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WASTE NOT, WANT NOT: THE ECO-INITIATIVE EMPOWERING NATUNA'S COMMUNITIES THROUGH SUSTAINABLE PRACTICE

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A B S T R A C T

This study explores the initiatives undertaken by the Kehati and Natuna Environmental Community to transform waste into valuable resources. Amidst the growing environmental challenges due to waste accumulation, this community has taken proactive steps to mitigate negative impacts and shift public perception of waste. Employing a qualitative approach, data were gathered through in-depth interviews with the founders of the Kehati Community and participatory observations. Through the diffusion of innovations, the community engaged several district and sub-district parties to implement various innovative programs such as recycling, eco-enzyme production, and transforming waste into eco-bricks and handicrafts. These programs help reduce waste volume and provide economic value to the local community. The study's findings also identify challenges in program development, including limited human resources for marketing recycled products, low youth participation in the community, the public's view that recycled products are sold too expensively, and the need for more intensive education to change public behaviour. The implications of this research highlight the importance of support from the government and related institutions to strengthen and expand waste management programs. Additionally, it underscores the necessity of collaboration between the community, government, and youth to create a more sustainable environment in Natuna.

Keywords: Diffusion of Innovation, Waste Management, Sustainable Development, Community Empowerment, Natuna

1. INTRODUCTION

Natuna Regency, known as the "Land of a Thousand Islands" and "National Fish Reservoir," is not only celebrated for its breathtaking natural beauty and abundant marine resources but also for its rich biodiversity, which makes it a haven for various species of flora and fauna. The pristine waters of Natuna, with their mesmerizing coral reefs and plentiful fisheries, have positioned it as a prime eco-tourism destination and the primary livelihood source for the local community.

However, behind this beauty lies a pressing challenge that threatens the environment and the well-being of the population: waste management. As the population grows and economic activities increase, so does the volume of waste in Natuna, reflecting a serious waste management issue. Household waste, which amounts to approximately 14 tons per day (Metroindonesia.co.id, 2023), constitutes a significant portion of this growing problem. Waste accumulation could lead to severe environmental and health hazards (Gupta et al., 2021; Zhang et al., 2019; Porta et al., 2020).

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The situation is further exacerbated by limited waste management capacity and landfills that have already exceeded their limits, such as the Sebayar landfill. Afriyudi, Secretary of the Environmental Agency of Natuna, revealed that the Sebayar landfill has reached its maximum capacity, preventing it from accommodating more waste, which has begun to overflow (ecoedu.id, 2023; Metro Indonesia, 2024). In addition to household waste, trash from passing ships and foreign fishing vessels also contributes to the problem. According to Cherman from Jelajah Bahari Natuna (JBN), many beaches across the islands in Natuna have become regular dumping grounds for plastic waste from neighbouring countries. The most common types of garbage found include beverage bottles, shampoo, soap, oil containers, detergent, and floor cleaner packaging (Azizah, 2023). This waste not only pollutes the land but also threatens marine ecosystems, as plastics carried by ocean currents can damage coral reefs and endanger aquatic life (Derraik, 2002; Isangedighi, 2020; Thompson, 2006).

Ongoing efforts are taken by the Natuna Environmental Agency to manage and reduce waste, such as plans to expand the capacity of the Sebayar landfill (Redaksi Berita, 2023). The local administration also encourages the public to practice the 3Rs: Reduce, Reuse, and Recycle (Afrizal, 2024). However, these initiatives face numerous limitations, particularly in terms of infrastructure. The lack of adequate waste processing facilities and insufficient waste collection points hinder efficient waste management (Posmetro.co, 2021).

To address these challenges, the Natuna Environmental Agency has partnered with various community organizations to implement more effective waste management programs. Through these collaborations, they work with local groups such as Komunitas Kehati to carry out educational campaigns on waste reduction and promote recycling practices. Effective waste management requires active participation from all levels of society, including local communities. Communities play a crucial role in supporting waste management programs through education, awareness campaigns, and sustainable practices. Their participation can significantly raise public awareness of the importance of reducing and recycling waste, and fostering behavioural changes in daily waste management (Sekito et al., 2013; Colon & Fawcett, 2006; Sunarti et al., 2023).

This research will focus on the role of local communities, specifically Komunitas Kehati, in supporting waste reduction through their initiatives and engagement in sustainable waste management programs. The research will also identify key obstacles, such as infrastructure limitations, insufficient waste processing facilities, and low public awareness, that continue to hinder effective waste management efforts in Natuna.

