

Review

From Ocean to Table: How Public Awareness Shapes the Fight Against Microplastic Pollution

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Abstract

Microplastic pollution is an escalating environmental and public health issue. Defined as plastic particles less than 5 mm in size, microplastics have been found in oceans, rivers, food, drinking water, air, and even human tissues. While scientific research on microplastics has expanded significantly, public understanding and behavioral change remain limited. This literature scan synthesizes global findings on public awareness, perceptions, and responses to microplastics, drawing from surveys, focus groups, and online behavioral data collected by existing studies. It explores the following: (1) general knowledge and perceived environmental and health risks; (2) trust in scientific and governmental sources; (3) willingness to adopt behavioral changes; (4) attitudes toward policy and corporate responsibility. Public concern is high, especially regarding marine life and food safety, but varies across populations based on education, socioeconomic status, and media exposure. Despite growing concern, psychological distance and persistent knowledge gaps hinder meaningful action. Communication strategies such as school programs, media campaigns, and eco-labels show mixed success, while regulatory interventions like plastic bags or microbead bans are more effective when supported by clear public messaging. This literature scan highlights the need for interdisciplinary collaboration to close the knowledge-behavior-policy gap and strengthen public engagement, particularly in urban settings where consumption and waste generation are concentrated.

Keywords: microplastic pollution; public perception; risk awareness; behavior change; policy trust; science communication; environmental education; sustainability



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1. Introduction

Microplastics, commonly defined as plastic particles less than 5 mm in size, have become a focal point of environmental concern in the 21st century. Originally identified in marine ecosystems in the 1970s, microplastics are now recognized as a global pollutant found in both urban and rural environments [1]. They originate either as microbeads, fibers, and pellets, directly manufactured for use in consumer products (primary) or from the degradation of larger plastic waste (secondary) [1,2]. Due to their small size and persistence, microplastics have infiltrated virtually every corner of our planet's ecosystems. Scientists have detected microplastic contamination in drinking water, sea salt, beer, and other foods [3,4]. Airborne microplastic particles have become part of atmospheric cycles, leading to human inhalation exposure both indoors and outdoors [4]. Alarming, studies have

recovered microplastics from human tissues and fluids, including liver [5], heart tissue [6], blood [7], placentas [8], breast milk [9], and stool [10], highlighting multiple pathways by which these particles enter the human body (Figure 1). While research on health effects is still nascent, early evidence links microplastic exposure to inflammation, oxidative stress, and other potential health risks (e.g., respiratory issues and possibly cancer) [11,12]. These findings underscore that microplastics represent not only an ecological issue but also a direct human health concern [13].

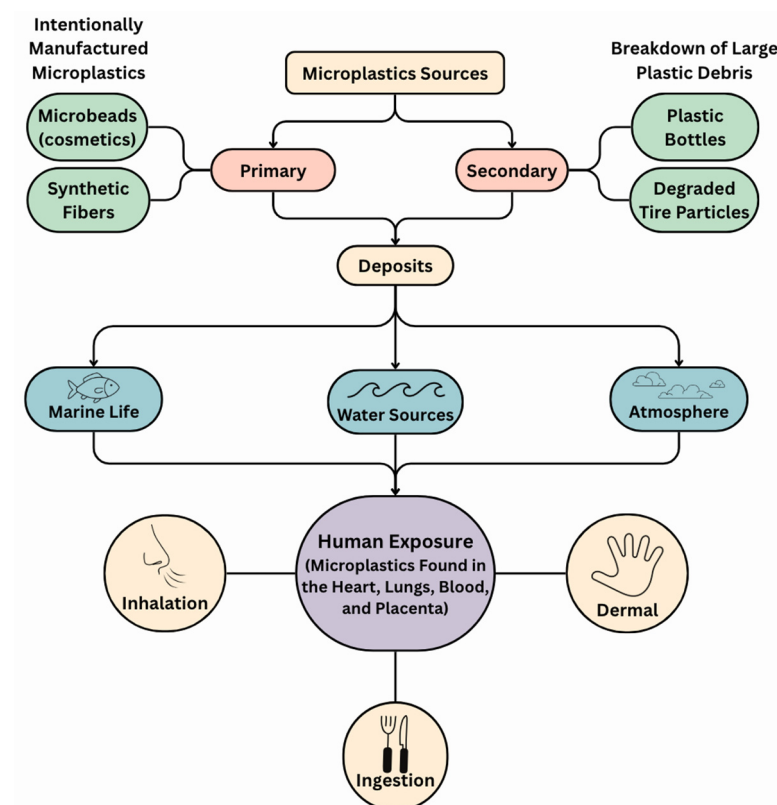


Figure 1. Conceptual framework of microplastic pollution and human exposure. Icons trace primary and secondary sources, environmental compartments, transport processes, exposure routes (ingestion, inhalation, dermal), and tissues where particles have been recovered [5–10]. This overview visually sets the stage for later sections on awareness and risk perception. Created by the authors based on information from cited references.

The rise in microplastic pollution has coincided with greater public visibility of plastic waste problems, yet a critical gap remains between scientific knowledge, public behavior, and policy action. This “knowledge–behavior–policy” gap refers to the disconnect whereby increasing information on microplastic risks does not automatically translate into widespread behavior change or rapid policy responses. Public engagement is increasingly seen as essential for addressing microplastics: informed citizens can pressure industry and policymakers, adopt personal waste-reduction habits, and support regulatory initiatives. However, achieving such engagement requires understanding the current state of public awareness and attitudes toward microplastics across different societies.

This article reviews the literature (2015–2025) on public awareness and perceptions of microplastics, focusing on how people worldwide understand the issue, how concerned they are, what actions they are willing (or unwilling) to take, and how they view the roles of government, industry, and science in addressing microplastic pollution. We draw on peer-reviewed surveys and studies from high-income countries as well as low- and middle-income countries to capture a global perspective. Key demographic and cultural factors,

including age, education level, media exposure, and political orientation are examined to illuminate how different segments of society perceive microplastic risks.

