Environmental ethics of refill water consumption and the challenges of reducing single-use plastic: a literature review of community behavior in Gorontalo

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Abstract. Single-use bottled water remains a dominant choice among consumers in Gorontalo despite the widespread availability of refillable water depots, creating an ethical dilemma between the perceived hygiene of packaged water and the ecological responsibility to reduce plastic waste. This article examines refill water consumption through an environmental ethics perspective by analyzing moral values, risk perception, and social influences on consumer behavior. A narrative literature review was conducted using empirical studies, community reports, health regulations, and ethical analyses (2015–2025). Thematic analysis reveals that consumption choices are shaped not only by environmental awareness but also by perceived safety, bottled water branding, and social habits. Several local studies indicate that some refill water depots show inconsistent microbiological or chemical quality, reinforcing consumer preference for bottled water. From a responsibility ethics standpoint, reducing plastic waste is morally defensible only when the safety of refill water is reliably ensured by producers and monitored by public authorities. Thus, low-plastic water consumption should be understood as an ethical practice that requires guaranteed safety, ecological education, and social value transformation to support environmentally sustainable behavior.

1 Introduction

The increasing consumption of single-use plastics has become one of the most urgent environmental issues in recent years. Global reports indicate that the linear consumption model "take–make–dispose" continues to dominate and drives plastic waste generation at a rate far exceeding current management capacity, particularly in developing countries [1,2]. In the Southeast Asian context, the use of single-use packaging (including bottled drinking

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water) is a significant contributor to terrestrial and marine pollution, positioning behavioral change in consumption as a key pathway toward a low-plastic society [2,3].

In Indonesia, single-use plastic consumption has risen in line with urbanization and lifestyle shifts, while the national recycling rate remains relatively low at approximately 22% of total waste generated [2,4]. This situation is further compounded by the dominance of bottled drinking water, chosen for its accessibility and perceived hygiene despite the widespread availability of refill water depots. As a result, packaged drinking water substantially increases the national plastic waste burden [5]. Meanwhile, microbiological studies reveal that not all refill depots meet adequate sanitation and hygiene standards, with several facilities reporting E. coli and coliform contamination above permissible limits [6]. Ethically, this creates a dilemma between consumer preference for ready-to-drink packaged water and the moral responsibility to minimize environmental impacts by reducing singleuse plastic consumption.

Within environmental ethics, everyday consumption is understood not merely as a material act but as an expression of individual moral values toward the living environment. The ethics of responsibility, as articulated by Hans Jonas and further examined within the context of ecological degradation, posits that every act of consumption carries long-term ecological consequences. Therefore, decisions to purchase, use, or avoid a product constitute moral practices that reflect human relationships with nature and with future generations [7]. In this sense, community preferences for refill water or bottled water cannot be separated from the values, risk perceptions, and social norms that shape their ecological sensitivity.

The Gorontalo context is particularly relevant for analysis through the lens of environmental values and responsibility. Although access to refill drinking water depots is widespread and community mobility is increasing, preferences for single-use plastics are not always accompanied by ethical reflection. Environmental behavior studies in Indonesia demonstrate the presence of a value–action gap: despite relatively high levels of ecological knowledge and awareness, many individuals continue to use single-use plastics routinely [8]. Research among millennials similarly shows that environmental awareness and knowledge significantly influence willingness to reduce plastic waste, although these intentions do not always translate into concrete actions [9].

By framing refill water consumption as an ethical practice, this article aims to examine how environmental values, motivations, and responsibilities are manifested in the everyday behavior of Gorontalo communities. This analysis is essential for understanding how plastic-reduction strategies can be aligned with a more reflective and contextual form of environmental ethics, and how policy interventions and educational efforts may be directed to strengthen moral awareness toward sustainability.

2 Theoretical Review

2.1 Single-Use Plastics and Their Impacts

The use of single-use plastics has become one of the most pressing environmental issues in the past decade. The dominant linear consumption model “take–make–dispose” continues to generate plastic waste at rates that outpace management capacity, particularly in developing countries [1,2]. In Indonesia, single-use plastic consumption has increased alongside urbanization and lifestyle changes, while recycling rates remain low at around 22% [2,4]. The widespread consumption of bottled drinking water further intensifies the national plastic burden despite the availability of refill water depots [5]. Microbiological assessments also indicate that several refill stations fail to meet hygiene standards, with some exceeding permissible levels of *E. coli* and coliform [6].

2.2 Environmental Ethics and Moral Responsibility

In environmental ethics, consumption is viewed not merely as a material act but as an expression of individual moral values toward nature. Hans Jonas's principle of ecological responsibility emphasizes that human actions carry long-term consequences for the environment and future generations. Thus, choices to purchase, use, or avoid particular products constitute ethical practices reflecting human–nature relations [7,10]. This perspective is highly relevant to plastic consumption, where choosing refill water over bottled water is tied not only to convenience but also to moral responsibility and sustainability values.

