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The role of environmental NGOs in communicating e-waste awareness to rural communities in Malaysia

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ABSTRACT

Globally, electronic waste (e-waste) is causing a significant environmental concern and Malaysia is no different. Although the government has implemented policies and regulations to manage waste, public awareness and participation in proper e-waste disposal is still limited, especially in rural areas. The existence of this gap makes it important for environmental non-governmental organizations (ENGOs) to play a crucial part in spreading awareness about environmental issues and encouraging behavioural change at the grassroots level. Thus, this study aims to identify the roles played by ENGOs in educating rural communities in northern Malaysia about e-waste. Using a qualitative research method, seven volunteers from two ENGOs participated in semi-structured interviews. The findings indicate that ENGOs play multiple roles in raising e-waste awareness. They specifically educate and raise awareness about the improper disposal of e-waste, advocate for sustainable practices and bridge the gap between policy and community, while empowering rural communities to take part in e-waste collection and management efforts. These communication strategies promote both environmental literacy and collective responsibility, as well as long-term behavioural change. The study highlights how ENGOs can influence public perceptions of e-waste issues through community-based communication strategies that utilize both traditional and digital media platforms. This research expands the understanding of the role of ENGOs in environmental governance and sustainable development. Ultimately, it exhibits how communication can be a powerful tool for ENGOs to influence attitudes, encourage participation and promote sustainable e-waste management practices in rural Malaysia.

Keywords: ***E-waste, environmental communication, environmental NGOs, rural communities***

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INTRODUCTION

The rapid expansion of digital technology and consumer electronics has contributed to a significant increase in electronic waste (e-waste) worldwide, posing serious environmental and public health concerns (Acuti et al., 2023). In Malaysia, improper disposal of e-waste, including household appliances and obsolete mobile devices containing hazardous substances such as lead, cadmium and mercury continues to threaten soil and water systems. Despite the implementation of national policies and waste management regulations, public awareness and community participation in proper e-waste disposal remain relatively low (Mohamad Saleh et al., 2017; Tukiman et al., 2025).

In response to these challenges, environmental non-governmental organizations (ENGOs) have emerged as key actors in environmental governance. Unlike government agencies, ENGOs work closely with grassroots communities and serve as intermediaries between policy, public awareness and behavioural change (Haris et al., 2022). As long-standing advocates of environmental protection, ENGOs play a crucial role in promoting sustainability and environmental stewardship through communication efforts that complement and reinforce those of governments and other stakeholders (Willoughby & Smith, 2016). Recent studies also indicate growing public trust in ENGOs as credible environmental communicators (Mira et al., 2025). However, their effectiveness depends largely on their ability to communicate environmental messages that raise awareness, influence environmental attitudes and behaviours as well as foster public support for sustainability initiatives (Mira et al., 2025).

Environmental communication refers to the strategic dissemination of environmental messages to influence public attitudes, values and behaviours towards environmental protection (Sultan Mohideen et al., 2022). Although previous studies on e-waste have primarily focused on technical, regulatory and policy dimensions, little attention has been given to the communication strategies employed by ENGOs and their role in encouraging public engagement with e-waste issues (Mohamad Nasir & Ahmad, 2013; Tukiman et al., 2025). The gap is particularly evident in Malaysia, where public awareness of e-waste has improved, yet participation in proper e-waste management and disposal practices remain limited.

The problem is especially prevalent in rural communities, where limited waste management infrastructure, inadequate environmental information and scarce resources heighten vulnerability to the environmental and health impacts of improper e-waste disposal. (Haris et al., 2022; Mohamad Saleh et al., 2017). These challenges are further compounded by ineffective communication between rural communities and relevant stakeholders, underscoring the critical role of ENGOs in facilitating environmental awareness, community engagement and sustainable e-waste management practices.