We begin by summarizing the environmental and health risks of microplastics in urban and aquatic ecosystems, setting the stage for why public engagement is urgent. We then organize the review around four thematic areas: (1) general public understanding of microplastics and perceived impacts on environment and health; (2) credibility and trust in information sources (scientists, government, media) regarding microplastics; (3) public willingness to change personal behavior (such as reducing plastic use, increasing recycling, or adopting alternatives) in response to microplastic concerns; (4) public trust in policy measures and attitudes toward industry responsibility for microplastic pollution. In each section, we integrate findings from multiple countries and highlight differences and commonalities. We also discuss the methodologies used to gather these data, including traditional surveys, focus groups, and novel “infodemiological” analyses of internet and social media trends and note the limitations inherent in studying public perception. The influence of media and education in shaping awareness is considered, given that media narratives and school curricula can profoundly affect public understanding of emerging environmental issues.

This review identifies how public misunderstandings or apathy toward microplastics may hinder progress on urban sustainability goals and regulatory efforts. When individuals lack accurate knowledge of microplastic sources, pathways, and solutions—or do not feel personally affected—they are less likely to support meaningful policy changes [14]. These gaps between concern and action mirror patterns seen in other environmental issues, often described as psychologically “distant.” Despite general awareness of plastic pollution, many people remain unaware of microplastics’ pervasive presence in daily life or are unsure how to respond effectively. While several prior reviews have examined the environmental and toxicological impacts of microplastics or summarized policy measures, few have comprehensively synthesized global evidence on public awareness, perceptions, and behavioral responses—particularly with attention to how demographic, cultural, and media factors shape these views. This review fills that gap by integrating findings from both high-income and low- to middle-income countries, incorporating diverse data sources including surveys, focus groups, and infodemiological analyses, and critically evaluating communication strategies for their ability to translate concern into action. By doing so, it provides an interdisciplinary perspective that connects public perception research with policy relevance. We assess interventions such as awareness campaigns, nudges, eco-labels, and regulations like microbead or single-use plastic bans, drawing lessons from both successful and ineffective efforts. The article concludes with forward-looking recommendations for how scientists, educators, policymakers, and urban planners can collaborate to improve public understanding, promote informed behavior, and foster collective action.

Methods and Data

This review was guided by four research questions designed to capture the multiple dimensions of public awareness and responses to microplastics:

- a. What is the level of public awareness and perceived environmental and health risks of microplastics?
- b. How credible are scientific, governmental, and media sources in shaping public perception of microplastics?
- c. To what extent are individuals willing to adopt behavioral changes in response to concerns about microplastics?
- d. How does the public view policy measures and corporate responsibility in addressing microplastic pollution?

Literature search: We adopted a comprehensive, narrative approach rather than a formal systematic review, with the goal of synthesizing diverse evidence across disciplines. To capture the breadth of literature, we searched PubMed, Web of Science, Scopus, and Google Scholar, focusing on studies published between 2015 and 2025. Search terms included “microplastics AND public perception,” “microplastics AND awareness,” “microplastics AND behavior,” “microplastics AND policy,” and “microplastics AND trust.” Because public perception of microplastics is addressed in multiple fields, we also included relevant policy reports, survey data, and infodemiological analyses. Reference lists of key papers were cross-checked to identify additional sources.

Inclusion and Exclusion Criteria: We included studies that (a) provided empirical insights into public awareness, perceptions, behavioral responses, or attitudes toward microplastics, and (b) were published in peer-reviewed journals or authoritative reports. We excluded sources focusing solely on toxicology, laboratory methods, or environmental measurements without a perception or policy component. This ensured the review remained focused on the social and behavioral aspects of microplastics.

Study Scope: The reviewed literature employed a range of methods to assess public perceptions of microplastics. The majority of studies used cross-sectional surveys, which provide broad insights into awareness, risk perception, and attitudes toward interventions [13,15,16]. These surveys allow for large sample sizes and comparability across regions, but they also vary widely in definitions, question wording, and measures of concern. As a result, findings can sometimes reflect methodological inconsistencies as much as true differences in public opinion [1].

A smaller number of studies employed mixed methods, combining surveys with qualitative interviews or focus groups. These approaches allow for both breadth and depth, quantifying awareness levels while also capturing misconceptions, uncertainties, and the narratives that shape individual and community responses [17,18]. Although such studies are less generalizable due to smaller samples, they are valuable for illuminating how people make sense of microplastics in their everyday lives [19].

More recently, researchers have turned to infodemiology as a novel tool to capture public interest and discourse in real time. By analyzing online search behavior, media narratives, and social media content, these studies reveal how awareness spikes around major news events or scientific reports and then declines without sustained attention [20–22]. Infodemiological approaches offer timely insights but may overrepresent digitally active populations and do not always distinguish between curiosity and sustained concern [23].

Taken together, these diverse methods provide complementary perspectives. Surveys offer breadth, qualitative approaches provide depth, and infodemiology captures temporal dynamics. Each method carries strengths and limitations, underscoring the importance of triangulating evidence when interpreting public awareness, perceptions, and behavioral responses to microplastics [24].

Recent bibliometric analyses further highlight the growth and diversification of research on microplastics. Zhou et al. [25] documented the increasing scholarly attention to microplastics in the marine environment between 2004 and 2020, while Sorensen and Jovanović [26] mapped the expansion of research from nanoplastics to microplastics in the environment. These studies underscore the rapid emergence of the field and provide important context for understanding the evolution of public perception research [25,26].

Analytical Approach: Findings were synthesized thematically according to the four domains outlined in the research questions: (1) awareness and risk perception, (2) credibility of information sources, (3) trust in policy responses and industry accountability, and (4) willingness to adopt behavioral changes. Within each domain, we compared results across regions, demographics, and methods. The process is summarized in Figure 2, which

outlines how research questions, data sources, and thematic categories were linked in the review. Within each domain, we compared patterns across regions, demographics, and study methodologies, highlighting both consistencies and divergences. This approach allowed us to capture not only what is currently known about public perceptions of microplastics, but also the methodological strengths and limitations shaping this evidence.

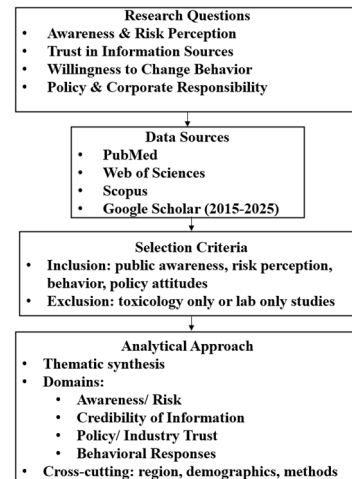


Figure 2. Conceptual framework of the comprehensive review. The diagram illustrates the flow from research questions to literature search, inclusion and exclusion criteria, study scope, and thematic synthesis. This process highlights how diverse sources were identified, screened, and organized into four domains (awareness and risk perception, information credibility, policy and industry trust, and behavioral change), ensuring a structured yet flexible approach consistent with a narrative review.