2.3 The Value–Action Gap in Plastic Consumption in Indonesia

Environmental behavior studies in Indonesia highlight a persistent value–action gap: high ecological awareness does not necessarily translate into reduced plastic use. A study among university students found that knowledge of plastic risks does not always lead to behavioral change [11]. Environmental awareness does not consistently influence daily decisions regarding plastic use [8]. Even when public policies promote plastic reduction, moral and behavioral education remain necessary to transform intentions into concrete action [12].

2.4 Consumption Dynamics and Community Preferences in Gorontalo

The Gorontalo context provides a relevant case for evaluating environmental values and responsibility. Although refill water depots are widely accessible and mobility is increasing, preferences for single-use plastics often lack ethical reflection. Both national and local findings indicate that the gap between knowledge and practice persists, presenting a key challenge for sustainability adoption [8,11]. This suggests that moral, social, and cognitive factors must be strengthened through policy and educational interventions to promote refill water consumption as a sustainable practice.

2.5 Policy and Environmental Education Implications

Addressing the value–action gap requires interventions that integrate policy, education, and moral value reinforcement. Plastic reduction initiatives must be supported by educational campaigns aimed at internalizing ecological responsibility and fostering long-term behavioral change [12]. Ecological knowledge and awareness need to be translated into practice through moral learning, demonstration of environmentally responsible behaviors, and community support systems to effectively reduce plastic use.

3 Methodology

This article is structured as a narrative literature review aimed at integrating empirical evidence and theoretical perspectives on refill water consumption, single-use plastic reduction, and the environmental-ethical dimensions of community behavior in Gorontalo. The method is designed to ensure replicability in literature search and selection

3.1 Approach

A narrative approach was selected to allow the analysis, synthesis, and interpretation of findings from diverse sources (including quantitative and qualitative studies, community reports, undergraduate theses, and policy documents) and to relate them to environmental ethics frameworks. This approach enables the integration of local Gorontalo-specific data with broader conceptual literature.

3.2 Data Sources and Databases

Literature searches were conducted across multiple databases and repositories: Google Scholar, Scopus / Scopus Preview, DOAJ, GARUDA, SINTA and national journal portals, local university repositories (UNG, Poltekkes Gorontalo), and official institutional websites (Ministry of Health, Gorontalo Provincial Health Office, WHO, UNEP) for policy documents and standards. The search focused on Indonesian- and English-language publications from 2015–2025, with priority given to sources addressing Gorontalo.

3.3 Search Keywords (Example Strings)

Searches used bilingual Boolean combinations. Sample string (adjusted per database):
"refill water" OR "refill water consumption" OR "air isi ulang" OR "DAMIU"
AND "plastic waste" OR "single-use plastic" OR "plastik sekali pakai"
AND "behavior" OR "perilaku" OR "consumption decision"
AND "Gorontalo" OR "Bone Bolango" OR "Boalemo" OR "Gorontalo Utara"
Additional ethics-related terms: "environmental ethics", "etika lingkungan", "value–action gap", "tanggung jawab ekologis".

3.4 Inclusion and Exclusion Criteria

Inclusion criteria

- Empirical studies (quantitative/qualitative), reviews, community service reports, undergraduate/graduate theses addressing plastic consumption behavior, refill water, DAMIU quality, or environmental ethics relevant to Gorontalo.
- Publications from 2015–2025.
- Indonesian or English language.
- Full-text accessible (open access or university repositories).

Exclusion criteria:

- Popular opinion pieces without empirical grounding.
- Pre-2015 sources unless major policy documents
- Studies focused solely on industrial waste without relevance to household consumption or refill stations.
- Exclusion: Non-peer-reviewed articles, opinion pieces without empirical data, studies outside the relevant region, studies before 2015, or those unrelated to biophysical and environmental ethics aspects.

3.5 Literature Selection Process

- Initial screening of titles and abstracts to remove irrelevant documents.

- Full-text assessment to evaluate contextual fit (Gorontalo-based data or strong conceptual relevance).
- Data extraction using a standardized form covering study aims, methods, location/sample, key findings, limitations, and ethical relevance.
- Simple quality ranking (high/medium/low) based on study design, methodological transparency, and data availability.

3.6 Analysis and Synthesis

- Thematic analysis: organizing data into themes (behavioral patterns, value–action gap, water quality and safety, local initiatives, economic/brand factors, ethical implications).
- Narrative synthesis: summarizing and contrasting theme-based findings, then interpreting them through environmental ethics frameworks (e.g., responsibility ethics, eco-justice, value–action gap).
- Reporting demographic or regional variations where available to highlight heterogeneity.

4 Results and Discussion

4.1 Plastic Waste Reduction Behavior in Gorontalo

Local studies indicate that the challenge of reducing plastic waste does not depend solely on ecological knowledge but also on practical behaviors in daily life. A study found no significant relationship between household heads' environmental knowledge and their actions in minimizing plastic waste through the 3R method (Reduce, Reuse, Recycle) in Gorontalo City, indicating that environmental understanding does not automatically translate into ethical everyday actions [13]. This condition provides an important basis for examining plastic consumption from an ethical perspective, as behavior is influenced not only by knowledge but also by values, habits, comfort, and social norms.