Accordingly, this study aims to identify the roles of ENGOs in communicating e-waste awareness among rural communities in Malaysia. Specifically, the study examines the communication approaches adopted by ENGOs, their engagement with rural communities and their capacity to influence environmental awareness and behavioural change. By focusing on environmental communication, this study contributes to a deeper understanding of how ENGOs can promote sustainable e-waste management and strengthen community participation in environmental conservation.

LITERATURE REVIEW

Environmental awareness

Environmental awareness refers to an individual's understanding of environmental issues, concern for environmental quality and a commitment to integrate environmentally conscious practices into daily life (Ahmad et al., 2019). It reflects the relationship between humans and the environment and encompasses three interrelated dimensions, environmental knowledge, environmental attitudes and environmental behaviour (Widmer et al., 2005). As a fundamental component of environmental sustainability, environmental awareness enables individuals to recognise environmental problems and supports sustainable development through informed decision-making (Mohd Jalil & Ahmad, 2021).

However, increased environmental awareness doesn't automatically lead to pro-environmental actions. Despite possessing knowledge on environmental issues, individuals might not implement environmentally responsible practices (Rödder, 2020). This awareness–behaviour gap has been widely recognised in environmental research, with evidence indicating that environmental understanding and awareness have a moderate impact on waste management practices (Rödder, 2020). Consequently, inappropriate waste disposal practices continue to persist despite increasing public awareness of environmental issues.

Addressing this gap requires continuous environmental education and effective communication strategies that not only increase awareness but also encourage behavioural change. Burksiene and Dvorak (2022) argue that educational and awareness programmes alone are insufficient to cultivate positive environmental attitudes and to encourage sustainable waste management practices. In this regard, ENGOs play a crucial role by implementing awareness campaigns, community outreach programmes and educational initiatives that translate environmental knowledge into meaningful public engagement. Through strategic environmental communication, ENGOs help strengthen environmental awareness and encourage individuals to adopt responsible e-waste management practices. Therefore, environmental awareness serves as an important foundation for this study in examining how ENGO communication initiatives influence public understanding and engagement in e-waste management within rural communities.

E-waste

Electrical and electronic waste (e-waste) refers to electrical and electronic equipment that has reached the end of its useful life or is discarded because it is no longer functional or considered valuable (Mahat et al., 2019). In Malaysia, e-waste is classified as scheduled waste under the Environmental Quality (Scheduled Wastes) Regulations 2005 due to the presence of hazardous components, including batteries, mercury switches, cathode ray tube (CRT) glass and heavy metals such as cadmium, lead and mercury (Ministry of Environment and Water, 2024). If not properly managed, these hazardous substances may contaminate soil and water resources posing significant risks to environmental quality and human health.

According to The Global E-waste Monitor 2020, approximately 53.6 million metric tonnes of e-waste were generated globally in 2019, yet less than 20% was formally collected and recycled (Forti et al., 2020). This growing disparity between

e-waste generation and proper disposal highlights the need for more effective waste management systems and greater public participation in recycling initiatives.

Previous studies suggest that these challenges are not solely the result of regulatory and enforcement limitations but also reflect inadequate environmental awareness, insufficient public education and limited community participation in sustainable e-waste management (Smith, 2019; Vishwakarma et al., 2022). Although the government has provided a framework for managing scheduled waste, its effectiveness still depends on public understanding, compliance and active community participation. This underscores the need for complementary approaches that go beyond regulation alone.

In this context, ENGOs play an important complementary role by bridging the gap between environmental policy and community action. Through environmental communication, public education and grassroots engagement, ENGOs translate technical information into accessible messages, raise awareness and promote responsible recycling practices. These communication initiatives can enhance public participation and support the implementation of sustainable e-waste management, particularly in rural communities where access to environmental information and waste management services is often limited.