2. Public Understanding and Risk Perception of Microplastics

2.1. Awareness and Knowledge Levels Across Regions

Over the last decade, public awareness of microplastics has increased markedly in many countries, but significant portions of the population remain unfamiliar with the term microplastics or lack detailed knowledge of the issue. Surveys from high-income nations often show moderate awareness. For example, in the United States (U.S.)—the world’s largest per capita producer of plastic waste—about half of adults (49%) in 2021 had heard of microplastics [13]. However, only 18% considered themselves “very familiar” with the topic, while the rest had only a vague understanding [13]. Similarly, a recent study in Portugal found that less than half (47%) of respondents knew the term “microplastics” before being surveyed [27]. These figures suggest that even in regions where plastic pollution is a known environmental issue, the specific concept of microplastics is not yet universally recognized by the public.

Awareness levels tend to be lower in many low- and middle-income countries, where public attention to pollution issues may focus more on visible waste or other pressing needs. In Bangladesh, a country severely affected by plastic pollution—research shows that a majority of people have little to no awareness of microplastics. One survey found only 12% of respondents had any prior knowledge of microplastic pollution, whereas roughly two-thirds admitted being completely uninformed [28]. Another study similarly found that 66% of participants felt uninformed about microplastics, despite living in communities affected by plastic debris [29]. Qualitative interviews with Indonesian coastal fishers reveal a similar gap: fishers routinely encounter plastic fragments in their nets yet lack the vocabulary or scientific framing to describe the phenomenon [30]. In Malaysia, a 2024 survey further reported that just over half (54%) of respondents had heard of microplastics, and only 50% were aware of associated risks [27]. These findings underscore a global disparity: while

populations in Europe, North America, and Australia increasingly recognize microplastics as an environmental and health issue, many LMIC communities remain largely unaware of the problem. Such contrasts highlight the importance of tailoring communication and education strategies to local contexts when addressing microplastic pollution.

Even within affluent nations, public knowledge about microplastics stratifies demographic groups. A Norwegian open-ended “mental-models” study found that university-educated citizens could readily name microplastic sources and mitigation strategies, whereas those with less schooling struggled; younger participants recognized the term more often, yet older adults rated the problem as more personally threatening [14]. Similarly, a representative survey in Germany in 2020 found that over two-thirds of respondents rated the risk from microplastics as “very high” for both environmental and human health dimensions [15]. This disconnect is striking, as scientific assessments at the time had not confirmed such elevated levels of risk; rather, researchers noted a divergence between the still-inconclusive evidence base and public perceptions, which leaned toward worst-case assumptions. Individuals who were more environmentally engaged—and those exposed to alarming media narratives—were especially likely to perceive microplastics as dangerous. These results suggest that heightened media attention to potential harms, such as marine toxicity or food contamination, may be shaping public perception ahead of the scientific consensus.

Despite gaps, overall public awareness of microplastics has trended upward in the last decade. Infodemiological evidence supports a growing global interest: analyses of Google Trends data show that internet searches for “microplastics” have surged worldwide and reached record highs in recent years [20]. A 2025 study that analyzed Google search behavior in 56 countries found a moderate but significant correlation between a country’s plastic waste generation and its search interest in microplastics ($r \sim 0.43$) [21]. In other words, populations in countries producing more plastic waste (such as the United States, Australia, and some high-waste Asian nations) also showed greater engagement with microplastics online. The same study noted that health-related queries were especially common: people frequently searched for phrases like “microplastics in blood,” “microplastics in placenta,” or links between microplastics and diseases (cancer, infertility, heart attacks) [20].

International survey data from 2015 to 2025 confirms that microplastics have entered the public consciousness, although awareness levels vary significantly by region. In Europe and Australia, a large 15-country survey ($n > 15,000$) conducted around 2020 found that the public was highly aware and concerned about microplastics’ human health impacts [31]. In fact, Europeans and Australians in that study ranked plastic pollution (especially microplastics in the food chain) as the greatest marine-related threat to human health—above issues like chemical spills or oil pollution [31]. By contrast, in countries where public discourse on plastic pollution has been less prominent, microplastics are rarely singled out as a distinct concern. Overall, one can observe an awareness gap between higher-income, media-rich societies and lower-income regions—a disparity that may impact each society’s readiness to tackle microplastic pollution.

2.2. Risk Perception: Environmental vs. Health Concerns

Knowing about microplastics is one thing; perceiving them as risky or harmful is another [24]. Among those familiar with the issue, risk perceptions are often high. Many people intuitively view microplastics as dangerous pollutants, even though the scientific evidence on specific health effects is still emerging [13]. A U.S. survey found that almost half of adults reported being “very concerned” about microplastics in oceans and wildlife, while slightly fewer expressed the same concern about potential health risks. Individuals

with direct connections to the issue, such as frequent seafood consumers, tended to report greater worry [13].

A consistent finding is that people perceive microplastics as a greater threat to the environment than to their own health. Ecological impacts such as harm to marine life and contamination of waterways are often cited as the most serious risks. This emphasis reflects media narratives that popularized microplastics as primarily an “ocean problem” [13,14].

However, as reports increasingly highlight human exposure (in drinking water, food, and even human tissues), concern about health effects has grown. In some surveys, concern rose significantly after participants were shown brief factual explanations of how microplastics persist and enter food webs [13]. This reveals a knowledge–perception gap: people may underestimate risks until provided with more information.

Risk perception also varies across demographic groups. Studies often find that women express greater concern than men, and older adults sometimes report higher worry than younger adults, possibly due to heightened sensitivity to health risks [15,29,32]. Education level may also shape perception, with some evidence that less formally educated individuals adopt a more precautionary stance.

Importantly, health-related concerns must be interpreted with caution. Early research suggests possible links to inflammation and oxidative stress, but these findings remain preliminary and the implications for human health are not yet fully understood. Public perceptions may therefore outpace scientific consensus, highlighting the need for transparent communication that distinguishes between established evidence and ongoing uncertainty [15].

