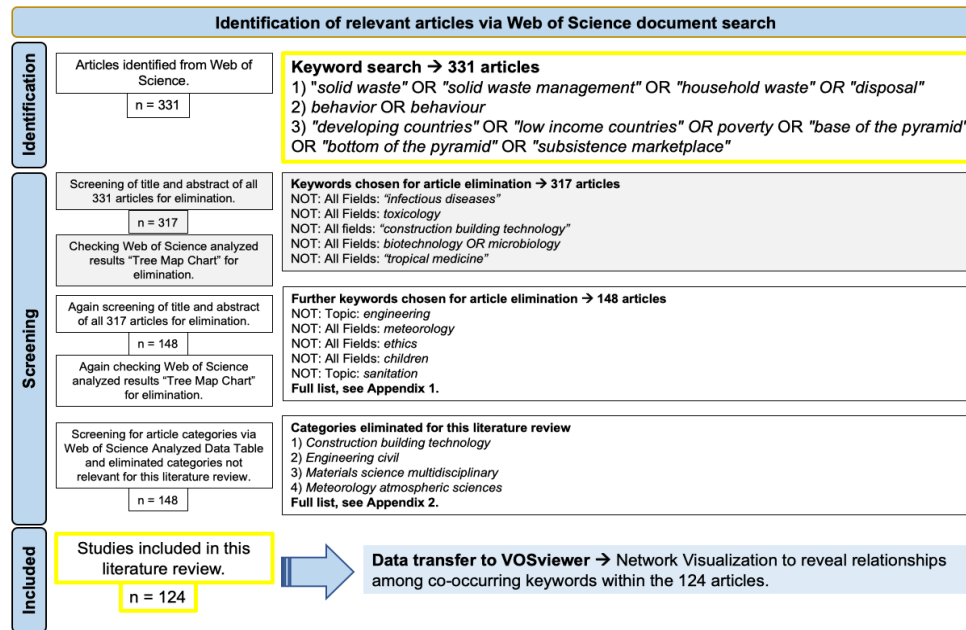


Figure 1. Overview of the document search and selection process in Web of Science

Source: own processing

To start, the author carefully chose specific keywords to comprehensively cover the whole scope of research in this literature review, conducting a series of keyword experiments and combinations to pinpoint the most suitable set of keywords in this research domain. Notably, the inclusion of "solid waste" alongside "household waste" was justified by the intention to encompass articles that discussed "solid waste" as a subject, even if they did not focus exclusively on household waste. The selected keywords for this literature review include the following:

All Fields: "solid waste" OR "solid waste management" OR "household waste" OR disposal
AND: All Fields: behavior OR behaviour

AND: All Fields: "developing countries" OR "low-income countries" OR poverty OR "base of the pyramid" OR "bottom of the pyramid" OR "subsistence marketplace"

The initial keyword search yielded a corpus of 331 articles that required further refinement through a preliminary scan based on their titles and abstracts and focusing on relevant keywords. Subsequently, the author employed Web of Science's tools, including "Analyze Results" and "Tree Map Chart," to progressively narrow down the article selection. This process was iterated until a total of 124 pertinent articles aligned with the research domain were identified for subsequent comprehensive analysis and interpretation using VOSviewer version 1.6.19. The author downloaded all 124 articles from Web of Science as text files encompassing full records and cited references. In transferring this data set to the VOSviewer, the author had to choose among various data visualization options. To obtain a comprehensive overview of the research domain, the author chose "Create a Map Based on Bibliographic Data" with "Co-occurrence Analysis" as the methodology for interpreting results to reveal relationships among frequently co-occurring terms or keywords within a set of documents. This method was valuable for identifying research trends, topic clusters, and thematic associations within the 124 articles.

In the final step, the VOSviewer network visualization mode was chosen, and the 124 articles were visually represented (see Figure 2), which enables zooming between keywords to get an overview of the main topic areas. Items such as management, determinants, and the like are depicted by their labels and typically encircled by default. The size of both the label and the circle surrounding an item is contingent on the item's weight; items with higher weights have larger labels and circles. Each item's color

corresponds to the cluster it belongs to, and lines between items signify connections. The proximity of journal articles in the visualization roughly indicates their relatedness in terms of co-citation links; closer articles are more closely related. The strongest co-citation links between articles are also depicted by lines. Thus, a network is essentially a group of items (clusters) connected by these links. Each link between items has a total link strength, which is a positive number. The higher this number, the stronger the connection between those items. In this network visualization, there are five clusters highlighted by different colors: cluster 1 (red), cluster 2 (green), cluster 3 (blue), cluster 4 (yellow), and cluster 5 (purple). They are described in the results section.