Environmental communication theory (ECT)

This study is grounded in the Environmental Communication Theory (ECT), which conceptualises communication as a fundamental process for promoting environmental awareness, fostering public participation and encouraging sustainable behaviour. Environmental communication is the combination of the words, "environment" and "communication." The environment is generally defined as all the elements that surround human life, such as land, flora, fauna and air (Waititu, 2021). Waititu (2021) suggested that the environment is frequently influenced by human actions towards it. On the other hand, communication is a process that involves exchanging and transmitting information between individuals (Christensen & Nilsson, 2018). Therefore, environmental communication can be defined as the pragmatic and constitutive use of communication to influence environmental understanding, decision-making and action (Cox & Pezzullo, 2021).

Environmental communication is a dynamic process through which environmental issues are framed, interpreted, negotiated and acted upon among diverse stakeholders (Milstein & Mocatta, 2022). The theory highlights that effective environmental communication fosters dialogue, participation, trust and collaboration, enabling communities to become active participants in addressing environmental challenges rather than passive recipients of information.

According to Abdul Rahman (2009), environmental communication serves two functions. First, to educate and persuade individual who receive environmental information to address environmental issues. Second, to utilize the power of environmental communication in conveying environmental issues so that the audience can understand and be aware. These two functions highlight that environmental communication is not merely the dissemination of information but also a strategic process that shapes public perceptions, attitudes and behaviours toward environmental sustainability.

Environmental communication also serves as a vital tool for promoting sustainable development by enhancing individuals' understanding of environmental concepts (Mao & Nishide, 2025). It also plays a key role in strengthening public awareness, which is essential in fostering environmental ethics, positive attitudes, skills and behaviours needed to achieve sustainability goals (Carbonell-Alcocer et al., 2025). Traditionally, media such as radio, television and newspapers have been used to inform and educate the public about environmental issues. However, the emergence of digital technology has positioned social media as a key platform for environmental communication among ENGOs. In particular, ENGOs in developed countries have effectively leveraged these platforms to raise public awareness and promote environmental action (Nguyen et al., 2021; Tran & Duong, 2024).

In this study, ENGOs are viewed as key environmental communicators who educate, advocate and engage rural communities on e-waste-related issues. Through various communication strategies, ENGOs facilitate the exchange of environmental knowledge and encourage the adoption of responsible e-waste management practices. ECT thus provides a strong conceptual foundation for examining how ENGOs communicate e-waste issues, engage with rural communities and contribute to behavioural change towards sustainable waste management.

Environmental non-governmental organizations (ENGOs) and their communicative role

Effective communication is fundamental to the success of NGOs, as it enables them to build relationships, establish trust and mobilize local communities towards collective action (Carbonell-Alcocer et al., 2025). Despite its importance, many NGOs particularly in the Malaysia, face challenges arising from inadequate strategic planning, resulting in ineffective communication approaches that limit community participation and stakeholder engagement (Haris et al., 2022). Therefore, ENGOs need to develop clear and planned communication strategies that encourage stakeholders to take an active role rather than just receive information. These strategies are important for building awareness, strengthening community ownership and supporting long-term action to achieve environmental goals (Acuti et al., 2023; Cox, & Pezzullo, 2021).

Recent research consistently highlights that effective NGO communication is central to fostering community participation, trust and sustainable development outcomes. Gallegos (2025) emphasized communication as a core mechanism for mobilization and behavioural change, particularly in development contexts. Similarly, participatory communication approaches have been widely advocated, with Dellech et al. (2024) noting that effective NGO engagement requires communication processes that are community-driven, culturally sensitive and long-term oriented. More recent empirical work in the Philippines also identifies multiple strategic dimensions of NGO communication, including digital media use, traditional channels, participatory communication and public relations activities (Gallegos, 2025).

Although communication frameworks have improved, many organisations still use top-down approaches that focus more on their own goals than on community voices (Cox & Pezzullo, 2021). In practice, there remains a gap between theory and implementation, especially in rural settings, where NGOs often struggle to adapt communication strategies to local socio-cultural conditions, low literacy levels and

limited access to digital platforms (Haris et al., 2022). Studies therefore emphasise the need to move from organisation-centred communication to more collaborative and dialogic approaches that value local knowledge and strengthen community ownership (Mohamad Saleh, 2017).