3. Credibility of Information Sources and Media Influence

An important dimension of public awareness is the perceived credibility of information sources on microplastics. In tackling any emerging environmental issue, the public typically receives information from scientists (through reports or outreach), government agencies and officials, news media, social media, and non-governmental organizations. The degree to which individuals trust these sources will influence how seriously they take warnings about microplastics and whether they might change their beliefs or behaviors. This section explores the public’s trust in scientific versus governmental information on microplastics and the role of media narratives, including potential misinformation, in shaping perceptions.

3.1. Communications from Scientists and Government Organizations

Surveys indicate that scientists generally possess a relatively high level of public trust as information providers on environmental issues, and microplastics appear to be no exception. When asked who they trust for information about microplastics (particularly in food and drink), respondents in some studies have rated scientists as more credible than government entities or media sources [33]. For instance, a 2025 study on microplastics in food safety found that scientists/universities were trusted more than government agencies, which in turn were trusted more than social media or commercial media [33]. People tend to believe scientific experts, especially if they are seen as independent and knowledgeable, whereas government sources might be viewed with some skepticism if citizens suspect downplaying of issues for political reasons [34]. Media outlets, given their mixed track record on accuracy, often garner little trust unless they have a reputation for quality science journalism.

However, public trust is not uniform. It varies by individual worldview and by how information is communicated. For example, many studies indicate that trust in science is divided across political parties in the United States, with a greater proportion of Democrats

trusting science compared to Republicans [35,36]. Likewise, trust in science and national institutions varies across the world: data show that many Europeans trust information on food-related risks from scientists (82%), followed by consumer organizations (79%), national authorities (60%), and EU institutions (58%) [37]. In the U.S., 76% of Americans express a great deal or fair amount of confidence in scientists to act in the public's best interests, and 65% view research scientists as honest [36]. Conversely, in places where government or organizational transparency is questioned, the public may doubt official statements on pollution safety. A 2025 qualitative study in Iran on microplastic health risk perceptions found an erosion of public trust in environmental managers. Participants cited unclear laws and weak enforcement, poor coordination among responsible bodies, and a lack of accountability among managers as some of the factors that led to the deterioration of trust [38]. This lack of trust can lead people to rely more on alternative information channels, such as social media or word-of-mouth, which may or may not be reliable [34].

One concern is the perceived lack of transparency in scientific and governmental communication about microplastics. The scientific understanding of microplastics' impacts is evolving, and agencies have sometimes been tentative in their public advisories, given inconclusive evidence [39]. This caution, while scientifically appropriate, can be misinterpreted by the public as withholding information: a 2024 systematic review noted "inconsistencies, confusion, and a perceived lack of transparency" in how scientific findings on microplastics are communicated to the public [24]. Furthermore, scientists themselves have expressed concern that the nuance of their research may be lost in the context of modern communication methods, as increased reliance on social media for information blurs the line between scientific fact and un-verified reports [24,40]. Indeed, scientists worry that misinformation and oversimplification in the public sphere are clouding communication of microplastics risk. For example, a 2019 report found that 67% of scientific studies analyzed framed microplastics risks as hypothetical or uncertain, while 93% of media articles implied that microplastics risks are highly probable [41]. Ensuring credibility thus involves not only trustworthy communication but also the active opposition of miscommunication.

Government agencies in the U.S. have begun to address microplastics. For example, the Environmental Protection Agency (EPA) and Food and Drug Administration (FDA) both have webpages dedicated to communicating microplastics research to the public and summarizing risk findings in an accessible manner [42,43]. However, declining reliance on official sources for risk communication and public awareness means that many individuals first learn of microplastics through social media, rather than through governmental advisories [24]. This shift suggests that public trust often depends on secondary sources, which may be reported by laypeople without regard for the entire context of available evidence [24]. With the power to influence public opinion and drive social action, the source from which individuals obtain information relating to microplastics risk is crucial [24]. If a sensational news headline from a modern media source is later contradicted by a government fact-sheet, it is possible that public distrust in either or both sources of information can emerge. Consequently, clear and credible scientific messaging—grounded in public confidence and broad awareness of reliable information—is crucial to counter misinformation and prevent the spread of misleading or harmful narratives.

3.2. Media Narratives and Misinformation

The media, including traditional news outlets and newer social media platforms, has played a pivotal role in raising public awareness of microplastics [19]. Over the last decade, concern about the effects of microplastics on health and the environment has grown, spurring research on the topic and, consequently, widespread mediatization [1]. On the positive side, media attention has alerted the public to the existence of microplastic pollution

and framed it as an important issue of our time in a similar fashion to other environmental issues [1]. Documentaries, high-profile news stories about microplastics found in sea life, and viral social media posts have all contributed to the public consciousness. Mass media essentially acts as a “social amplifier” for scientific findings, validating them to lay audiences and spreading them widely [1]. For instance, a study by Traylor et al. (2024) on microplastics found in sea life received global press coverage: a news article about the study with the headline, “Study finds microplastic contamination in 99% of seafood samples” was shared widely on social media platforms, undoubtedly informing millions who might never read a scientific journal [44,45]. Even short, attention-grabbing posts such as the widely circulated image of a sea turtle with a plastic straw in its nose receive millions of views on social media, spreading awareness to plastic overuse and pollution [1]. The media’s ability to construct narratives relating to microplastics not only increases awareness of scientific findings and environmental issues but further influences the public’s risk perception.

Significantly, increases in perceived risk often beget increases in action. For instance, a BBC documentary on plastic waste in the ocean brought awareness to the environmental issues relating to plastic overuse, spurring a wave of action globally [1]. This action often takes the form of additional information gathering and advocacy. In 2015, the United States government announced the Germ-Free Water Act, which prohibits the manufacturing, packaging, and distribution of rinse-off cosmetics containing plastic microbeads [46]. This law was enacted on the heels of the #BantheBead campaign, which created the social pressure and media attention necessary to change policy [19,47]. It is through narratives constructed by the media that individuals learn about and gain passion for environmental issues like microplastics.