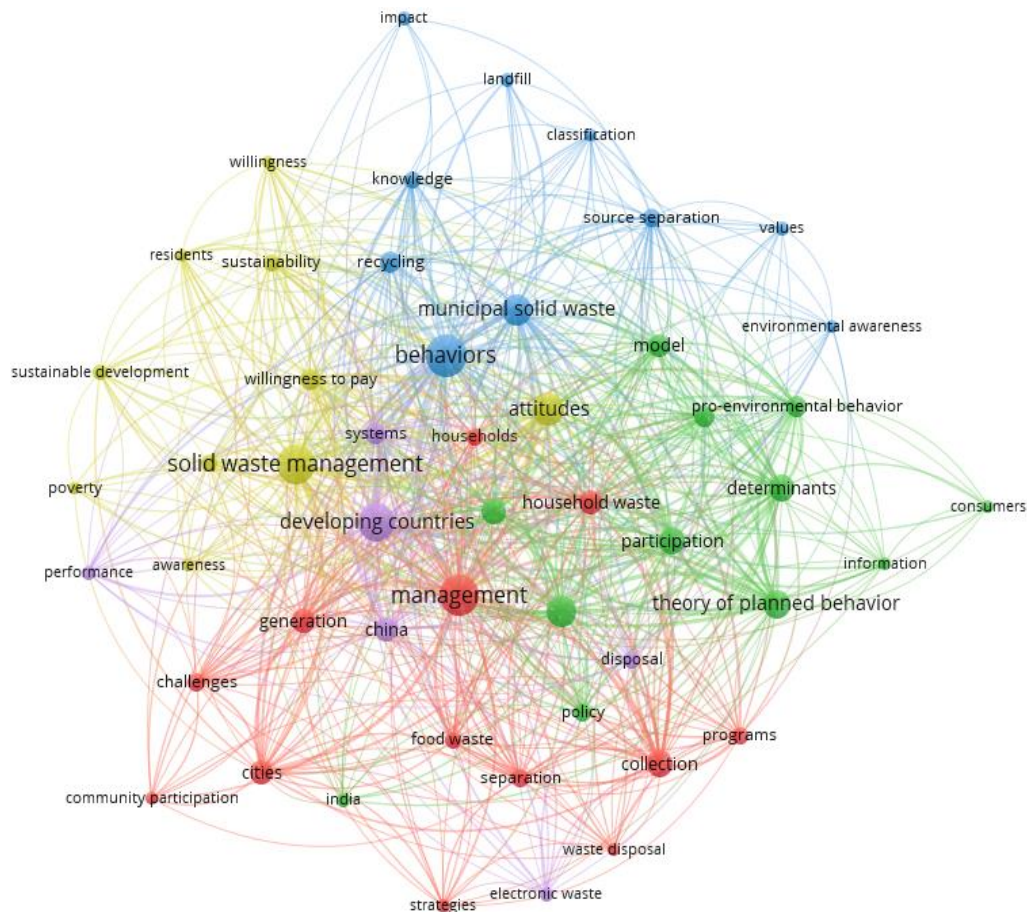


Figure 2. VOS network visualization showing the structure of topics in scholarly research on disposal behavior and waste management at the BoP

Source: own processing

Results

This section explores the clusters identified by the VOSviewer and concisely interprets the results in all five clusters, which provide valuable insights into the multifaceted landscape of solid waste management and disposal behavior of consumers living at the BoP in developing countries. The focus is on the key themes and drivers evident in these clusters. For each cluster, the author proposes viable, applicable theories in the scholarly context and management-related solution approaches to guide practitioners and scholars.

Cluster 1: Challenges in solid waste management (red)

Cluster 1 represents the multiple challenges in the domain of waste management in developing countries, emphasizing cities, as the generation of solid waste is concentrated in larger cities in less developed countries. A high percentage of this waste is not reused and ultimately ends up in landfills (Méndez-Lazarte et al., 2023). Vinti and Vaccari (2022) emphasize that, with almost half the world's population residing in rural areas, ensuring effective solid waste management is vital for mitigating environmental threats and enhancing a population's well-being. The prominence of terms such as "collection," "separation," and "household waste" signifies the course within waste management practices. The term "food waste" emphasizes the necessity for a more robust emphasis and improved management of organic waste on a household level (Attiq et al., 2021). Given the inherent complexity of solid waste management systems, the individual actions of their various components—from waste generation to collection and finally disposal—play a pivotal role in shaping the overall system's effectiveness (Kwenda et al., 2022). The concept of community participation in programs appears to be a solution to improving waste management (Sinthumule & Mkumbuzi, 2019; Zambezi et al., 2021) (Table 1).

Table 1. Cluster 1, emphasizing collection management in cities

Cluster 1: 13 Items	Links	Total Link Strength	Occurrences
challenges	28	45	9
cities	30	80	15
collection	36	111	18
community participation	12	19	4
food waste	27	46	7
generation	34	76	15
household waste	32	81	14
households	30	43	7
management	48	220	42
programs	24	42	7
separation	28	52	9
strategies	18	25	5
waste disposal	19	23	4

Note: In the VOS network visualization (Figure 2), Cluster 1, "Challenges in solid waste management," is colored in red.

Source: own processing

An interesting aspect emerges from Cluster 1, as the visualization shows that the item "strategy" is far away (an outlier) from "management," indicating a deficit in scholarly and practitioner planning. Evidently, they attempt to solve the waste management problem through attitudes, collection, and behaviors but lack a strategy and do not work conceptually.

Relevant scientific theories

Community participation theory: This theory suggests that involving local communities in waste management programs can lead to positive changes in both attitudes and behaviors toward solid waste management (Ghazali et al., 2021; Shyamal et al., 2023; Sinthumule & Mkumbuzi, 2019; Zambezi et al., 2021).

Complexity theory: The inherent complexity of solid waste management systems in developing countries is a key theme in this cluster. This merits the use of complexity theory (Byrne & Callaghan, 2022), as it suggests that addressing challenges in waste management requires a deep understanding of the intricate interactions between various components of the system, including waste generation, collection, and disposal. This is underlined by Kwenda et al. (2022), who state that the individual actions of these

components significantly influence the overall effectiveness of a waste management system.