Thus, ENGOs play a key role in environmental communication by fostering dialogue, supporting environmental monitoring and advocating for sustainable policies, with their effectiveness relying on their ability to translate complex issues such as e-waste into clear and culturally appropriate messages for diverse audiences (Jain et al., 2023; Sahharon et al., 2024). In Malaysia, although ENGOs are key actors in environmental governance, existing research has largely overlooked their communication role in e-waste management, particularly in rural areas. Even with the rise of digital platforms that improve engagement, there is still limited knowledge of how Malaysian ENGOs design communication strategies to promote e-waste awareness and responsible disposal practices.

METHODOLOGY

Research design

This study adopted a qualitative approach in line with its aim of exploring the roles, experiences and involvement of ENGOs in environmental activities. Semi-structured interviews were used to gain in-depth insights into ENGOs' experiences and knowledge of environmental issues, particularly e-waste.

Informants

Informants were selected using purposive sampling, which is appropriate for qualitative studies seeking in-depth insights from individuals with relevant experience. In this study, representatives from ENGOs involved in e-waste awareness initiatives in northern Malaysia were identified as key informants. Informants were selected based on specific criteria. These included direct involvement in environmental education or outreach programmes related to e-waste, at least one year of experience in community-based environmental projects and active engagement with rural communities. These criteria ensured that all informants possessed relevant, context-specific knowledge aligned with the objectives of the study.

This study involved seven informants, comprising five males and two females aged between 32 and 43 years. They were members of two NGOs, Krayon4Society and Trash Hero Perlis, chosen due to their strong engagement with rural communities in Kedah and Perlis. Although the sample size may not represent all ENGOs, it provides meaningful insights as both organisations are among the most active in the region. The informants consisted NGO leaders, environmental officers and volunteers who shared their experiences on organisational roles, daily operations, challenges in environmental management and their involvement in environmental communication, particularly on e-waste issues. Their perspectives offer valuable understanding of how grassroots environmental organisations contribute to e-waste awareness and community participation in rural settings.

Data collection

The researcher conducted each interview face-to-face in Bahasa Malaysia, with sessions lasting between 45 and 90 minutes. Before recruiting informants, the researcher obtained informed consent from both the NGOs managing the volunteers and the volunteers themselves, in line with ethical research requirements. Since NGOs often work with vulnerable groups, the researcher also secured organisational approval to ensure proper access and institutional support for the study.

The interview questions were developed to explore the roles of ENGOs in e-waste management, with a particular focus on their environmental communication strategies. Informants were asked open-ended questions about their awareness and perceptions of ENGO initiatives, including e-waste awareness programmes, key elements of environmental communication and collaborative efforts undertaken by ENGOs.

Data collection continued until data saturation was achieved, when no new themes or insights emerged from additional interviews. Saturation was assessed alongside data collection through ongoing iterative analysis. After several coding cycles, it was observed that further interviews produced repetitive information rather than new categories, indicating that the data were sufficiently rich to meet the study's analytical objectives. The decision to stop data collection was therefore guided by information redundancy rather than a predetermined sample size (Hennink & Kaiser, 2022).

Data analysis

All interviews were transcribed verbatim and analysed using thematic analysis. The transcripts were systematically organised and managed using NVivo12 qualitative data analysis software, which supported the coding, categorisation and comparison of data across informants. The analysis followed an iterative process, beginning with repeated readings of transcripts to achieve data familiarity, followed by the generation of initial codes. These codes were then grouped into broader categories and further refined into themes that reflected recurring patterns within the dataset.