However, the narratives surrounding microplastics perpetuated by the media are not always accurate, as with heightened coverage comes the risk of sensationalism and inaccuracies to increase views [15]. In the case of the #BantheBead campaign critics argue that the change in federal law was based on public outrage and media attention rather than scientific evidence [19,47]. Furthermore, journalistic simplification and/or bias can sometimes distort scientific nuance. A systematic review of media content on microplastics identified several problematic patterns: missing or incorrect referencing of scientific sources, factual inaccuracies, misleading representations of the scale of pollution, and alarmist tones not backed by evidence [24]. In fact, only 7% of articles examined focused solely on reporting of factual scientific information without further interpretation [24]. A common narrative that “microplastics cause cancer” circulated in the media without robust evidence, likely derived from laboratory studies of cell toxicity that were not directly translatable to human risk [41]. Such narratives, once in the public domain, can strongly influence perception: Pop et al. (2023) found that people who had heard media claims like “microplastics cause cancer or infertility” were significantly more likely to express high concern about microplastic health risks [1]. Public awareness and concern relating to microplastics exposure are growing as a result of media attention, but media claims—which establish public risk perception—are often not supported by scientific studies on environmental and human health risks [15].

The credibility and flow of information about microplastics depend on a complex interplay of scientific findings, media coverage, government communications, and educational messages. Misinformation, unsupported claims, and contradictory ‘facts’ propagated by the media have the potential to undermine public trust in the information they are receiving overall. When one article, titled, “Researchers find a massive number of plastic particles in bottled water,” mentions that microplastics have been found in human blood and lungs [48] while another article from the same news outlet reads, “WHO study finds no evidence of health concerns from microplastics in drinking water,” [48] individuals may become unsure what to believe. Such inconsistencies, along with alarmist tones and

speculative reporting, can erode trust, as Agnew et al. (2024) observed [24]. Broadcasting every step of research—including contradictory data—may cause the public to dismiss concerns or panic unnecessarily [41]. This fragmented and often conflicting information landscape underscores the need for coordinated, transparent messaging from scientists and policymakers. Improving clarity and consistency in communication is essential, as public understanding directly shapes risk perception and willingness to act.

Social media is a specific branch of information dissemination that acts as a double-edged sword in this circumstance. Platforms like Twitter, Facebook, and Instagram can engage younger audiences and disseminate information rapidly, allowing for increased accessibility of information on microplastics that drives community and policy action [1]. However, social media also allows unvetted and sensationalist claims to spread, igniting fear and driving public opinion in unfounded ways. Content analyses of environmental communication on social media show that posts often blend factual information with speculation, which can fuel misunderstandings and overstate risks [24]. In the case of microplastics, online discussions frequently emphasize dramatic imagery or health threats without sufficient context, shaping perceptions in ways that may not align with scientific consensus [41]. Thus, while social media offers unprecedented reach and engagement potential, it also demands careful navigation to ensure accuracy and prevent the amplification of misinformation.

Recognizing the power of the media, experts have called for more accurate and balanced reporting on microplastics [1]. Ensuring that headlines reflect realistic outcomes and that articles provide context (e.g., noting what is known versus unknown about health effects) is vital. Common misconceptions gleaned from the media, including the belief that microplastics cause genetic mutations, can be avoided through accurate reporting of established scientific facts while avoiding interpretation or speculation. Emphasizing the cause, use, and waste streams of plastic pollution, rather than uncertain or hypothetical health and environmental effects of microplastics, can further direct data-guided public opinion and action [24]. In addition, to ensure that scientific information better reaches diverse audiences, it may be beneficial for scientists and researchers to engage directly with audiences as opposed to allowing interpretation and subsequent communication by a third party [49,50].

4. Public Trust in Policy Responses and Industry Accountability

As microplastic pollution is a systemic issue, solutions require not only individual action, but also collective policy measures and industry changes. Public support for such measures, and trust in the entities implementing them is crucial for their success. This section examines how the general public views governmental and industry roles in addressing microplastics. We explore survey findings on who people think should take responsibility, how much they trust various policy responses, and whether they have confidence that industries will act accountably. We also consider how a lack of public awareness or concern can impede policy progress, linking back to the knowledge gaps discussed earlier.

4.1. Who Is Responsible?

One clear theme in public surveys is people believe that the responsibility for addressing plastic and microplastic pollution should lie primarily with those who produce it. A 2024 Eurobarometer survey of representative samples across EU member states found that 92% of Europeans say companies should pay for the costs of cleaning their pollution [51]. This overwhelming agreement reflects a principle known as Extender Producer Responsibility—a policy approach that places the responsibility of a product's lifecycle

on the producer, rather than solely on consumers or the government [52]. At the same time, 74% in that poll also felt public authorities should allocate funds for environmental cleanup, indicating a belief in shared responsibility, but with industries taking on the primary lead role.

In the U.S., where an individualist culture often emphasizes personal responsibility, surveys still show that the public largely attributes blame for plastic pollution to the industry. In a 2021 nationwide survey, 41% of U.S. adults identified the plastic industry (manufacturers and producers) as bearing the greatest responsibility for reducing plastic pollution, while only 19% said the federal government should be most responsible, and 18% pointed to consumers themselves [13]. These responses suggest that, despite being labeled as ‘consumers,’ Americans do not primarily blame themselves for the problem, but rather they direct the root of the issue towards those who produce disposable plastics. Notably, members of environmentally engaged organizations, such as Ocean Conservancy, were even more likely to assign primary responsibility to industries [13]. This public consensus view likely stems from a growing recognition that individual actions alone are inadequate in the face of continued large-scale plastic production by corporations.

Public trust in policy measures to address microplastics is generally positive but not without skepticism. Many individuals support interventions such as bans and regulations, yet there is concern about their enforcement and sufficiency [13,53]. Plastic bag bans and microbead bans have become common across U.S. states and are often viewed as common-sense steps. However, some critics in the public argue that such bans are inadequate relative to the scale of plastic production. As Gannon et al. (2025) stated, bag and straw bans are frequently criticized for their lack of strict enforcement and deflect attention from more major sources of microplastics, such as synthetic textiles and tire wear [4]. Currently, the 2015 Microbead-Free Waters Act remains as the only federal law directly addressing microplastics, and other proposed legislations like the MICRO Plastics Act have been stalled in Congress, with public knowledge of these measures being limited. What U.S. citizens do see are general plastic reduction policies, but these are often perceived as insufficient [4,54]. These perceptions, shaped in part by media critiques, reflect a broader concern that current policies fall short of tackling the complexity and scale of microplastic pollution.