2. METHODS

The research method used in this study is descriptive qualitative. Descriptive qualitative research aims to provide an in-depth depiction of the phenomena studied based on the perspectives of key informants (Creswell, 2014). In this context, in-depth interviews were used as the main data collection method to explore the insights and experiences of Hazriani Rasyid, the founder of Komunitas Kehati, regarding the role of the local community in waste management in the Natuna Regency. In-depth interviews were chosen because they allow researchers to explore the informant's views, attitudes, and experiences in greater detail, providing a comprehensive understanding of the challenges and opportunities in community-based waste management (Kvale & Brinkmann, 2009).

This approach used semi-structured interviews, meaning the researcher employed a flexible interview guide that allowed the informant to speak freely on relevant topics (Patton, 2015). This technique is useful for uncovering information that may not surface through other data collection methods, as semi-structured interviews offer the informant an opportunity to express their views more spontaneously and authentically. Through in-depth interviews with Hazriani Rasyid, the data collected is expected to shed light on the initiatives undertaken by Komunitas Kehati in waste management, the challenges faced, and the strategies implemented to enhance community participation in sustainable waste management programs in Natuna.

The data obtained from these interviews were analyzed thematically. Thematic analysis is used to identify, analyze, and report patterns or themes that emerge from the data (Braun & Clarke, 2006). This approach enables researchers to organize and explain complex data while providing new insights relevant to the research objectives. By utilizing thematic analysis, this study aims to offer a deeper understanding of the contributions of local communities, particularly Komunitas Kehati, in supporting waste management in the Natuna Regency.

3. RESULTS AND DISCUSSIONS

Results

The community plays a crucial role in supporting sustainable waste management in various regions, including urban and rural areas. In urban contexts, community efforts have proven effective in mobilizing local initiatives to reduce the amount of waste sent to landfills. For instance, a study conducted by Susilo et al. (2022) found that community efforts in Yogyakarta managed to reduce waste volumes by up to 30% through household-level waste banks and composting programs. These communities also focused on educating the public about the importance of separating organic and inorganic waste as well as recycling plastic waste into valuable products. These initiatives have not altered waste management behaviours and raised public awareness about the importance of maintaining a clean and healthy environment. According to data from the Ministry of Environment and Forestry (KLHK), the active participation of communities is critical in helping the nation meet its target of reducing waste by 30% by 2025, in line with the "Indonesia Free from Waste by 2025" program.

Based on in-depth interviews with Hazriani, the founder of Komunitas Kehati and Lingkungan Natuna, the community was established because of her deep love for biodiversity (Kehati) and commitment to sustainable waste and plant management. In the interview, Hazriani revealed that although the community was officially founded in 2018, her waste management activities had begun as early as 2010. At that time, she was actively collecting waste at the neighbourhood level (RT) to sell or exchange it for plant seedlings. This initiative was part of her early efforts to reduce waste while promoting reforestation in the local environment.

During the early stages of Komunitas Kehati and Lingkungan Natuna, all waste management activities were carried out independently by Hazriani. Over time, however, the community began to attract new members, especially housewives and working women, who later joined and helped implement the community's various programs. As the community grew, so did its popularity, leading to Hazriani being frequently invited as a speaker at seminars addressing waste management and environmental sustainability.

Within the community, members are provided with structured training on waste management innovations, focusing on two main types of waste: organic and inorganic. Organic waste, which can decompose naturally, is processed into valuable products such as compost, eco-enzymes for household and agricultural use, leaf-based eco-print materials, and used cooking oil transformed into candles. In contrast, inorganic waste, which does not decompose, is repurposed into handicrafts such as bags, wallets, and tables made from eco-bricks. These training programs aim to equip members with effective and innovative waste management skills, all guided and taught by Hazriani as the community leader.

The development of innovations within Komunitas Kehati and Lingkungan Natuna has taken place gradually. These activities began in 2010 with the distribution of plant seedlings as an initial step to reduce waste through organic waste management. Over time, the community's innovations have expanded, including initiatives to recycle household waste, such as product packaging, into handicrafts. To support the success of waste management and encourage active community participation, Hazriani developed three main programs, which include:

1. **Sedekah Sampah**

   The "Sedekah Sampah" or waste donation program is a grassroots initiative developed to promote more efficient and inclusive waste management by directly involving local communities. Unlike conventional waste disposal systems, this program reframes waste not as a burden, but as a valuable contribution that residents can actively donate for environmental and social good. The central idea is to create a culture of sharing and responsibility, where household waste, if properly sorted and collected, can be transformed into something meaningful.