To strengthen analytical rigour, a constant comparative approach was applied throughout the coding process, enabling systematic analysis of similarities and differences across informants' data. Emerging themes were continuously reviewed, refined and validated to ensure conceptual coherence and accurate representation of informants' perspectives. This iterative process facilitated the interpretation of ENGOs' communication roles in addressing e-waste issues. Overall, the use of NVivo12 enhanced the systematic organisation of data, ensuring that the findings were transparent, traceable and firmly grounded in the empirical evidence.

Trustworthiness

To enhance the trustworthiness of this study, several strategies were applied in line with qualitative research criteria (Nowell et al., 2017). Credibility was ensured through prolonged engagement with ENGO representatives involved in e-waste awareness programmes, enabling an in-depth understanding of their communication roles and practices. Member checking was also conducted by sharing preliminary findings with selected informants to verify that interpretations accurately reflected their

experiences. Dependability was strengthened through systematic documentation of the research process, including informant selection, interview protocol development and thematic coding procedures, ensuring a clear and transparent record that enhances the consistency and reliability of the study.

FINDINGS

The roles of ENGOs in communicating e-waste awareness

Malaysia has experienced a notable increase in the involvement of ENGOs in promoting better e-waste management practices. Although e-waste management is not their primary focus, many ENGOs have actively worked to raise public awareness of e-waste and its environmental impacts. ENGOs have been identified as performing several key roles, including policy advocacy and linkage, public education, awareness-raising and community empowerment. The following section provides a detailed discussion of these roles.

Advocate and bridge policy

In Malaysia, policy efforts on e-waste are focused on improving laws and systems for proper disposal and recycling. These include better collection services, producer responsibility through programmes like Extended Producer Responsibility (EPR) and stricter rules for recycling centres. The aim is to increase recycling and reduce environmental and health problems caused by e-waste.

However, rural communities often find it hard to understand these technical rules. ENGOs are the one who step in and help by explaining the policies in simple ways at the community level. For example, when take-back programmes were introduced, ENGOs in Kedah and Perlis helped rural people understand how the programme works, its benefits, and how to dispose of old devices properly. They also communicate hurdles faced by local communities, such as lack of collection points and transport to policymakers so that these problems can be addressed. In this way, ENGOs help ensure that policies are not just on paper but are effectively implemented at the grassroots level.

Interview findings show that ENGOs play an important role in policy advocacy by collecting information, doing simple research and representing the voices of local communities to decision-makers.

> *We strive to ensure that the policies developed are more environmentally friendly and aligned with the needs of sustainable e-waste management.* (N1)

When raising awareness, ENGOs act as a bridge between the government and the public. They use different communication methods to highlight issues and make it easier for people to understand and relate to it.

> *We use several approaches such as face-to-face sessions with government agencies, awareness campaigns on social media, and community education*

programs. We also team up with universities and the private sector to explore new solutions for e-waste management. (N2)

ENGOs recognize that raising awareness about e-waste is important, but most of their efforts focus on prevention through advocacy and promotional campaigns, rather than direct intervention programmes. However, what stands out in their work is their close connection with local communities. Their activities are carried out in rural villages and local areas, where they work closely with the public to build understanding and encourage better practices.

ENGOs can now reach a wider audience, thanks to low-cost digital tools. Many of them use platforms such as Facebook, Instagram, and Twitter to share information, engage different groups and communicate quickly, following the global rise of social media. They also use short videos, infographics and hashtag campaigns to raise awareness on issues such as climate change, waste, and pollution. This approach helps them reach not only urban populations but also rural communities, where access to traditional information sources is often limited.

Besides, social media also enables ENGOs to leverage local leaders, community figures and online influencers to spread their messages more effectively. It is also used to increase public participation through online petitions, fundraising activities and calls for volunteers in clean-up campaigns and awareness programmes. The combination of online engagement and face-to-face activities in rural areas often provides a more effective way to bridge the gap between national policy ideas and the realities of rural communities.

