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# Exploring Hindu Eco-Ethics in School-Based Zero Waste Initiatives: Implications for Student Character Education in Denpasar

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**Abstract:** The lack of waste management awareness leading to waste accumulation has prompted elementary schools in Denpasar to implement a Hindu Eco-ethics-based Zero Waste program. Using a qualitative research method with a field study approach, this study aims to explore and analyze the program's implementation, challenges, and its implications for strengthening student character. Primary data was collected through interviews and observations, supported by secondary data from literature reviews and documentation. Through qualitative data analysis using the Miles and Huberman approach and verified with triangulation techniques, the findings reveal that the Zero Waste program focuses on systematic efforts to enable school communities to manage their own waste. The challenges include awareness gaps, infrastructure limitations, and insufficient external support. Despite these obstacles, the program shows positive impacts on student character building. This research provides guidelines for waste management program development and serving as a reference for future environmental studies.

**Keywords:** zero waste; Hindu eco-ethics; student character building

## 1. Introduction

Bali is one of the provinces in Indonesia renowned for its pristine natural beauty. The lush environment serves as the lifeblood of the local community, a cherished heritage, and a divine blessing from the Almighty. It is no surprise that this natural splendour is a factor making Bali a world-famous destination (Win, 2024). In the tourism sector, the allure of its landscapes, mountains, hills, beaches, and more, continues to charm visitors. It draws them back to the Island

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of the Gods time and again (Mahadewi et al., 2025). Beyond its breathtaking scenery, every corner of Bali also presents traditions that set it apart from other nature-based tourist destinations.

However, Bali's pristine beauty, its most prized asset, now faces serious challenges. Empirically, the island's waste problem has become an eyesore and a source of disasters such as flooding (Zulkifli, 2021). With the overload and increase of population in Bali, there is a new 'waste emergency' which has resulted in the government trying to control the waste. This is especially noted in Badung Regency (Dalem et al., 2024). In essence, since waste is largely generated by human activity, it is crucial to cultivate awareness among all sectors of Balinese society to manage their waste responsibly.

According to data from Bali Partnership (Wijaya & Putra, 2021), Bali's daily waste production once reached 4,281 ton/day, including the temple waste, with an estimated 60% being organic waste, 20% inorganic, and the remaining 20% consisting of metal, paper, glass, and ceremonial remnants from temples. The data also spots a concerning trend, that is modernization has shifted the materials used in Hindu religious offerings from natural elements to synthetic, non-biodegradable plastics (Wardhana & Sudiarawan, 2021). This throws back a troubling reality, that millions of worshippers, while performing rituals or making offerings, inadvertently hand out Bali's waste problem.

According to 2022 regional data (Setiawan et al., 2023), Denpasar City ranks as Bali's largest waste contributor, generating approximately 349,500 tons annually—or around 957.5 tons daily. Gianyar Regency follows in second place with 141,400 tons per year (387.4 tons daily), trailed by Buleleng (123,700 tons/year or 338.9 tons daily), Badung (116,700 tons/year or 319.7 tons daily), and Tabanan (84,200 tons/year or 230.7 tons daily).This distribution throws back expected patterns, given Denpasar's dual role as Bali's provincial capital and primary tourism center that props up a dense population. The city's diverse demographic composition (Putri et al., 2024) further complicates waste management efforts, with varying levels of environmental consciousness among residents and some displaying outright apathy toward local waste issues.

Facing these challenges, the Denpasar City Government has implemented Mayor Regulation No. 15 of 2023 on Culture-Based Waste Management, divided into eight chapters and 19 articles designed to guide community-led waste management. This regulation aims to break the waste production cycle at its source by stimulating environmental awareness rooted in Bali's traditional ecological values. The goal is to transform waste management into an ingrained cultural practice, giving back a conscious society committed to restoring Bali's pristine environment (Arini, 2024). For effective implementation, the current phase requires extensive education programs,

community outreach, and concrete actions to operationalize the regulation while building commitment to tackle waste problems from their origin. This approach emphasizes prevention rather than just managing the consequences, lining up with Bali's cultural philosophy of environmental stewardship.

As part of implementing this regulation, elementary schools in Denpasar have pioneered an inventive waste management initiative called the *Hindu Eco-Ethics Based Zero Waste Program*. This program educates children to take responsibility for their waste, significantly reducing the volume of trash generated in schools. The program is philosophically grounded in Hindu Eco-Ethics. It draws upon Hindu environmental principles that make a point of the sacred duty to protect nature. Beyond classroom integration, in line with Bali's character education framework, the program involves teachers, parents, and the community as a whole. Preliminary observations specify the program supports Governor's Circular No. 9 of 2025 on the 'Clean Bali Movement'. It gives an idea of how policy, education, and cultural values can converge to address environmental challenges.