Management-related problem-solving approaches

Community engagement and participation: Building on Sinthumule and Mkumbuzi's (2019) concept of community participation, management should prioritize encouraging and involving local communities in waste management programs. This includes awareness campaigns, community education, and encouraging citizens to actively participate in waste separation and disposal activities so as to overcome barriers to behavior change.

Strategic waste collection: To address challenges in collection and disposal in suburban areas, management should consider optimizing collection routes and providing infrastructure as recommended by Vinti and Vaccari (2022).

Cluster 2: Behavioral perspective in waste management (green)

Cluster 2 offers profound insights into the intricate dynamics shaping pro-environmental behavior within the specific contexts of waste management, particularly in regions characterized by limited resources and unique socioeconomic challenges. Recycling behavior seems to be a linchpin in the domain of waste management, with 69 of 124 articles from the Web of Science Core Collection at least naming the item "recycling." Its inclusion emphasizes the cluster's dedication to exploring and encouraging recycling practices. Understanding the nuances of recycling behavior seems to be vital for advancing sustainable waste management. According to Méndez-Lazarte et al. (2023), recycling programs for municipal solid waste in emerging economies typically place an emphasis on educational (Debrah et al., 2021) and motivational initiatives (Méndez-Lazarte et al., 2023). To encourage greater source-separated recycling efforts in lower socioeconomic groups, authors recommend potentially beneficial measures such as improving education (Debrah et al., 2021), affordable housing policies, and increasing internet access for vulnerable populations (Padilla & Trujillo, 2018).

A study by Conke (2018) identifies several common barriers to successful recycling programs, including a lack of practical knowledge, unequal distribution of costs and benefits, inadequate infrastructure, and a shortage of professional management. Fostering a deeper understanding of these barriers could enhance waste recycling efforts in diverse urban settings, as related challenges have been documented in both developed and developing countries. However, the solutions must be adapted to the local context.

Additionally, the prevalence of Ajzen's theory of planned behavior (1991) as related to recycling behavior is evident in this cluster. The theory of planned behavior is relevant because it is a well-established psychological theory and provides a structured framework for assessing the determinants and intentions behind pro-environmental behavior, offering a systematic approach to dissecting the psychological aspects that drive individuals' waste disposal choices. For example, Oduro-Appiah et al. (2022) used a modified model of the theory of planned behavior to evaluate household heads' attitudes toward separating municipal solid waste from its source. Moral norms and perceived behavioral control were the primary factors influencing intentions. Control beliefs, such as the availability of waste receptacles, regular waste collection services, and knowledge of the separation process, played a significant role in facilitating households' intentions. The strong link of the item "determinants" highlights the need to delve into the determinants (e.g., social norms, education, perceived convenience) that underpin individuals' choices and actions in managing waste sustainably (Celestino et al., 2022; Raab et al., 2021a).

The item "participation" underlines the significance of community engagement and participation in sustainable waste management initiatives, implying that the active

involvement of local communities is a key component in achieving effective, sustainable waste management practices (Shyamal et al., 2023). This is highlighted by the study of Ghazali et al. (2021) showing that participation and education can positively affect waste reduction.

The inclusion of items such as “consumers,” “India,” and “information” shows the importance of understanding the local contexts and information flows that influence consumers’ disposal behaviors. The term “information” suggests that understanding how information flows, whether through educational programs, awareness campaigns, or community initiatives, can significantly impact individuals’ behavior and attitudes toward waste management and recycling (Padilla & Trujillo, 2018) (Table 2).

Table 2. Cluster 2, emphasizing the theory of planned behavior to enhance recycling behavior

Cluster 2: 12 Items	Links	Total Link Strength	Occurrences
consumers	9	11	4
determinants	37	107	18
India	13	16	5
information	19	24	4
intention	33	70	11
model	30	68	13
participation	35	108	19
policy	27	42	9
pro-environmental behavior	30	77	12
recycling behavior	41	148	24
theory of planned behavior	33	117	20
waste management	37	95	17

Note: In the VOS network visualization (Figure 2), Cluster 2, “Behavioral perspective in waste management,” is colored in green.

Source: own processing

In Cluster 2, it becomes evident that the system of waste management is rooted in the theory of planned behavior, as consumer attitudes and awareness play a crucial role in fostering pro-environmental behaviors in developing countries.

Relevant scientific theories

Theory of planned behavior: This theory posits that individuals’ intentions to engage in a behavior are determined by their attitudes, subjective norms, and perceived behavioral control. Ajzen’s theory (1991) is widely used to predict and understand various individuals’ choices and actions, including disposal and recycling behavior (Al Mamun et al., 2022; Oduro-Appiah et al., 2022; Raab et al., 2021a).

Value-belief-norm theory: This theory emphasizes personal values, beliefs, and perceived social norms as driving factors behind pro-environmental behavior (Al Mamun et al., 2022; Raab et al., 2021b). It is commonly used in studies related to nature conservation and environmental protection.

Management-related problem-solving approaches

Behavioral interventions: In line with Shyamal et al.’s (2023) impact assessment study, management can design targeted behavioral interventions to improve waste separation and collection behaviors at the household level. This approach should focus on attitudes, norms, and perceived behavioral control.

Environmental belief model: This model focuses on individual environmental beliefs and how they affect behaviors. It calls for interventions and highlights the importance of perceived risks, efficacy, and personal responsibility (Kopaei et al., 2021).