In summary, ENGOs play a vital role in advocating for stronger policies while bridging the gap between policymakers and communities. They support policy development and implementation in ways that benefit local populations, particularly in rural areas, by simplifying complex regulations, voicing community concerns, and linking grassroots realities with national policy frameworks.

Raise awareness and educate

ENGOs play an important role in helping rural communities understand the environmental and health risks associated with e-waste. Many people in rural areas are still unaware that old phones, batteries, and broken appliances can release harmful substances when disposed of improperly.

During the interviews, informants emphasized awareness-raising at the community level as the first step toward improving e-waste management. Since 2019, the group has worked closely with local communities to promote sustainable practices such as proper waste separation, which facilitates recycling. Through workshops, educational programmes, and community-led recycling campaigns, ENGOs have become an important source of information and guidance on responsible e-waste disposal.

According to one informant, most e-waste in Malaysia is still disposed of together with household waste and ultimately ends up in landfills. This practice not only harms the environment but also contradicts national waste management policies. Recognising the urgent need to address this issue, they have focused their efforts on supporting community-based initiatives in Kedah and Perlis, particularly through e-waste collection and awareness programmes.

Informant N3 noted that Trash Hero Perlis has placed recycling bins at several key locations, encouraging residents to use them as official drop-off points.

> *Our drop points are located at PEDi Tambun Tulang, PEDi Beseri, and PEDi Padang Besar Selatan. We also have the Drive Thru Recycle Centre (DTRC) Arau, which has now been moved to the Arau Public Market area and behind the Kangar Municipal Council Arau Branch Office.* (N3)

For now, their focus is on common recyclables like aluminium cans, plastics, and glass bottles.

> *Although our initial focus was on recycling aluminium cans, plastic, and glass bottles, we aim to expand our efforts to raise awareness about proper e-waste management.* (N5)

Other than awareness, education is another key area of their work. ENGOs often partner with schools, colleges, and community centres to conduct seminars and awareness sessions aimed at fostering responsibility and promoting sustainable e-waste management practices. One key challenge highlighted by Informant N2 is that many teenagers and students are still unaware that electronic devices should be disposed of separately. They often do not know how or where to properly discard outdated items.

> *We (Trash Hero Perlis) have worked with UUM, UniMAP and a lot of schools around Kedah and Perlis to run environmental education and awareness programmes. We've done many programmes, for example Malaysia Greening Campaign, tree-planting activities with the Perlis State Forestry Department, geopark visits with the Geoguide Association, and even fun stuff like colouring competitions.* (N2)

> *Besides that, we also give talks on environmental protection to help students understand more and build a stronger sense of responsibility towards sustainability.* (N4)

As Informant N4 explained, they also organize workshops, community talks and campaigns in school and village using simple language and relatable examples. Some groups use visual aids and live demonstrations to show how toxic substances such as lead and mercury from discarded electronics can contaminate soil and water. By simplifying complex information, ENGOs make it easier for rural communities to understand the risks and the need for safer disposal methods.

Through these educational programmes, ENGOs not only help reduce electronic waste in the short term but also lay the foundation for long-term sustainable practices in e-waste management and recycling.

Empower community participation

ENGOs also place strong emphasis on empowerment by involving rural communities directly in e-waste programmes. Instead of being passive recipients of

information, residents are encouraged to actively participate in collection drives and local campaigns.

In several villages in northern Malaysia, ENGOs have organised community recycling days where residents can bring old appliances to a central drop-off point. They also identify and train local "green champions" who continue to spread awareness within their own communities. This form of grassroots participation helps build a sense of ownership and responsibility, turning e-waste management into a collective community effort rather than an externally imposed initiative. Over time, this empowerment supports rural communities in adopting sustainable practices and contributing meaningfully to broader environmental goals.

> *We took the initiative to work closely with different departments and agencies to make the program more meaningful. In partnership with other NGOs, the Perlis State Forestry Department organized a CEPA program in conjunction with the International Day for the Conservation of the Mangrove Ecosystem 2023, held at the Mangrove Interpretation Platform, KOMALAUT Complex, Kuala Perlis.* (N6)

According to the informants, the e-waste collected through these initiatives typically includes items such as laptops, tablets, cables, and larger household appliances like refrigerators and televisions.