4.2. Support for Specific Policies and Interventions

When asked about concrete policy actions to mitigate microplastics, high support has been shown. For example, in the U.S., a 2021 voter survey in California, Florida, Maine, and Washington reported that 76% of voters supported legislation to reduce plastic pollution, and 80% supported laws aimed at reducing ocean pollution [55]. This reflects broad public support in coastal states for environmental legislation targeting plastic waste and marine debris. Further evidence from a nationwide survey found that Americans expressed strong support for a range of microplastic-related interventions, including phasing out single-use plastics, mandating filters in washing machines, and government funded research on microplastic health risk [13]. In Europe, public support for rigorous microplastic interventions is also high. According to a 2021 Eurobarometer survey, up to 89% of Europeans expressed concerns about microplastic pollution and the environmental impacts of plastic products [56]. However, a nuance is that while people often express support for strong action on microplastic pollution, they may be reluctant to bear the full cost or inconvenience unless it is fairly distributed. For example, mandating filters on washing machines—an expense that could be passed to consumers, tends to receive less public enthusiasm than policies requiring producers to contribute to pollution mitigation funds. In an Oregon study, willingness to pay for high-efficiency microfiber filters was relatively low, with fewer than 25% of respondents willing to cover the full cost. However, support

significantly increased when government subsidies were introduced [4]. These findings suggest that the public expects industry or government to shoulder a meaningful portion of the financial burden in order to make microplastic mitigation strategies more equitable.

4.3. Impact of Public Awareness on Policy Action (or Inaction)

A critical insight from social science research is that public awareness and public presence, or the absence of it, can directly influence policy outcomes. Policymakers are more likely to implement strong regulatory measures when there is widespread public understanding and demand. Conversely, when public awareness is low or concern is lacking, policy efforts often stall. This dynamic is clearly evident in the context of microplastics. Mahaliyana and Nugawela argue that limited attention to microplastic research in mainstream media contributes to insufficient public awareness, which in turn weakens pressure on decision makers [27]. Without citizens asking for change, policymakers may not prioritize microplastic pollution among many competing issues. This phenomenon has been observed in the U.S. Following the passage of the Microbead-Free Waters Act in 2015, which had relatively high public visibility and support, other microplastics legislation has struggled to gain traction in Congress [4]. One possible explanation is a shift in public attention, and there has not been sustained pressure to advance newer regulations.

In many urban contexts, local governments now actively engage residents around plastic reduction as part of sustainability goals. Public buy-in is crucial—for instance, Seattle’s attempt to introduce a 20-cent plastic bag fee in 2008 was repealed by referendum in 2009 due to public opposition, illustrating how mistrust or misinformation can inhibit or prolong new policy passing [57]. Conversely, when awareness is high, communities often demonstrate enthusiastic participation. Programs like Save Our Shores’ volunteer beach and river cleanups in Monterey Bay have removed tons of plastic debris and catalyzed local advocacy for plastic bag bans and educational campaigns [58]. Similarly, California’s Coastal Cleanup Day, attracting over 1.6 million volunteers, demonstrates how hands-on community involvement solidifies support for municipal plastic reduction initiatives [59].

5. Communication Strategies and Behavioral Interventions

Public concern about microplastics does not automatically translate into consistent action, making communication strategies and behavioral interventions essential for bridging this gap. In this section, we evaluate interventions with attention to both their successes and limitations. For this review, we define success in two ways: (1) demonstrated behavioral change (e.g., reductions in single-use plastic use, adoption of alternatives, compliance with bans); (2) increased public engagement or awareness (e.g., improved knowledge, stronger policy support, or heightened willingness to participate in advocacy). Limitations may include weak or short-term effects, inequities in implementation, or challenges with enforcement. This framing provides a balanced lens for evaluating awareness campaigns, nudges, eco-labels, and regulatory measures.

Bridging the gap between knowledge, attitudes, and action on microplastics requires effective communication and behavior-change strategies [29,60,61]. In recent years, interventions by governments, NGOs, educators, and businesses have aimed to raise awareness and encourage more sustainable plastic use behaviors [62–64]. This section evaluates several categories of interventions—informational campaigns, nudges, eco-labels, and regulatory measures—assessing their impact on public attitudes and consumption patterns [62–64]. We highlight examples of successful approaches as well as challenges and discuss strategies that show promise for modifying behavior in the microplastics context.

5.1. Public Awareness Campaigns and Education Programs

One strategy is to educate the public about microplastics through targeted campaigns [65]. These can range from school-based programs (e.g., incorporating microplastic pollution into curricula) to mass-media campaigns by environmental organizations [66,67]. The goal is to raise awareness of sources, risks, and potential solutions, while presenting microplastics as an issue requiring public attention and action.

However, communication research shows that simply providing factual information—known as the “informational deficit model”—is often insufficient to change behavior [14,65]. People need to see personal relevance [65,68]. As a result, campaigns increasingly highlight health or local environmental effects of microplastics, rather than only emphasizing distant marine impacts [68]. For example, the Ocean Conservancy in the U.S. shifted its messaging to include concerns about microplastics in seafood and salt, based on the hypothesis that such health-related framing would better engage the public. Indeed, their survey data indicated that members exposed to these communications reported higher levels of concern and knowledge than the general public [13].

A common limitation of awareness campaigns, however, is assessing their actual influence on behavior. Success is often claimed without rigorous evaluation, and attendees of educational events may already be more engaged than average [69–71]. Still, given persistent gaps in understanding of microplastic sources and solutions [14], education remains a crucial first step in any broader intervention.

5.2. Willingness to Adopt Behavioral Changes

Public willingness to modify behavior in response to microplastic concerns is an essential but uneven dimension of engagement. Surveys consistently show that while many individuals express high levels of concern, fewer translate that concern into sustained action. In the United States, for instance, most respondents support reducing single-use plastics, yet fewer consistently adopt practices such as carrying reusable bags or bottles [13]. Similarly, research from Germany indicates that although microplastics are widely perceived as a serious environmental and health threat, this perception does not consistently lead to lifestyle adjustments, such as changes in purchasing or consumption habits [15].

Willingness is often conditional on perceived personal relevance, convenience, and cost. Individuals are more likely to adopt behaviors that are low-cost or require minimal effort, such as avoiding microbead-containing cosmetics, compared to those involving higher personal expense, such as installing washing machine filters. A recent study showed that public support for filters increased markedly only when subsidies were introduced, underscoring the role of financial incentives [4].