   Through this initiative, residents are encouraged to donate pre-sorted waste, such as plastic bags, bottles, and aluminium cans, which allows for more effective recycling and repurposing processes. The program introduces a simple and organized waste collection system, making it easier for households to participate without disrupting their daily routines. Rather than throwing away recyclable items, community members are invited to set them aside intentionally as a form of environmental contribution.

   The communication strategy for the program relies heavily on social media and WhatsApp groups, which serve as primary channels for outreach and coordination. Through the platforms, residents receive regular updates, reminders, and educational content about the importance of waste sorting and how they can contribute. These messages are designed to be accessible, actionable, and community-driven, creating a sense of shared mission and accountability.

   One of the program's most distinctive features is the active role of local women, who often take the initiative to collect and deliver the donated waste to the Komunitas Kehati Secretariat. This strengthens community cohesion and empowers women as environmental agents of change within their neighbourhoods. Once the waste arrives at the secretariat, it is sorted, processed, and either recycled or repurposed into products like eco-bricks, crafts, or reusable materials.

Figure 1. Upcycled Handbags from Household Waste Packaging by Komunitas Kehati Natuna

The Sedekah Sampah program represents more than just a waste management strategy; it embodies a movement towards community-based environmental stewardship. It fosters a sense of pride, participation, and shared responsibility in preserving the environment for future generations by turning everyday actions into acts of environmental generosity.

2. **Barter Sampah**

The "Barter Sampah" or waste barter program, which has been actively running for over three years, is a creative and community-centred solution to address waste management while simultaneously offering tangible economic benefits. The core idea behind this initiative is simple yet impactful: residents are encouraged to collect specific types of waste, such as aluminium cans, plastic bottles, and plastic packaging, which are then exchanged for essential goods such as staple foods or plant seedlings, including flowers, fruit-bearing plants, and traditional medicinal herbs.

Community members should prepare waste properly before submitting it to ensure the quality and usability. All waste must be clean, dry, and ready for processing, thereby reducing contamination and making the recycling process more efficient. This requirement also fosters a culture of responsibility and awareness among participants regarding the value of proper waste handling.

The waste collection takes place through drop-off activities at the community's Secretariat, which serves as both the logistical hub and a symbol of collective environmental action. In exchange for their contributions, residents receive goods that directly support their daily needs or enhance their household gardens with an immediate, visible return on their environmental efforts.

Beyond waste reduction, the program generates social and economic value. It transforms materials that would otherwise contribute to landfills into resources that support food security and sustainable urban greening. It also helps residents, especially those in lower-income brackets, to meet basic needs without financial transactions, turning environmental stewardship into a mutually beneficial exchange. Overall, the Barter Sampah program illustrates how waste management can be reimagined not only as a technical challenge but as an opportunity to empower communities, strengthen environmental ethics, and build a circular

economy at the grassroots level. It exemplifies how small, localized actions can lead to significant collective impact.

3. **Gerakan Selamatkan Bumi Kite**

   The "Gerakan Selamatkan Bumi Kite" (Save Our Earth Movement) is a collaborative initiative developed by Komunitas Kehati, in partnership with Lingkungan Natuna and the local youth community. This program was born out of a shared concern for the growing waste crisis and the urgent need to foster sustainable environmental behaviour starting from the household level. Rather than relying solely on government-driven solutions, the movement empowers local communities to take the lead in managing waste responsibly while receiving tangible benefits for their efforts.

Figure 2. The "Gerakan Selamatkan Bumi Kite" Program

The core activity of the program revolves around the collection of household plastic waste, particularly plastic packaging from commonly used consumer products such as detergents and dish soaps (e.g., Rinso, Sunlight). Participants are guided to clean and dry the plastic waste, ensuring it is suitable for weighing and processing. For every 2 kilograms of cleaned plastic waste, individuals receive 1 liter of cooking oil in return, a valuable and practical reward that aligns with the daily needs of most households.

This incentive-based approach has proven to be highly effective in mobilizing community participation. In one phase of the program, the organizers successfully collected up to 500 kilograms of plastic waste, a remarkable indicator of both the community's enthusiasm and the scalability of the initiative. The distribution of cooking oil and other staple goods is coordinated by Darma Wanita, a women's organization that plays a crucial role in ensuring the smooth operation and sustainability of the program.