As much as the earlier discussed policies have provided an impetus in this regard, the execution of the Hindu Eco-Ethics Based Zero Waste Program in primary schools (*Sekolah Dasar* or SD) in Denpasar has promising emerging achievements. For example, the observation from pilot schools SD Negeri 1 Penatih and SD Saraswati 6 Denpasar which practiced variants of this Zero Waste program for three to five years shows some positive changes in student attitudes. The faculty and staff note a heightened engagement among students with waste separation, a measurable increase in the avoidance of littering within the school, and an emerging culture of environmental stewardship regarding the maintenance of cleanliness in the environment among the students. Such changes in behavior indicate that there are formative changes, however small, occurring in the adoption of attitudes associated with sustainable environmental practices.

Previous studies examining waste in schools emphasize practical issues, technological approaches, or superficial campaigns focused on environmental awareness (Rada et al., 2016; Heiges et al., 2022). Some have studied the intersection of character education with ethics but have not traced it to waste management programs that draw extensively on local spiritual or ethical traditions. For example, the existing scholarship on environmental education in Indonesia has largely been dominated by a quantitative approach directed at knowledge, theory acquisition related to environmental issues or attitudes towards the environment (Cutter-Mackenzie, 2010; Derqui et al., 2020), focusing on the behavioral dimensions of character development in culturally rooted, action-oriented programs.

This study stands out because it examines the Hindu Eco-Ethics Based Zero Waste Program as a specific case of character education that is culturally integrated. This research seeks to analyze more holistically through qualitative methods the action and subtle behavioral changes, along with attitudes that the program's implementation nurtures, in order to fill a void within the scholarly conversation on environmental education and character development.

Given these developments, this study examines the Hindu Eco-Ethics Based Zero Waste Program implemented in Denpasar's elementary schools. The study aims to: (1) analyze the program's operational framework as a waste management model, (2) identify implementation challenges, and (3) assess its impact on character development among elementary students across Denpasar. This research puts up to present-day waste management discourse by presenting an evaluative study of an education-based initiative. Furthermore, it hands out a model for integrating environmental stewardship into primary education curricula that exemplifies how early intervention can plow sustainable practices from elementary academic levels.

## 2. Literature Review

### *2.1 Zero Waste Program*

Zero waste is an effort based on the latest paradigm aimed at designing the recycling of resources and the outcomes of resource processing, with the primary goal of preserving resources (Awasthi et al., 2021). This preservation is achieved by processing waste or by-products from activities or production without disposing of it in open landfills. It burns waste in ways that degrade air quality, or by dumping it into water sources, all of which endanger human health and the surrounding environment (Januari & Agustina, 2021).

The problem of waste alongside its environmental implications is becoming more severe in Indonesia. According to the National Waste Management Information System (Dalem et al., 2024), Indonesia produced around 67.8 million tons of waste in 2020, only managing to process 48.5% of it. Simply put, Zero Waste implementation follows the 3R framework, Reduce, Reuse, and Recycle, which can expand to 4R (adding Replace) or 5R (including Replant) (Suryawan & Atmika, 2021). Waste management under the Zero Waste program is also carried out close to homes or the sources of waste generation (Janu et al., 2025). This approach continues to rely heavily on the final disposal sites (TPA) which are often over congested and adversely affect ecological quality (Dalem et al., 2024).

### *2.2 Eco-Ethics: Hindu Environmental Ethics*

Eco-ethics is a concept and an acronym for *environmental ethics*. Environmental ethics itself is a guideline that directs humanity to responsibly apply reason and sensibility toward the sustainability of nature and the environment (Long, 2025). This ethical approach teaches that humans, as beings with superior reasoning abilities, should uphold values, norms, obligations, and moral principles in maintaining a harmonious relationship with nature and all its inhabitants. Environmental ethics is often synonymous with the intersection of ecology and moral philosophy (Sukotjo & Suhardi, 2018). Thus, indirectly, environmental ethics manifests in integrated efforts to preserve nature and maintain a clean environment to establish the safety and well-being of all living beings (Riko, 2024).

Regarding its conceptual foundation, eco-ethics, or environmental ethics is normally explored through religious perspectives (Januaripin & Rahtikawati, 2024). As an integral part of societies worldwide, religious perspectives reinforce and guide humanity in protecting nature and its elements as fellow creations of the Divine (Pradheksa et al., 2023).

One of the world's major religions that builds in eco-ethical principles is Hinduism. Research by Dalapati (2022) lays out an academic analysis of religion's relevance in modern environmental ethics. Using a literature-based approach drawing from ancient Hindu scriptures, the study gives an idea that religious teachings and perspectives can put up to environmental ethics. In Hinduism, for instance, ethical principles are intertwined with the concept of Devas and Devis (divine manifestations) as guardians of natural elements, such as oceans, mountains, and other aspects of the natural world (Venkatkrishnan, 2017).

### *2.3 Character Building*

Character building, as an integral part of holistic education, means developing the moral, ethical, and social virtues of a person (Lickona, 1996). Character building nurtures responsibility alongside academic achievement, in addition to integrity, empathy, respect, and resilience. In the context of education, character building is delivered through the curriculum, the culture of the school, and through extra-curricular activities aimed at developing students into active members of the community (Keser et al., 2011).