Social norms also strongly shape willingness: when sustainable practices are framed as common or expected, individuals are more inclined to participate [72]. At the same time, willingness to change is not evenly distributed across populations. Younger respondents frequently report stronger pro-environmental attitudes, while older individuals sometimes perceive greater personal health risks and are motivated by those concerns [15]. Cultural and regional differences matter as well: in higher-income settings, willingness often manifests through consumer choice, whereas in lower- and middle-income contexts, awareness campaigns may first be needed to establish a foundation of understanding before behavioral change can occur [28,30].

Taken together, the literature suggests that willingness to adopt behavioral change is genuine but conditional. Effective interventions must therefore reduce barriers, reinforce supportive social norms, and connect recommended actions to outcomes that people perceive as personally relevant, such as food safety or health. These findings link directly

to communication strategies and highlight the need for policies and nudges that make sustainable choices both accessible and affordable.

5.3. Nudges and Behavioral Insights

Beyond providing information, interventions that directly alter choice environments—often called “nudges”—have gained attention in environmental policy [71,73,74]. Nudges subtly shift how options are presented to encourage certain behaviors without restricting freedom. In the context of plastics, this includes defaults like not providing straws or cutlery in delivery apps unless users opt in, or placing recycling bins in more prominent locations to increase recycling rates [74–76].

A notable example for microplastics involves requiring washing machines to include built-in microfiber filters [77]. If new washing machines came equipped with microfiber filters by default, consumers wouldn’t have to take any additional action themselves to reduce microfiber pollution [78,79]. While this approach involves regulatory pressure on manufacturers, it still leverages the behavioral principle of reducing friction. By building the filter into the product, it nudges the entire user base toward lower emissions without relying on individual motivation [79].

Social norms messaging is another effective strategy. People often mimic behaviors they see as typical [72,80]. Thus, campaigns highlighting that most people bring reusable bags, for example, can motivate others to do the same [81,82]. For microplastics, community challenges or pledges—like challenging a neighborhood to avoid plastic bottles for a month—may help normalize sustainable habits by making behavior change a shared experience [72,81,82].

5.4. Eco-Labels and Product Innovation

In the marketplace, clear labels about microplastic-related attributes can help guide consumer choices. Some textiles are labeled “reduced microfiber loss” or “designed to shed less” [83,84], while some cosmetics carry “Zero Plastic Inside” labels as an initiative by the Plastic Soup Foundation [85,86]. These labels can serve both as informative tools and badges for eco-conscious consumers, helping build trust and shift purchasing decisions toward more sustainable products [87,88].

However, the effectiveness of eco-labels depends on awareness and credibility [89,90]. Generic symbols with no explanation may have little impact. Conversely, recognizable NGO or government-backed labels—akin to organic or EnergyStar certifications—can drive competition among companies to meet standards [91,92]. In Europe, proposed labels for products like tires or cosmetics based on microplastic release could pressure manufacturers to adopt low-shedding designs [93,94]. Public surveys support such transparency, showing that consumers want to know which products contribute to microplastics so they can avoid them [4]. Yet many still do not know that common items like tires and synthetic fabrics are major contributors, so labeling can help fill this knowledge gap and empower informed choices [17,95].

Product innovation driven by consumer demand is another angle. Biodegradable or bioplastic alternatives—such as biodegradable glitter or bioplastic microbeads from natural materials—have emerged in response to public and regulatory pressure [95,96]. If these truly reduce microplastic persistence (an area of ongoing research), they could cut pollution without requiring behavior change. By voicing their preferences and concerns, consumers create a market incentive for such innovation [95,96].

5.5. Bans, Infrastructure, and Public Engagement

Arguably the most direct interventions have been outright bans or restrictions on microplastic sources [86]. A key example is the U.S. Microbead-Free Waters Act (2015),

which banned rinse-off cosmetics containing plastic microbeads as of 2018. Similar bans followed in the UK, Canada, New Zealand, and other jurisdictions [54,97]. These policies succeeded due to easy industry compliance (microbeads were replaceable with alternatives like pumice or jojoba beads) [98] and strong public support (microbeads had no essential function and were seen as avoidable pollution) [13]. The result: a significant reduction in one category of primary microplastics entering wastewater [4]. Though microbeads make up only a small fraction of global microplastics [4,86], the ban still prevented an estimated billions of beads per day from being discharged in the U.S. alone [98]. Importantly, it also raised awareness and showed that legislation can effectively address microplastic pollution, building public trust in policy solutions [99].

Other bans target macroplastics like bags, straws, stirrers, and certain food containers, which indirectly help reduce microplastics by limiting fragmentation [100]. These efforts have had mixed results. As of 2023, 11 U.S. states and many cities banned disposable plastic bags, while numerous countries imposed bans or taxes [4]. Public response has generally been positive—usage drops significantly, and people adapt [101,102]. However, enforcement challenges exist (e.g., thicker “reusable” plastic bags are still distributed), and critics argue that focusing on high-visibility items may be politically convenient but insufficient [4]. Still, such measures reduce waste and have spillover educational value, reinforcing a culture of waste consciousness.

Another regulatory approach is infrastructure improvement, such as upgrading wastewater treatment plants with microfiber filters [103]. Though less visible, these are critical. Public pressure can indirectly lead to such investments if people demand cleaner waterways and drinking water, giving political cover for spending on treatment upgrades [32]. In some cases, lawsuits have even been filed by citizen groups to compel action when plastic pellet spills have occurred, showing that public engagement can also drive legal accountability [104].

5.6. *Aligning Policy and Behavior on Microplastics*

Evaluating these strategies shows that a combination is often most effective. Information campaigns raise awareness; nudges and labels help people act on that awareness; and regulations eliminate harmful behaviors or set new norms. Ideally, regulatory tools and behavioral insights work together [105]. For instance, the microbead ban not only removed one pollutant but also raised public awareness, paving the way for further voluntary change.

Unfortunately, several challenges complicate the effectiveness of microplastic interventions. First, ensuring that policies are equitable and avoid backlash is crucial. For instance, an Oregon study found that straw bans raised concerns among people with disabilities who rely on them [4]. When policies are perceived as burdensome or inconsiderate, public support can erode [4,106], making clear communication and appropriate accommodations essential for maintaining trust [106]. Second, behavioral spillover poses mixed outcomes: while some pro-environmental actions, like using reusable bags, encourage further efforts, others may create a “moral license” effect that reduces motivation [107]. Still, building habits—such as carrying a reusable bottle—can foster an eco-conscious identity and drive broader change, especially when framed as part of a larger commitment or social norm [108,109]. A third challenge is measuring direct impacts on microplastic pollution. While it is reasonable to assume that reduced plastic use leads to less pollution, quantifying that impact is difficult due to complex degradation pathways and attribution challenges [110,111]. As a result, interventions typically measure intermediate outcomes—like reduced consumption, greater awareness, or self-reported behavior

change—while more precise environmental metrics, such as declines in microplastic runoff, remain rare [111].