Beyond waste collection, Gerakan Selamatkan Bumi Kite serves as a model for how environmental campaigns can integrate education, reward systems, and local leadership to produce lasting change. The involvement of youth ensures intergenerational awareness, while the use of household incentives motivates broader participation. This initiative demonstrates that when environmental efforts are rooted in local wisdom, collaboration, and fairness, they not only contribute to a cleaner environment but also to a stronger, more resilient community.

These programs illustrate the comprehensive and community-driven approach Komunitas Kehati and Lingkungan Natuna have taken to engage the local population in sustainable waste management practices. By offering tangible incentives and fostering collaboration, they have effectively encouraged behavioural changes and provided solutions that benefit both the environment and the community's economy.

At the early stage of implementation, the three environmental innovations introduced by Komunitas Kehati and Lingkungan Natuna: Sedekah Sampah (Waste Donation), Barter Sampah (Waste Barter), and Gerakan Selamatkan Bumi Kite (Save Our Earth Movement) faced notable challenges. One of the key barriers was the community's limited habit of sorting waste, which hindered the smooth operation of the donation-based programs that required waste to be pre-cleaned and separated. Despite these initial difficulties, persistent outreach and education gradually shifted public perception. As more residents began understanding the environmental and economic benefits, these initiatives were increasingly welcomed and actively supported. The launch of Barter Sampah, which provided incentives such as groceries in exchange for recyclable materials, and the implementation of Gerakan Selamatkan Bumi Kite, which traded cleaned plastic packaging for cooking oil, sparked a noticeable increase in community participation. However, the program had to adapt once again when rising prices of staple goods made it difficult to maintain the original exchange system. In response, Hazriani, a local leader and program coordinator, restructured the barter model by replacing grocery exchanges with plant seedlings, a sustainable and relevant alternative that continued to engage the community while promoting urban gardening and self-sufficiency.

An effective communication became a cornerstone strategy to support the growth and sustainability of these programs. Information dissemination was conducted intensively through various platforms, including Instagram, Facebook, and WhatsApp groups, which allowed real-time updates, volunteer coordination, and active engagement across demographics. These digital channels broadened awareness and strengthened the sense of community ownership over environmental actions. As participation increased, the waste collected at the Komunitas Kehati Secretariat was no longer seen as trash, but as raw material for innovation. Plastic packaging was upcycled into handcrafted items like bags and wallets, while non-organic materials were converted into eco-bricks, which were later assembled into useful objects such as tables and benches. Waste became a medium for creativity, community empowerment, and environmental resilience through this transformation. It proved that grassroots movements can drive meaningful change by the right combinations of communication, collaboration, and adaptability.

The discussion above focuses on innovations applied to inorganic waste management. For organic waste, or waste that can decompose, Komunitas Kehati and Lingkungan Natuna also developed other innovations, which include:

1. **Ecoenzym**

   Komunitas Kehati and Lingkungan Natuna have implemented an organic waste management program by producing eco-enzymes. Eco-enzyme is an enzyme created through the fermentation of vegetable and fruit scraps with brown sugar over approximately three months. The process of making eco-enzyme does not require special equipment or large spaces; discarded items such as bottles, cans, and jerry cans can be used as fermentation containers. This method not only helps reduce the cost of waste management but also allows the community to practice it at home, thereby strengthening independent and sustainable waste management efforts.

The innovative products developed by Komunitas Kehati based on eco-enzyme include eco-friendly cleaning detergents, organic fertilizers that promote plant growth, and multipurpose cleaning solutions. These products are designed as effective and sustainable solutions because they reduce the negative impact of organic waste on the environment and meet the community's everyday needs. Additionally, the community produces various other products, such as the "Kehati Natuna" organic solid soap, herbal health drinks, and multipurpose liquid soap for household use. The soap is enriched with natural colorants from plant extracts and a blend of three types of oils: olive oil, coconut oil, and palm oil. These oils are added to enhance the benefits of the soap, making it softer and more effective for skincare. After production, the soap requires a maturation period of about one month before it is ready for use, ensuring its optimal quality and effectiveness.

Figure 3. Eco Enzyme Multipurpose Liquid Soap Produced by Komunitas Kehati

In addition to producing solid soap, Komunitas Kehati and Lingkungan Natuna also manufacture highly beneficial liquid soap. The Eco Enzyme Multipurpose Liquid Soap is an organic product for various cleaning purposes, such as washing dishes, laundry, and household cleaning. The community also produces liquid soap that utilizes the lerak plant, a natural foaming agent, to enhance cleaning effectiveness. By using natural ingredients, these products provide eco-friendly and sustainable cleaning solutions. The use of natural soap reflects a simple and environmentally conscious lifestyle, helping reduce negative environmental impacts while maintaining everyday cleanliness.