> *We (volunteers) managed to collect around 500kg of waste, including e-waste, during the Malaysia Youth Volunteer Day 2023 at the Perlis State level. The program, jointly organized with the Perlis State Department of Youth and Sports, was held along the Sungai Padang Keria coastline from 8:30 am to 11:00am* (N6)

These programmes aim to instil green cultural values within the community while improving environmental literacy. For example, the Malaysia Youth Volunteer Day brought together around 70 participants, including representatives from Trash Hero Perlis, Universiti Malaysia Perlis (UniMAP), Politeknik Tuanku Syed Sirajuddin (PTSS), Universiti Utara Malaysia (UUM), Kolej Universiti Islam Perlis (KUIPs), and the Perlis State Forestry Department.

Beyond raising public awareness, these initiatives also help strengthen collaboration with ministerial stakeholders. They provide ministries with a platform to not only educate the public but also to gather feedback and improve services delivered by the Ministry of Natural Resources and Environmental Sustainability (NRES) and its related agencies.

In parallel, the volunteers emphasised the importance of ensuring that environmental sustainability goes hand in hand with economic development. Their views highlight that sustainable growth should balance environmental protection with social well-being, rather than prioritising one over the other.

Another key aspect of these partnerships is the involvement of technology-based organisations. NGOs recognise that the industry has the skills and resources to do more than just recycle. Through collaborations, they have been able to transform

e-waste into useful and creative products, showing rural communities that old or broken electronic items are not simply "rubbish" but can be reused in new ways. This approach not only helps reduce waste but also teaches communities that electronic components can have a second life and contribute to a more sustainable lifestyle.

Trash Hero Perlis, for instance, is part of the global Trash Hero World network, which supports e-waste management initiatives at a broader level. However, as Informant N7 pointed out, public awareness of waste separation remains low. Many people do not realise that e-waste management involves more than just sorting and disposal, it requires a more comprehensive process to minimise environmental impacts.

To address this gap, they launched an e-waste awareness campaign in February 2022 in collaboration with several local NGOs, including Perlis Nature Xplorer, Perlis Climbers, Hermission House, Persatuan Geoguide Perlis Geopark, Persatuan Sejarah Negeri Perlis and Perlis Nature & Wildlife, among others. This collective effort was strongly community-based. In addition to placing e-waste collection bins and designating recycling days, the NGOs organised awareness sessions to encourage residents and local groups to actively participate in the initiative.

> *What made this effort special was the way rural communities were actively involved, not just as spectators, but as participants. Residents joined in activities like planting mangrove seedlings, taking part in coastal clean-ups, and even sharing their knowledge about the ecosystem. This hands-on approach made them feel more connected and responsible for protecting the mangrove environment.* (N5)

The founder of Trash Hero Perlis shared that the campaign was well received by residents. Informant N6 added,

> *Over the past seven months, the organization has been contacted by private sector businesses interested in disposing of their e-waste safely. For the community, this was encouraging, as more people began to recognise how simple actions, such as separating waste at home can contribute to proper recycling and safer environmental practices.* (N6)

Overall, these roles demonstrate how ENGOs engage with communities through a continuous process of awareness, advocacy and empowerment. Their initiatives show that effective communication can bridge the gap between national policies and grassroots practices, making sustainable waste management more accessible and relevant to everyday life. At the same time, the findings indicate that their impact is still limited by low public awareness and a lack of professional expertise in the field. This makes their work in rural areas particularly important, as they bring knowledge, resources, and advocacy directly to communities most affected by poor waste management.