In summary, a multi-pronged approach seems most promising. Communication strategies that effectively educate and empower individuals, combined with structural changes (nudges, design standards, bans) that make the sustainable choice the default, are likely to yield the greatest behavior change [72,112]. Early successes like the microbead ban and widespread adoption of reusable bags show how quickly behaviors can change given the right conditions. As knowledge grows, interventions must evolve to target harder sources like tire wear and textiles [113], requiring continued collaboration among scientists, policymakers, and communicators.

6. Conclusions and Future Directions

Microplastic pollution represents a multifaceted challenge at the intersection of environmental quality, public health, and urban sustainability. This review demonstrates that while global awareness of microplastics has grown, detailed understanding of their sources, pathways, and solutions remains limited [14]. Additionally, perceptions appear to vary by region and demographic, underscoring the need for tailored approaches. Although both high-income and low- and middle-income countries show important gaps in knowledge, studies suggest some differences in emphasis. In high-income contexts, concern is often framed through health and food safety, providing a potential entry point for targeted interventions. In LMICs, by contrast, where baseline awareness is typically lower, integrating microplastic messaging into broader pollution and waste management efforts may be a more effective strategy [13,15,27,28,30]. These distinctions should be interpreted cautiously, as more systematic, cross-national comparisons are needed.

Meaningful progress will depend on institutionalized interdisciplinary collaboration, as microplastic pollution spans environmental science, public health, education, and urban planning. Concrete mechanisms include embedding microplastic awareness into municipal sustainability programs, establishing advisory councils that connect scientists, policymakers, and public health professionals, and integrating microplastic content into school curricula. Citizen science platforms provide another enduring structure for collaboration by engaging the public in data collection and advocacy. These arrangements not only foster interdisciplinary engagement but also ensure that knowledge is translated into practice through durable institutional pathways [24].

Future research should prioritize both long-term monitoring and global inclusivity. Longitudinal studies can track whether awareness and behaviors are increasing or stagnating, while cross-cultural research can illuminate how local context shapes perception and action. Digital tools and social media also offer opportunities for engagement, from viral campaigns to citizen science applications that allow individuals to contribute observations and data (Figure 3). While misinformation remains a challenge, these platforms can be leveraged to promote accurate information and community involvement. Finally, future work should explore the synergy between policy and behavioral nudges. For instance, pairing structural changes (e.g., straws provided only upon request) with communication campaigns may amplify impact by simultaneously shifting norms and behaviors.

In summary, microplastics have moved from a niche scientific concern to a global environmental and policy priority. The next decade will likely convert growing awareness into concrete shifts in how plastics are produced, used, and regulated. Meaningful progress will depend on coordinated action between many sectors of science, education, and the public. It will not come quickly, but with sustained engagement and coordinated action, society can not only reduce microplastic pollution but also strengthen its ability to confront future environmental challenges. In this way, the response to microplastics offers more than

just a path forward—it reflects the broader potential of collective action to drive lasting, systemic change.

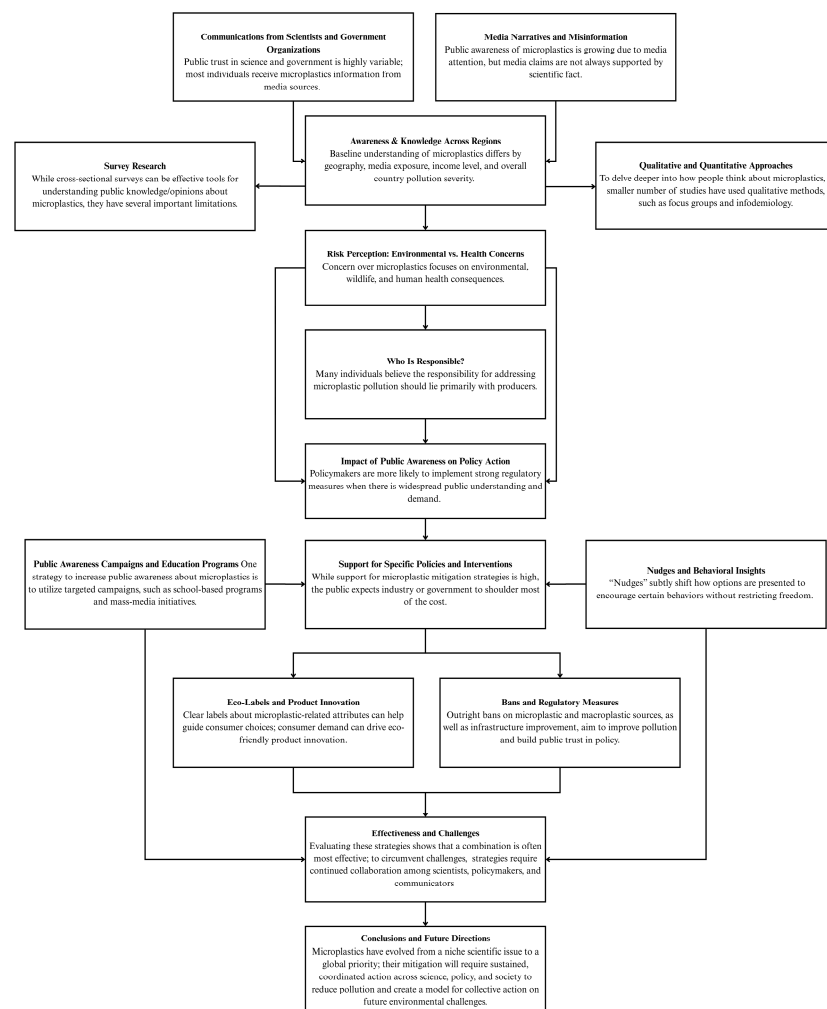


Figure 3. Conceptual framework of public awareness, perceptions, and behavioral responses to microplastics. This diagram summarizes key factors influencing public understanding and action on microplastics, including sources of information, perceived risks, policy support, and behavior change strategies such as education campaigns, eco-labels, and regulatory measures. Created by the authors based on information from cited references.

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