Komunitas Kehati Natuna has also developed a product called Classic Enzyme. Classic Enzyme is a health drink made from the fermentation of fresh fruit, offering various health benefits. This drink can help boost metabolism, strengthen the function of red and white blood cells, and improve digestion. It is recommended to consume Classic Enzyme daily, with a suggested dosage of one tablespoon mixed into 200-250 ml of water, equivalent to one glass.

2. Recycling Used Cooking Oil

In addition to their efforts in repurposing vegetable and fruit waste into eco-enzymes and compost, Komunitas Kehati and Lingkungan Natuna have also taken an innovative step in recycling used cooking oil known as *minyak jelantah* into eco-friendly candles. Used cooking oil, especially after repeated use, undergoes degradation in quality, making it unsuitable and potentially harmful for further consumption. Unfortunately, in many households, this waste product is either reused beyond safe limits or discarded irresponsibly, contributing to environmental pollution, especially when poured into drainage systems or soil.

Figure 4. Eco Enzyme Multipurpose Eco-friendly Candle Produced by Komunitas Kehati

By transforming used cooking oil into handmade candles, the program reduces the environmental burden and adds new economic and functional value to a substance that is usually thrown away. The process involves filtering and purifying the oil, mixing it with natural additives such as beeswax or essential oils, and pouring the mixture into molds to solidify. The final product is a clean-burning candle that can be used for household lighting or sold as part of a community livelihood initiative.

This small-scale innovation aligns with the broader mission of promoting sustainable and circular waste management practices. It teaches the community that even hazardous household waste can be transformed into beneficial products when approached with creativity and ecological awareness. Moreover, it provides a practical, low-cost opportunity for local residents, particularly women and youth, to learn new skills, contribute to environmental efforts, and potentially generate income.

Through the candle-making program, Komunitas Kehati and Lingkungan Natuna demonstrate that sustainability is not limited to large-scale infrastructure but can be nurtured from simple, community-driven actions that promote resourcefulness, education, and shared environmental responsibility.

3. Ecoprint

In their continuous efforts to promote environmental sustainability and local empowerment, Komunitas Kehati and Lingkungan Natuna have also ventured into the field of sustainable fashion by developing products using eco-printing techniques. This initiative harnesses the natural beauty and richness of local plant species to create unique, eco-friendly textile designs. Recently, they launched their own brand named Dare Ecoprint, a label that reflects both creativity and environmental responsibility. However, this product line is still in its early development phase, largely due to the time-intensive production process and limited availability of trained human resources.

Eco-printing itself is a sustainable alternative within the fashion and textile industry. Unlike conventional dyeing methods that rely on synthetic chemicals, eco-printing uses natural pigments extracted directly from plants, leaves, and flowers. However, the process is highly dependent on the types of plants used, and not all vegetation produces optimal results. Plants with strong pigmentation and high moisture content, such as teak leaves, cosmos flowers, or guava leaves, are considered ideal, as they produce more vivid, long-lasting, and visually appealing patterns on fabric.

Figure 5. Eco-Print Textile by Komunitas Kehati

Despite its potential, the ecoprint faces challenges that are common in artisanal production: the delicate, manual nature of the printing process, the need for precision, and the limited scale of current operations. Still, the project represents an important step toward integrating traditional ecological knowledge with modern sustainable practices. By introducing eco-printing to the community, Komunitas Kehati and Lingkungan Natuna promote waste-free fashion and open up new avenues for creative economic empowerment, especially for local women and youth interested in craftsmanship and design.

As the initiative evolves, it holds the promise of becoming a symbol of local identity and a model for low-impact fashion that prioritizes environmental ethics over mass production. With continued support, training, and collaboration, Dare Ecoprint has the potential to contribute significantly to the growing global movement of slow, sustainable fashion rooted in local culture.

Discussion

The Diffusion of Innovations Theory, introduced by Everett M. Rogers (1962), serves as a valuable conceptual framework for understanding the dissemination of community-based environmental initiatives, such as those developed by Komunitas Kehati and Lingkungan Natuna. This theory explains how new ideas, practices, or technologies referred to as innovations are communicated through certain channels over time among members of a social system (Rogers, 2003). It outlines the process that individuals move from first hearing about an innovation to fully adopting it in their daily lives. Diffusion studies have shown that innovations often follow a mathematically consistent S-shaped adoption curve, which reflects how innovations are gradually accepted first by innovators and early adopters, followed by the majority, and finally laggards (Dearing, 2014). The success of this diffusion process relies heavily on the influence of opinion leaders who model and advocate for the innovation within their social networks. Without their positive engagement, diffusion may slow down or fail.