Community engagement and participation: The significance of community involvement in sustainable waste management, as highlighted by Shyamal et al. (2023) and Ghazali et al. (2021), underscores the importance of engaging local communities. Management should actively involve residents in municipal solid waste management systems and educational efforts.

Cluster 3: Disposal dynamics and pathways (blue)

This cluster suggests an emphasis on the cognitive aspects that drive waste behaviors among individuals living at the BoP. Whereas Cluster 2 leans more toward the psychological aspects of pro-environmental behavior, Cluster 3 delves deeper into the practical implementation of waste management practices. The items “value” (e.g., Ghazali et al., 2021), “knowledge” (e.g., Zand et al., 2020), and the perceptual dimension of “environmental awareness” (e.g., Shyamal et al., 2023) provide valuable insights.

The strongest item, “behaviors,” highlights a primary focus on understanding various waste-related behaviors: recycling is mentioned in 69 articles (e.g., Oduro-Appiah et al., 2022; Raab et al., 2021a), separation in 41 articles (e.g., Méndez-Lazarte et al., 2023; Zhou et al., 2022), and separation at source in 13 articles of the 124 (e.g., Oduro-Appiah et al., 2022; Slavík et al., 2021). Source separation strives to enhance household and organic waste initiatives, promoting a gradual shift toward a circular economy (Celestino et al., 2022). The results of a study by Méndez-Lazarte et al. (2023) demonstrate that attitude and the availability of physical space influence solid waste separation behavior. Municipal solid waste recycling programs in emerging economies tend to focus on education (e.g., Debrah et al., 2021) and motivational actions without giving due consideration to space at home for managing solid waste.

Consumer behavior encompasses much more than exploring the actions and choices made by individuals in managing their household waste (e.g., Celestino et al., 2022; Chikowore, 2021; Raab et al., 2021a), as their state of knowledge (e.g., Celestino et al., 2022; Oduro-Appiah et al., 2022; Raab et al., 2021a; Zand et al., 2020) and the impact of their actions are also important. Knowledge (e.g., Celestino et al., 2022; Zand et al., 2020) has a considerable link strength, indicating a focus on the role of knowledge and information in influencing waste management decisions and behaviors. Vinti and Vaccari (2022) underline this by stating that inadequate knowledge and a lack of suitable tools frequently result in improper disposal practices, such as dumping and uncontrolled burning. The incorporation of environmental awareness as demonstrated by studies such as those of Borthakur and Singh (2022) and Shyamal et al. (2023) highlights the significance of environmental knowledge and awareness in influencing behaviors related to waste management (Table 3).

Table 3. Cluster 3, emphasizing the theory of planned behavior to enhance recycling behavior

Cluster 3: 10 Items	Links	Total Link Strength	Occurrences
behaviors	46	181	43
classification	19	20	4
environmental awareness	14	16	4
impact	7	8	5
knowledge	26	42	7
landfill	11	17	5
municipal solid waste	41	142	25
recycling	26	47	11
source separation	30	55	9
values	13	15	5

Note: In the VOS network visualization (Figure 2), Cluster 3, “Disposal dynamics and pathways,” is colored in blue.

Source: own processing

The results in Cluster 3 reveal that behavioral aspects are predominant, and that awareness, knowledge, and behavioral factors can positively shape waste management practices in impoverished settings.

Relevant scientific theories

Cognitive behavior theory: Cluster 3 places a strong emphasis on cognitive aspects that influence waste behaviors, indicating the significance of cognitive behavior theories (Attiq et al., 2021) in understanding how individuals manage their waste. These theories explore the role of knowledge, awareness, and values in shaping waste-related behaviors, particularly in the context of recycling, source separation, and classification (e.g., Celestino et al., 2022; Chikowore, 2021; Raab et al., 2021a).

Environmental knowledge and awareness theory: The inclusion of “environmental awareness” as an item in this cluster underscores the importance of understanding how environmental knowledge and awareness impact waste-related behaviors. This theory suggests that individuals with greater environmental awareness may be more likely to engage in sustainable waste management practices (e.g., Borthakur & Singh, 2022; Shyamal et al., 2023).

Management-related problem-solving approaches

New ecological paradigm: This paradigm measures an individual’s ecological worldview and may help to explain how people at the BoP perceive their relationship with the environment and how this affects waste-related behaviors (Barradas & Ghilardi-Lopes, 2020).

Norm-activation model: This model rests on the idea that personal norms mediate the relationship between awareness and behavior. It focuses on how raising awareness about environmental issues can inspire pro-environmental norms and behaviors (Farage et al., 2021). Wang et al.’s (2019) results show that individuals are more likely to engage in pro-environmental behaviors when they feel a personal moral obligation (responsibility) to do so. This underlines that waste disposal behaviors are driven by environmental awareness.