DISCUSSION

The diverse roles of ENGOs as educators, advocates, facilitators and community mobilisers reflect the key assumptions of the Environmental Communication Theory,

which views environmental communication as both practical and constructive in shaping understanding and action (Cox & Pezzullo, 2021). While previous studies have often highlighted ENGOs mainly as providers of environmental information through awareness campaigns, much of the literature tends to frame them as top-down communicators (Cox & Pezzullo, 2021). In contrast, this study shows that ENGOs in rural Malaysian contexts go beyond this limited role by encouraging more participatory and dialogic communication processes. This suggests a more interactive approach to environmental communication, where meaning is jointly created between ENGOs and community members rather than simply transmitted.

This finding both supports and extends earlier work on environmental communication. While Milstein and Mocatta (2022) emphasised that effective environmental communication should be based on participation and dialogue, there is still limited empirical evidence on how these principles are applied in rural e-waste contexts. This study addresses that gap by showing how ENGOs put these ideas into practice through community workshops, informal engagement and hands-on learning activities. These approaches not only increase environmental awareness but also build trust and strengthen relationships between ENGOs and rural communities, which prior studies have identified as important but underexplored factors in effective environmental communication.

Furthermore, although previous research has associated environmental communication with behavioural change, it often assumes a direct, linear link between awareness and action (Carbonell-Alcocer et al., 2025). This study challenges that assumption by showing that behavioural change in e-waste management is shaped by continuous interaction, trust-building and culturally grounded communication practices. This finding enriches the Environmental Communication Theory by highlighting the importance of contextual and relational factors in determining communication effectiveness at the grassroots level. In this way, the study extends the application of the theory beyond general environmental advocacy to the more specific and under-researched context of rural e-waste management in Malaysia.

While earlier studies have examined environmental communication in broader contexts, this study shows that e-waste poses distinct communication challenges due to limited public awareness of proper disposal methods, health and environmental risks as well as recycling opportunities. As a result, ENGOs adopt more targeted communication strategies that combine environmental education, digital engagement and stakeholder collaboration to address these knowledge gaps. This highlights the evolving role of ENGOs as communication intermediaries that link scientific knowledge, public awareness and community participation.

CONTRIBUTIONS AND IMPLICATIONS

This study contributes to the growing body of literature on environmental communication by enhancing the understanding of how ENGOs design and implement communication strategies to raise e-waste awareness, particularly in rural communities. While previous studies have mainly focused on the advocacy and policy roles of ENGOs, this research shifts attention to their communication functions, showing how environmental messages are adapted into simple, accessible and culturally relevant

forms for different audiences. By examining real practices in Malaysia, the study also adds empirical evidence on the challenges and approaches ENGOs use in addressing complex issues such as e-waste management. In doing so, it offers a more detailed understanding of the link between environmental communication, community engagement and sustainable development.

In terms of practical implications, the findings provide useful guidance for ENGOs, policymakers and community stakeholders in strengthening e-waste communication strategies. ENGOs can use these insights to design more participatory, inclusive and locally relevant communication approaches that better suit rural communities. For policymakers, the study highlights the need to support capacity-building programmes and collaborative frameworks that strengthen partnerships between NGOs and communities in environmental education. At the community level, improved communication strategies can increase awareness, encourage behavioural change and promote participation in sustainable e-waste practices. Overall, the study highlights the importance of culturally sensitive and strategic communication approaches in improving the effectiveness of environmental governance.

CONCLUSION

This study examines the roles of ENGOs in informing rural communities in Malaysia about e-waste awareness. The findings show that ENGOs are not only information providers but also act as advocates, change agents and mobilisers, playing an important role in bridging the gap between policy frameworks and local realities. In summary, the study highlights the importance of ENGOs as key partners in environmental governance and sustainable development. They contribute to building a culture of environmental responsibility in rural Malaysia through the use of local knowledge, trust-building and community engagement. Therefore, the communication roles of ENGOs should be recognised and supported in future policies and programmes, with greater inclusion of ENGOs as strategic partners in national e-waste management initiatives.

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