4.2 Public Awareness and Practices in Waste Management

Similar findings were reported in a study examining household perceptions and waste-sorting practices in Gorontalo City. Among 400 respondents across eight districts, most residents understood the economic and ecological benefits of waste sorting, yet only a minority practiced it regularly [14]. The discrepancy between awareness and practice reflects a value–action gap, indicating a misalignment between ecological moral values and actual behavior, which also applies to issues involving single-use plastic consumption, such as bottled drinking water.

4.3 Local Efforts to Reduce Plastic Waste and Their Relevance to Environmental Ethics

A community service study showed that residents of Molingkapoto Village in North Gorontalo were guided to manage plastic waste using the ecobrick method [15]. Although technical in nature and focused on reuse education, ecobrick practices demonstrate local community initiatives to reduce plastic waste. From an environmental ethics standpoint, such collective actions show that local communities can generate their own ecological solutions, yet also imply that cultural shifts in consumption behaviors remain dependent on educational and community-driven movements rather than purely individual awareness.

4.4 Single-Use Plastic Consumption Behavior in Gorontalo's Digital Community

A study on followers of the Instagram account @aliansizerowaste.id found that knowledge ($p = 0.001$) and attitudes ($p = 0.000$) were associated with single-use plastic consumption behaviors [16]. However, because the sample consisted of a digital community with a certain level of ecological awareness, the findings cannot be generalized to represent the broader Gorontalo population. These results show that within digital spaces, ecological ethical values more strongly encourage environmentally responsible behavior, suggesting that consumption changes (including packaged drinking water consumption) may progress if ethical norms are strengthened through community engagement and public education.

4.5 Drinking Water Quality and Safety as Ethical Considerations in Refill Water Consumption

Issues surrounding refill drinking water consumption involve not only plastic reduction but also water safety itself. A study reported significant differences in household water quality between facility points and consumption points in Gorontalo Regency in terms of TDS, pH, and *E. coli* [17]. These findings indicate that some consumers may be concerned about health risks, which in turn encourages a preference for bottled water beyond the issue of plastic. Furthermore, research found that several refill water depots (DAMIU) in Boalemo exhibited raw water quality exceeding acceptable TDS thresholds and contamination with *E. coli*, although their treated water was pathogen-free [18]. Meanwhile, a study in Bone Bolango showed that refill water contained Fe and Mn metals and nitrate (NO_3^-) levels exceeding safe limits under Ministerial Regulation No. 2 of 2023, although physical parameters, Pb, and nitrite still met standards [19]. These findings indicate nonmicrobiological risks with potential long-term health implications. From an environmental ethics perspective, responsibility lies not only with consumers who choose low-plastic drinking options but also with refill water producers and public health authorities to ensure water safety. Thus, choosing refill water as a means of reducing plastic waste can only be morally justified if its safety is consistently ensured.

4.6 Economic Factors and Brand Awareness in Choosing Bottled Drinking Water

Beyond health and safety concerns, bottled water consumption in Gorontalo is influenced by economic factors and brand image. A study of consumers of Boneva bottled drinking water showed that price and brand awareness significantly affected purchasing decisions, both partially and simultaneously [20]. These findings illustrate that consumers in
Gorontalo often choose bottled water based on perceived quality constructed by brand identity and economic considerations deemed reasonable. From an environmental ethics viewpoint, this suggests that consumption choices are influenced not only by basic needs (access to clean water) but also by market-driven social constructions. Consumers may not always consider the ecological impact of plastic waste; instead, they are guided by branding and marketing convenience. Therefore, efforts to reduce plastic waste through behavioral change require not only environmental education but also a transformation of marketing strategies that emphasize sustainability, such as eco-friendly packaging and environmentally conscious branding.

4.7 Ethical Responsibility in Low-Plastic Drinking Water Consumption

Findings from the digital community show that ethical values can more consistently encourage plastic reduction than in the general population [16]. This underscores that consumption preferences are influenced not only by knowledge but also by moral values. In Hans Jonas's ethics of responsibility, both individuals and producers have obligations to minimize ecological impacts. However, as shown earlier, efforts to reduce plastic waste can only be morally justified if refill water quality is ensured to be safe [17,18]. Thus, the ethics of drinking water consumption in Gorontalo encompasses two concurrent obligations: protecting the environment and ensuring public health.

5 Conclusion

Land cover changes in the Gorontalo watershed, particularly the conversion of forests and riparian vegetation into agricultural land, settlements, and shrubs, have increased surface runoff, erosion, and sediment transport to rivers and Lake Limboto. The resulting sedimentation reduces water capacity and quality, threatens ecological functions, and raises environmental ethics issues, including violations of the principles of precaution, ecological responsibility, and intergenerational justice. Vegetative approaches have proven effective in reducing erosion; however, their implementation needs to be expanded and integrated with watershed management policies oriented toward sustainability.

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