Cluster 4: Consumer attitudes and willingness in waste management (yellow)

Cluster 4 centers on the critical interplay between attitudes and solid waste management (e.g., Corrado & Pelloni, 2022; Massoud et al., 2021; Oduro-Appiah et al., 2022) in the context of impoverished communities and emphasizes practical waste disposal solutions. It also delves into these communities’ “willingness to participate” (Ghazali et al., 2021; Slavík et al., 2021) in circular economy practices and their “willingness to pay” (Huynh et al., 2022; Massoud et al., 2021) for sustainable development initiatives. The latter indicates a concern with understanding the financial aspects (Celestino et al., 2022; Oduro-Appiah et al., 2022) of waste management in impoverished communities (Shyamal, et al., 2023). Interestingly, the results of a study in Vietnam by Huynh et al. (2022) show that residents were generally willing to pay for sustainable waste management in a developing country, especially when they saw social benefits, and that those in less urbanized areas and those unfamiliar with waste sorting were more willing to pay. This suggests the need for an investigation into whether individuals are willing to invest in sustainable waste practices and how this willingness can be harnessed for effective waste management solutions (Massoud et al., 2021). Although the study’s results may come as a surprise by contradicting the prevailing assumption that individuals in low-developing countries are less inclined to invest in waste disposal, it’s crucial to consider that willingness can vary significantly depending on the poverty threshold and specific local contexts. These findings should not be generalized as representative of low-developing countries at large. Willingness to participate (Ghazali et al., 2021; Slavík et al., 2021) highlights the active engagement of impoverished individuals in waste management and

sustainable development endeavors, underscoring the importance of community participation and individuals' commitment to actively contributing to these initiatives (Borthakur & Singh, 2022; Massoud et al., 2021).

The strong link with "attitudes" suggests a focus on understanding how attitudes and beliefs impact the effectiveness of solid waste management practices in impoverished communities (Oduro-Appiah et al., 2022; Padilla & Trujillo, 2018). Research on the attitudes of individuals living at the BoP and their relationship with sustainable waste management offers valuable insights into the multifaceted dynamics of solid waste management in these vulnerable communities. This cluster underscores the significance of addressing waste-related issues in a manner that aligns with people's attitudes (Oduro-Appiah et al., 2022), awareness (Borthakur & Singh, 2022; Shyamal, et al., 2023), and capacities (Debrah et al., 2021). It reflects an exploration of how people's beliefs, opinions, and perceptions (Borthakur & Singh, 2022) play a vital role in shaping their disposal behaviors (Padilla & Trujillo, 2018).

In focusing on consumers living in extreme poverty at the BoP, it is important to understand that poverty can represent a significant barrier to effective waste management practices and sustainability (Debrah et al., 2021). Therefore, it is vital to explore how impoverished populations engage within solid waste management and which challenges they face on the path to sustainable development. The presence of the items "sustainability," "sustainable development," and "circular economy" (e.g., Celestino et al., 2022; Ghazali et al., 2021; Huynh et al., 2022) highlights a commitment to exploring waste management practices that align with broader sustainability goals. The cluster delves into how individuals' attitudes and "willingness to participate" can foster sustainable waste practices and contribute to circular economy principles (Vinti & Vaccari, 2022) (Table 4).

Table 4. Cluster 4, emphasizing attitudes and willingness in solid waste management

Cluster 4: 10 Items	Links	Total Link Strength	Occurrences
attitudes	43	170	27
awareness	15	20	4
circular economy	28	46	7
poverty	11	14	4
residents	20	29	4
solid waste management	45	168	39
sustainability	31	65	8
sustainable development	21	30	6
willingness	20	30	4
willingness to pay	35	72	12

Note: In the VOS network visualization (Figure 2), Cluster 4, "Consumer attitudes and willingness in waste management," is colored in yellow.

Source: own processing

Based on the above, a link exists between attitudes and the theory of planned behavior, but the VOS network visualization shows that they are not located close to each other and are found in different clusters. This indicates that consumer attitudes need more focus on theoretical approaches. Further, willingness to pay and management are prevalent in this cluster, leading to the question of how practitioners can inspire consumers (e.g., by means of increased awareness) to engage in sustainable waste management practices.

Relevant scientific theories

Theory of planned behavior: Although not explicitly mentioned, the emphasis on attitudes, beliefs, and perceptions in this cluster aligns with the principles of the theory of planned behavior, which can be extended to understand the attitudes, intentions, and behaviors of individuals in impoverished communities regarding waste management and sustainable development. This theory explores how perceived behavioral control, subjective norms,

and attitudes shape an individual's intentions and actions (e.g., Corrado & Pelloni, 2022; Oduro-Appiah et al., 2022).

Circular economy theory: This theory aims to promote a gradual shift toward a circular economy. The adoption of circular economy principles as seen in the work of Celestino et al. (2022) indicates that sustainable waste management is linked to broader concepts of circularity and resource conservation.

Management-related problem-solving approaches

Community participation: The "willingness to participate" (Ghazali et al., 202; Slavík et al., 2021) emphasizes community participation, a concept related to engaging individuals and communities in sustainable waste management and development initiatives.

Knowledge, attitudes, and behavior model: This model is pertinent to exploring the influence of knowledge and awareness on individual behavior (Schrader & Lawless, 2004). It explains how environmental awareness shapes waste management actions (e.g., Borthakur & Singh, 2022; Shyamal et al., 2023).

Capability approach: The mention of "poverty" indicates the impact of socioeconomic framing on waste management. While not a psychological theory, the capability approach can be relevant in understanding how poverty acts as a barrier to effective waste management practices and sustainable development (Sen, 2018). It emphasizes the importance of individuals' capabilities and opportunities in the context of poverty (Debrah et al., 2021).