Dearing (2014) illustrates how diffusion theory can be effectively applied in development and health promotion. In Haiti, a USAID campaign to reduce HIV infection rates successfully mobilized voodoo priests, considered trusted sources by villagers, to encourage participation exceeding outreach goals by 124%. In Nepal, the adoption of kitchen gardens spread effectively through peer modelling, improving dietary habits and vitamin A intake. By contrast, in Mali, youth relied on less credible sources such as friends

and siblings for reproductive health information, leading to persistent misinformation. These examples demonstrate the importance of credibility, cultural fit, and accessible messengers in the diffusion process. In the case of Komunitas Kehati and Lingkungan Natuna, the theory helps explain how innovations like waste donation, waste barter, and eco-product upcycling gained traction through structured communication, community influencers, and locally meaningful incentives guiding residents through the full adoption cycle from awareness to sustained practice.

Rogers (2014) outlines a five-stage model of innovation adoption that explains the psychological and behavioural process individuals undergo from initial awareness to sustained use. These stages include: knowledge, where an individual becomes aware of the innovation and begins to understand its function; persuasion, where attitudes positive or negative are formed based on perceived advantages and compatibility; decision, in which the individual chooses to adopt or reject the innovation; implementation, where the innovation is put into practical use; and confirmation, where the individual seeks reinforcement for the decision and continues or discontinues the adoption based on experience. This model provides a structured understanding of how innovations diffuse through communities and social systems over time. Its relevance is further demonstrated by Cole et al. (2014) in their evaluation of urban sanitation programs in Malawi, where the application of diffusion theory helped assess the effectiveness of social marketing interventions in promoting sanitation behaviour change.

1. **Knowledge Stage**

   At the initial stage of implementation, the local community is gradually introduced to a variety of environmental innovations developed by Komunitas Kehati. These include the production of eco-enzymes, a sustainable solution made from fermented organic waste, useful as a natural household cleaner or fertilizer; the upcycling of inorganic waste into handicrafts, which helps reduce environmental burden while offering economic opportunities; and the Sedekah Sampah (waste donation) program, which encourages responsible waste disposal by allowing people to exchange their waste for social or economic benefits.

   To maximize reach and impact, Komunitas Kehati applies a multi-channel communication approach. They leverage social media platforms like Instagram, Facebook, and WhatsApp to connect with digitally engaged audiences, while also conducting seminars, workshops, and direct outreach to ensure inclusivity across age and access groups. This strategy is essential, as early-stage communication is critical in shaping perceptions, reducing resistance to change, and enhancing innovation acceptance (Weiner, 2009).

   Research by Kurniawan et al. (2021) highlights that the initiation phase of innovation diffusion is key in raising awareness, particularly when innovations are community-based and address environmental or social needs. Similarly, Rogers (2003) in his *Diffusion of Innovations* framework emphasizes that the knowledge stage where individuals are first exposed to an innovation is foundational for adoption, especially when the innovation is perceived as beneficial, compatible with values, and easy to try.

   Moreover, the importance of such a multimedia strategy is supported by research from Snyder & Garcia-Garcia (2016), which shows that cross-platform advertising consistently yields higher returns on investment (ROI) than single-platform campaigns. Their study, part of the *"How Advertising Works"* initiative by the Advertising Research Foundation, demonstrates that integrating traditional

media (such as face-to-face outreach) with digital platforms can reinforce key messages, enhance recall, and strengthen behavioral impact. In the context of community-based environmental innovation, this multimedia reinforcement is crucial to foster trust, ensure message retention, and encourage sustained participation.

By applying this principle, Komunitas Kehati not only informs the community but builds a consistent and persuasive narrative across channels, increasing both the visibility and credibility of their innovations. This reflects the broader evidence that multi-platform engagement especially when creatively aligned and locally relevant can significantly enhance the success of awareness campaigns.

2. **Persuasion Stage**

In the persuasion stage of innovation diffusion, Komunitas Kehati concentrates on cultivating favourable attitudes by linking its waste-management innovations to residents' economic needs and emotional values. A flagship example is the barter-waste programme, in which households trade cleaned plastic bottles and cans for groceries, household items, or plant seedlings. This direct incentive structure turns rubbish into a tangible asset, fosters the habit of source-level sorting, and makes the innovation feel immediately compatible with daily life. As Rogers (2003) emphasises, attitudes at this stage are shaped not just by information but by perceived benefits, value fit, and ease of integration.