Cluster 5: Waste management in specific contexts (purple)

Cluster 5 indicates a comprehensive exploration of solid waste management and disposal with potential insights related to behaviors, regional practices (represented by China), and specific domains, such as electronic waste (e-waste) management. China plays a significant role in the global e-waste landscape as both a producer and processor of waste. Consequently, the mention of "China" in this cluster may indicate a regional focus on waste management practices, policies, or challenges within China, offering insights that could be relevant to other countries with similar characteristics (Wang et al., 2017; Zhou et al., 2022).

"Disposal" is a fundamental aspect of waste management, as it highlights the ultimate stage in the life cycle: managing e-waste at the end of its usefulness, which may include landfilling, recycling, or other practices. It implies a specific interest in the management and disposal of electronics, such as mobile phones (Wang et al., 2017), which is a growing concern in developing countries due to the proliferation of electronic devices. "Performance" (Shyamal et al., 2023) refers to evaluating the effectiveness of waste management systems and assessing their impact on the environment and resource recovery or to a focus on their performance in the real-world context. The item "systems" suggests an exploration, standardization, and formalization of the infrastructure and organization of solid waste management (Kwenda et al., 2022; Massoud et al., 2021; Oduro-Appiah et al., 2022) (Table 5).

Table 5. Cluster 5, emphasizing attitudes and willingness in solid waste management

Cluster 5: 6 Items	Links	Total Link Strength	Occurrences
China	30	73	14
developing countries	47	209	35
disposal	25	43	7
electronic waste	16	26	5
performance	18	27	5
systems	36	69	11

Note: In the VOS network visualization (Figure 2), Cluster 5, "Waste management in specific contexts," is colored in purple.

Source: own processing

Cluster 5 is well-networked with the other clusters and embraces systems, performance, and developing countries, precisely what is missing in Cluster 4.

Relevant scientific theories

Cross-cultural theories: Given the link to "China" and the mention of "developing countries," cross-cultural theories (Timokhina et al., 2018) can contribute to understanding how waste management practices, behaviors, and systems may vary across diverse cultural contexts and nations.

Behavioral reasoning theory: This theory as proposed by Westaby (2005) focuses on comprehending and explaining human behavior by examining the cognitive processes that drive individual actions. In the context of waste management, especially in areas such as China, gaining insights into the cognitive factors driving people's waste disposal behaviors becomes paramount. This theory provides a valuable framework for investigating the rationale behind individuals' choices of waste disposal methods, their propensity for recycling, and the various influences shaping their decision-making processes.

Management-related problem-solving approaches

Corporate social responsibility initiatives: Encouraging companies, especially electronics manufacturers, to take responsibility for the end-of-life disposal of their products can be an effective approach. Management can work with businesses to develop corporate social responsibility initiatives that promote sustainable product design, take-back programs, and recycling efforts, which reduce the burden on local waste management systems (Zhou et al., 2022).

E-waste recycling programs: Developing comprehensive e-waste recycling programs can be an effective approach. Management are required to design and implement collection and recycling initiatives that focus on reducing the environmental impact of e-waste, which could involve setting up e-waste collection centers and partnering with recycling facilities to ensure responsible disposal and recycling of electronic devices (Wang et al., 2017).

Discussions

Solid waste management and disposal behavior of consumers living at the BoP in developing countries are critical aspects of environmental sustainability. This literature review explored these issues by conducting an in-depth analysis of research articles obtained through a comprehensive keyword search. The findings offer significant contributions to the field, providing theoretical and management insights for scholars and practitioners. Generally, it can be stated that there is no single, one-size-fits-all solution to the waste management problem. Instead, the focus should be on individualized solutions

that address cultural contexts, socio-demographics, and geographic locations, which obviously have a significant impact on disposal behavior and, consequently, sustainable development (Raab et al. 2021b). Transferring results from one cultural context to another is challenging and always requires adaptation to local circumstances.

The contributions of this literature review also correspond to the four research questions posed in the introduction section as described below.

Question 1: What are the most significant challenges in solid waste management faced by developing countries, particularly in urban settings? Cluster 1 underscores that the challenges are multifaceted and require country-based solutions, community participation, and culturally sensitive approaches. The author claims that aligning waste management practices with the attitudes and values of impoverished communities is essential for effective and sustainable waste solutions. Moreover, Cluster 1 indicates a lack of alignment between creating sustainable waste management and the attitudes, values, knowledge, and awareness of impoverished communities (Borthakur & Singh, 2022; Shyamal et al., 2023). Consequently, it is important to enhance contextual rigor (Halme, et al., 2022) by considering cultural contexts, socio-demographics, and geographic settings (Raab et al., 2021a). Cluster 5 poses another challenge, appearing highly technical and system-oriented, with a noticeable absence of social aspects. The author suggests that this may be attributed to the issue of affluent Westernized societies exporting their e-waste to developing countries, causing adverse impacts. The prevalence of China in this cluster signifies substantial research activity, driven by the urgent need for developing countries to adopt circular economy approaches in dealing with the e-waste. China's leadership in technology makes it logical for them to pioneer in this area, also based on the fact that e-waste demands specialized handling distinct from solid waste management.

Question 2: To what extent do environmental awareness and knowledge impact individual waste disposal behaviors? This question's answer lies in the findings of Cluster 3, which demonstrate the significance of raising awareness and the role of knowledge in influencing waste management decisions (e.g., Celestino et al., 2022; Zand et al., 2020). Therefore, the author suggests knowledge enhancement initiatives, providing suitable tools, and educational programs to improve public knowledge of waste management. Based on insights from 124 sources, it is evident that the key drivers for a significantly positive impact on consumers' disposal behavior are environmental awareness and knowledge (e.g., Celestino et al., 2022; Zand et al., 2020). These findings emphasize the necessity for proactive measures, including workshops, repair cafés, collaboration with community leaders, media involvement, and organized clean-up efforts. The studies further recommend an inclusive approach, extending beyond communities and households to encompass schools, universities, and companies, fostering a comprehensive and collective positive shift (e.g., Attiq et al., 2021; Borthakur & Singh, 2022; Celestino et al., 2022; Farage et al., 2021; Oduro-Appiah et al., 2022; Shyamal et al., 2023; Zand et al., 2020).

Question 3: Which theories and management-based solutions can be applied to enhance pro-environmental behaviors among consumers living at the BoP? For all five clusters, the effort to answer this question yielded potential theories for further research and offered management-based solutions for practitioners. Cluster 2 especially suggests the relevance of the theory of planned behavior in driving pro-environmental behavior, particularly among consumers in the context of waste management. Drawing from that theory, management can develop behavioral interventions to influence waste behaviors, including motivational actions, educational programs, and initiatives that address the psychological determinants of waste management behaviors.

Question 4: What strategies and interventions can enhance the willingness of impoverished populations to actively engage in the circular economy aspects of waste management? Cluster 4 provides insights into these strategies, including education, incentives, and community engagement to foster willingness to participate in circular

economy practices (e.g., Ghazali et al., 2021; Slavík et al., 2021). The author highlights that a focus on strategies and interventions can enhance the willingness of impoverished people to participate in waste management by addressing their attitudes and beliefs. Along with raising awareness and community inclusion, it can play a crucial role in shaping impoverished peoples' willingness to participate in sustainable waste management initiatives.

Questions 3 and 4 are consolidated and visually presented in Figure 3. On the left side, the inclusion of the most pertinent and influential theories within the research context is thoughtfully organized, reflecting the researchers' comprehensive coverage of relevant domains. Models, such as the new ecological paradigm (Barradas & Ghilardi-Lopes, 2020), indicate a deliberate emphasis on fostering a pro-ecological worldview, particularly prominent in environmental education. This approach aligns with intervention recommendations from Slavík et al. (2021) and Ghazali et al. (2021), advocating for culturally aligned educational strategies (e.g., workshops, awareness campaigns, clean-ups).

The literature review identifies key theories for future research in waste management. Community engagement theory suggests involving local communities in positive changes in attitudes and behaviors (Ghazali et al., 2021; Shyamal et al., 2023; Sinthumule & Mkumbuzi, 2019; Zambazi et al., 2021). Complexity Theory addresses waste management challenges, emphasizing a holistic understanding. While the theory of planned behavior is extensively used, its focus on intentions raises limitations (Figure 3).

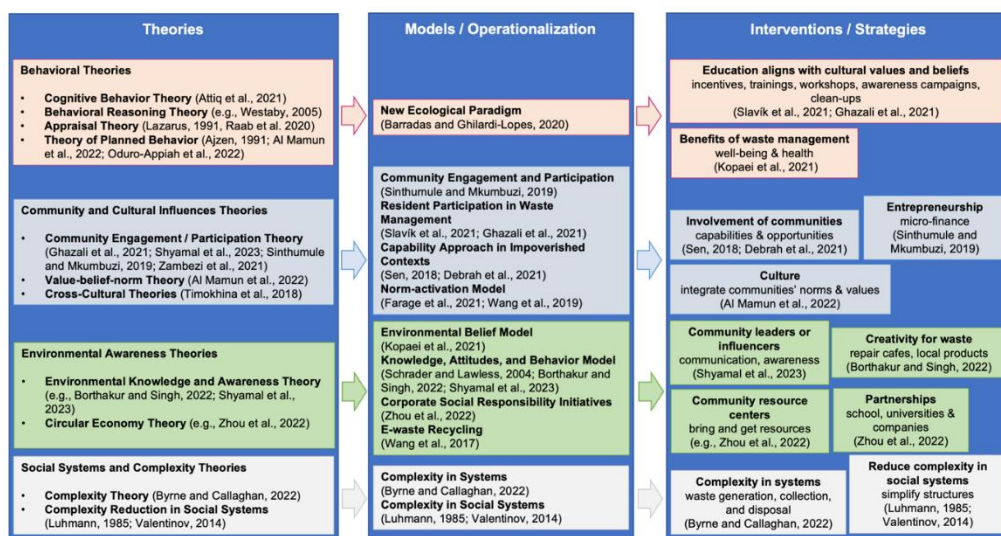


Figure 3. Overview of theories, models, and interventions employed or recommended in the 124 articles

Source: own processing

Cognitive behavior theory underscores knowledge's role, aligning with Attiq et al. (2021). Environmental knowledge and awareness theory explores awareness impact (Borthakur & Singh, 2022; Shyamal et al., 2023). Community participation theory highlights positive transformations (Ghazali et al., 2021; Sinthumule & Mkumbuzi, 2019). Valentinov's perspective suggests simplifying social systems for sustainability, applicable in waste management at the BoP. Luhmann's social systems theory challenges are addressed by robust models like the theory of planned behavior. Applied circular economy theory emphasizes circularity in waste management (Celestino et al., 2022). Cross-cultural theories (Timokhina et al., 2018) and behavioral reasoning theory (Westaby, 2005) consider diverse practices and cognitive processes, particularly in regions like China. Concluding, this literature review provides a significant theoretical contribution,

synthesizing diverse theories and offering a comprehensive framework for future research and interventions in sustainable waste management and enriches the scholarly discourse.