Empirical work supports this approach. A Beijing study by Cudjoe, Yuan, and Han (2020) showed that when residents clearly understood the benefits of waste sorting, intention to adopt rose significantly, whereas perceived difficulties suppressed participation effects that were amplified by how effective local policies seemed. Even more granular insight comes from Kim and Reeck's (2019) research on collective campaigns: they found that framing progress to highlight the "large area" most salient at a given moment broadens engagement. Early in a campaign, stressing remaining contributions energised hesitant groups; later, emphasising accumulated achievements had the same unifying effect. Translating this to Komunitas Kehati's context means spotlighting how much recyclable material is still needed at the programme's outset, then celebrating milestones once participation grows thereby sustaining motivation across diverse community segments.

Together, these findings reinforce Komunitas Kehati's strategy of pairing persuasive, dynamically framed messages with practical incentives and low-barrier processes. By simultaneously amplifying perceived benefits and minimising perceived hurdles, the organisation increases the probability that residents will move from favourable attitudes to concrete, long-term behavioural change.

3. **Decision Stage**

In Roger's diffusion model, the decision stage is the pivotal moment when individuals weigh the perceived advantages of an innovation against its risks and the effort required to adopt it. Among Natuna residents, initial hesitation toward Komunitas Kehati's eco-enzyme and ecobrick initiatives illustrated classic barriers at this stage: uncertainty about efficacy, doubts about personal capability, and questions of social acceptability. Those concerns diminished once early adopters often respected neighbours or community leaders publicly demonstrated concrete

benefits: eco-enzyme reduced household chemical expenses, and eco bricks were visibly transformed into durable benches and garden borders. Observing these successes provided the observability and relative advantage that Rogers (2003) identifies as critical cues for tipping a wavering audience toward adoption.

Tangible incentives further accelerated positive decisions. The Gerakan Selamatkan Bumi Kite program offered a direct, easily understood exchange of two kilograms of cleaned plastic packaging for one litre of cooking oil making the benefits immediate and practical. By combining social proof with material rewards, the program reduced both psychological and economic switching costs, prompting many previously sceptical households to commit to systematic waste separation (Sari & Pratama, 2022). As more residents joined, participation itself became a social norm, creating a reinforcing loop in which community endorsement, visible outcomes, and ongoing incentives collectively propelled the innovations from isolated experiments to widely accepted practices.

4. **Implementation Stage**

At the implementation stage, the abstract idea of waste management becomes part of everyday routines. Natuna households that once disposed of rubbish in a single bin now separate organic scraps for eco-enzyme production and clean, dry plastic or metal for recycling. Kitchen counters display repurposed bottles of amber-coloured eco-enzyme, used to mop floors or water vegetable beds, while yards and alleyways host neat sacks of sorted cans and sachets awaiting collection. This visible shift demonstrates what Rogers calls the "reinvention" of an innovation adapting it to local habits so it feels less like extra work and more like an improvement to normal life.

To smooth the transition, Komunitas Kehati runs an ongoing programme of hands-on workshops, WhatsApp tutorials, and household mentoring visits. During weekend training sessions, facilitators show residents how to mix fruit peel, brown sugar, and water in the correct ratio, troubleshoot odour issues, and strain the finished liquid after three months of fermentation. For inorganic waste, demonstrators teach simple crafting techniques folding detergent pouches into wallets or compressing bottles into eco-bricks for community benches. These activities build both technical skill and collective pride, turning implementation into a social event rather than an individual chore.

Research supports the importance of such practical support. Iskandar et al. (2020) found that the perceived ease and everyday usefulness of a sustainability innovation are the strongest predictors of sustained uptake in Indonesian villages. When residents understand exactly how an innovation fits their routines and can see quick wins such as reduced cleaning costs or free garden fertilizer implementation barriers drop sharply. Conversely, programmes that rely on complex equipment or unclear instructions stall, even when the environmental rationale is compelling. Komunitas Kehati's emphasis on low-cost materials, step-by-step guidance, and peer demonstration therefore aligns closely with evidence-based best practice for moving a community from initial trial to confident, long-term adoption.