To enhance the understanding of waste disposal behaviors at the BoP, the author also calls for extending the scope of applied theories and putting more focus on aspects such as emotions, spirituality, and religion because it seems that they are linked to the disposal behavior of household belongings (Raab et al., 2021a).

The presented implications address identified gaps in the literature review and provide a context-specific roadmap for sustainable waste management. The managerial implications offer a strategic guide for organizations addressing sustainable waste management challenges. Consumer behavior concepts, such as the new ecological paradigm and the knowledge, attitudes, and behavior model, highlight the importance of understanding individual perceptions and shaping informed disposal practices (Barradas & Ghilardi-Lopes, 2020; Borthakur & Singh, 2022; Farage et al., 2021; Kopaei et al., 2021; Schrader & Lawless, 2004; Shyamal et al., 2023). Management-related concepts advocate corporate social responsibility initiatives, emphasizing end-of-life product disposal responsibility as a strategic asset. Collaborative efforts with stakeholders can significantly alleviate the burden on local waste management systems (Wang et al., 2017; Zhou et al., 2022). In public policymaking, community engagement and participation are deemed fundamental. Encouraging local communities in waste management programs, with a holistic approach involving awareness campaigns and citizen participation, is crucial for behavior change (Ghazali et al., 2021; Shyamal et al., 2023; Sinthumule & Mkumbuzi, 2019). Acknowledging the capability approach is essential, particularly in impoverished contexts, recognizing the impact of poverty on waste management and addressing associated barriers (Debrah et al., 2021; Sen, 2018).

The concept of knowledge dynamics aligns with the multifaceted nature of solid waste management. Rational knowledge, represented by theoretical frameworks and management models (see the results section), is evident in the application of various waste management theories and concepts. Spiritual knowledge (Bratianu, 2015) comes into play through community engagement, emphasizing the importance of values and norms in promoting sustainable waste practices (Raab et al., 2021a). The recognition of emotional knowledge (Bratianu, 2015) highlights the significance of understanding the emotional aspects and motivations that drive individuals to engage in sustainable waste management, shedding light on the emotional connections and attitudes that influence their behaviors in this critical context (Raab et al., 2021b). Finally, the author concludes that the field of emotions, religion, and spirituality (Raab et al., 2021b) remains underdeveloped in connection with disposal behavior and an emphasis on developing countries.

Conclusions

The importance of this topic arises from the increasing challenges of waste management and its negative impact on the environment, particularly when focusing on developing countries and low-income populations. The contributions of this literature review are multifaceted. First, it sheds light on the significant challenges faced by developing countries in managing solid waste, especially in urban areas. It emphasizes the need for individualized solutions, community participation, and culturally sensitive approaches. Second, it provides insights into scientific theories that can potentially be applied, and the management-based solution approaches required to improve household waste disposal behavior in developing countries. Third, the review emphasizes the importance of consumer perspectives in waste management, with a focus on individuals at the BoP. It discusses the role of theories such as the theory of planned behavior in promoting pro-environmental behaviors among consumers.

This literature review aligns with the scope of knowledge advancements in waste management and behavioral psychology. It not only consolidates existing knowledge but also bridges the gap between theory and management solutions. By focusing on developing countries and low-income populations, it advances scholarly knowledge by opening an inclusive perspective, enabling the mapping of scholarly research and dynamic learning in management practices. This review underscores the necessity of community engagement, consumer-focused approaches, and more awareness campaigns, thus advancing knowledge in the field and promoting environmental sustainability. With regard to the question of whether and how to change people's behavior to be more environmentally friendly, it can be said that scholarly research efforts are increasing. Seemingly, the solution is that management must handle sustainable waste management individually, in a context-specific way, and very sensitively because of the living conditions of people in poverty.

This work is certainly limited by the keyword selection being confined to the research focus on solid waste management and disposal behavior at the BoP. Additionally, the review's reliance on the quality and comprehensiveness of the available articles embraces the limitations of the original research. In this study, the Web of Science was used as the search engine of choice due to its widespread recognition in academic research and to ensure academic rigor by using peer-reviewed sources indexed in the Web of Science database.

For further scholarly enrichment, the author proposes an exploration of interdisciplinary studies intersecting with solid waste management, such as social sciences or public health. This approach can offer a more holistic perspective, enabling researchers to enhance their theoretical focus and innovate solutions that resonate with diverse aspects of the subject.

The implications of this literature review are far-reaching. Scholars in the field of waste management, environmental sustainability, and behavioral psychology can benefit from the results, but also from the overview of considered theories, and management-based solutions. For practitioners, including policymakers and waste management organizations, this review offers actionable insights, underscoring the importance of community involvement and culturally sensitive strategies in waste management and highlighting the potential of consumer-focused campaigns and education programs (e.g., trainings, clean-ups) to drive environmentally responsible behavior.

Future research through in-depth case studies and empirical research in specific regions can provide a deeper understanding of waste management challenges and solutions tailored to unique contexts (Halme et al., 2022). It is important to further explore consumer-centric and country-based approaches. A detailed comparative analysis of the various geographical contexts within the BoP, as an extension of the research focus in this literature review, would undoubtedly be enriching and should be considered for future research.

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