5. **Confirmation Stage**

In Rogers's confirmation stage, adopters seek reinforcement for their earlier choice and decide whether to continue or discontinue the new practice. Rogers notes that confirmation hinges on "messages about an innovation that are

consistent with prior adoption decisions," while negative feedback can still trigger abandonment (Rogers, 2003). To keep momentum, Komunitas Kehati regularly circulates success stories on WhatsApp and at neighbourhood gatherings, spotlighting households that now spend less on chemical cleaners thanks to home-brewed eco-enzyme and showcasing community furniture built from ecobricks. By publicly validating early adopters and normalising the new routines, the group supplies the social proof that Rogers argues is essential for long-term commitment.

Tangible environmental pay-offs further lock in the decision. Recent scientific reviews show that converting kitchen scraps into eco-enzyme cuts household methane emissions, produces a versatile cleaning solution, and even generates ozone that helps offset local air pollutants (Muliarta, 2024). Visible, measurable benefits cleaner drains, reduced odour, and lower spending on commercial detergents give residents concrete evidence that their effort is worthwhile, deepening confidence in the innovation.

Economic returns add an equally powerful layer of reinforcement. Field work on Indonesia's Waste Sadaqah movement documents how exchanging recyclables for cash or staple goods boosts household income and strengthens community solidarity outcomes that participants cite as key reasons for staying engaged (Yandri et al., 2023). Similar community-led programmes in other remote Indonesian regions report sustained participation because people "see real value in waste" through small but reliable revenue streams and cleaner surroundings (United Nations SDG Action #47938, 2024). Together, environmental improvements and economic incentives create a positive feedback loop that anchors the Natuna community's commitment, ensuring that Komunitas Kehati's innovations move beyond short-term enthusiasm to durable, self-sustaining practice.

Through the **Diffusion of Innovations Theory**, we can observe that the programs implemented by Komunitas Kehati, such as eco-enzyme production, Sedekah Sampah (waste donation), and Barter Sampah (waste barter) are closely aligned with the stages of innovation diffusion. The initial knowledge of the community about waste management is enhanced through socialization efforts. Persuasion is achieved by offering tangible examples and incentives, while decision-making is driven by demonstrating direct benefits. Implementation and confirmation occur as the community begins to experience the advantages of these innovations in their daily lives, reinforcing their adoption and integration into sustainable practices.

6. CONCLUSION

Waste-management efforts in Natuna Regency spearheaded by Komunitas Kehati under the leadership of Hazriani illustrate how a grassroots movement can tackle mounting environmental pressures through locally tailored innovations. Programs such as Sedekah Sampah (waste donation), Barter Sampah (waste-for-goods exchange), eco-enzyme production, and the up-cycling of used cooking oil into candles have already diverted substantial volumes of household waste from coastal dumpsites. Nevertheless, four structural hurdles remain: (1) limited infrastructure for collection and processing, especially in remote villages; (2) low youth participation, attributable to migration for work or study and competing digital leisure; (3) insufficient policy support, with sporadic

coordination between village units (desa) and the regency's sanitation office; and (4) weak market access for recycled goods, which constrains revenue and dampens community enthusiasm. Although public awareness is high—thanks to school campaigns and social-media outreach implementation is still erratic, reflecting the gap between attitude and sustained behaviour.

Through Rogers's (2003) Diffusion of Innovations Theory, Natuna's experience sits between the implementation and early confirmation stages. A cadre of innovators and early adopters (mostly women's groups and neighbourhood leaders) has normalised source separation and eco-enzyme brewing, creating visible proof of concept. Their success stories circulate via WhatsApp and Friday-market stalls, gradually persuading the early majority to participate. Yet the leap to late-majority adoption hinges on perceived ease and relative advantage; households without reliable pick-up routes or safe storage for recyclables still view participation as burdensome. Studies in comparable Indonesian districts show that adoption accelerates only when infrastructure and incentives expand in tandem (Iskandar, Hidayat, & Lubis, 2020; Dearing & Cox, 2018).

To push the curve upward and embed waste stewardship as a community norm, multilevel collaboration is essential. The regency government can close infrastructure gaps by extending scheduled collection to outlying hamlets, subsidising compactors or eco-brick moulds, and issuing clear bylaws that reward compliant households. Provincial and national agencies could channel plastic-credit or circular-economy grants to finance branding, e-commerce training, and participation in green-market fairs, giving Komunitas Kehati's recycled handbags and candles wider market visibility. Parallel efforts to recruit and mentor youth "eco-champions" through vocational schools or social-entrepreneurship incubators would inject long-term energy into the movement and align with Indonesia's SDG 12 targets on responsible consumption. By coupling bottom-up innovation with top-down support, Natuna can convert its pilot successes into a resilient, regency-wide waste-management system that delivers enduring economic and environmental dividends.

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