Deep character building is necessary for environmental education, such as Zero Waste, as it fosters commitment to actual stewardship. The formation of values allows the participants to be accountable for their environment, which motivates them to consciously practice waste and resource minimization (Hanedar et al., 2021). Compassion enables students to identify the harmful

impacts of pollution, thus affirming their eco-friendly behaviors. The habits and practices of consistently behaving in a certain way are reinforced by the ability in empathy, especially in the case when no supervision is provided. Consequently, effective Zero Waste programs often, both implicitly and explicitly, focus on character building that promotes ethical behavior change (Marini et al., 2019). The application of eco-ethics, as discussed in the previous section, further enhances character building by relating environmental actions to moral and spiritual frameworks, thus reinforcing its development.

## 3. Method and Theory

### *3.1 Method*

This research, which examines the Zero Waste program based on Hindu Eco-ethics as a platform for strengthening student character in elementary schools across Denpasar City, takes on a descriptive qualitative method. The approach is naturalistic, meaning that the researcher systematically presents and describes the data found in the field exactly as it is (Dantes, 2023). This method is considered suitable for the researcher to explore and elaborate on the research questions to narratively detail the implementation of the Zero Waste program based on Hindu Eco-ethics, the challenges encountered during its execution, and its implications for reinforcing student character in elementary schools throughout Denpasar City.

Using a naturalistic, field-based research approach, this study was conducted as case studies across three distinct elementary schools (*Sekolah Dasar* or SD): SD Negeri 1 Penatih, SD Saraswati 6 Denpasar, and SD Negeri 5 Tonja. The selection of these three schools in Denpasar was based on several reasons. First, Denpasar is the capital of Bali Province, meaning it has the highest number of elementary schools and generates the most waste. Second, these three elementary schools have already become pioneers in implementing integrated waste management programs. Third, aligning with Mayor Regulation No. 15 of 2023 on Culture-Based Waste Management and Bali Governor's Circular Letter No. 9 of 2025 on the 'Clean Bali from Waste Movement,' these chosen schools in Denpasar have shown themselves to be progressive in adopting the Merdeka Curriculum policy. Merdeka Curriculum is Independent Curriculum. It is a newly implemented educational framework in Indonesia aimed at giving teachers and educational institutions more autonomy in the teaching and training processes, stimulating active student engagement and independence throughout the educational journey. They are implementing excellent school programs, including Zero Waste, which holds potential as a platform for strengthening student character, the main topic of this research.

Based on data from the Denpasar City elementary schools in 2025, there are a total of 241 elementary schools. Of these, 166 are state-owned and 75 are private. Breaking it down by sub-district, Denpasar Selatan has the most schools with 72 (42 state, 30 private), followed by Denpasar Barat with 59 (43 state, 16 private). Denpasar Utara has 56 schools (44 state, 12 private), and Denpasar Timur has 54 schools (37 state, 17 private). This data is sourced from the Basic Education Data (Dapodik) of the Directorate General of Early Childhood Education, Primary Education, and Secondary Education, Ministry of Primary and Secondary Education for 2025 (Dapodik, 2025).

Among the many elementary schools in Denpasar City, three schools serve as samples for the implementation of the Hindu Eco-ethics-based Zero Waste program. These three schools are known for their intensive implementation of integrated waste management programs. The three schools are SD Negeri 1 Penatih, SD Saraswati 6 Denpasar, and SD Negeri 5 Tonja. Out of the three schools chosen for the research, SD N 1 Penatih was the first to implement this program, even before the circulars from the Governor and Mayor of Denpasar regarding plastic waste reduction were issued. Initial information about these three elementary schools can be seen in Table 1.

Table 1. Schools with Zero Waste Program Information

| No. | School Name | Year Established | Address | School Area | Number of Students | School Achievements | Waste Production per Month | Remarks |
|---|---|---|---|---|---|---|---|---|
| 1 | SD Negeri 1 Penatih | 1927 | Trengguli Street No. 8 Penatih Denpasar | 1.520 M² | 299 | 1st Place in Denpasar City Environmental Essay Competition | 25 kg | Environmentally Conscious School |
| 2 | SD Saraswati 6 Denpasar | 1998 | Kenyeri Street Gg. Sekar Kemuda Denpasar | 1.950 M² | 730 | National Level Active Literacy School | 238 kg | National Active Literacy School |
| 3 | SD Negeri 5 Tonja | 1983 | Gatsu Street I / XIV No. 2 Denpasar | 2.390 M² | 496 | 1st Place in Denpasar City POP Bali Wastu Lestari Best Practice Competition | 200 kg | National Adiwiyata School |

Source: Results of the author's research, 2024

The researchers collected both primary and secondary data. The core empirical evidence for this study comes from its primary data sources, which include observations and interviews. The observations were conducted as a non-participant, two-month field study, systematically documenting the Zero Waste program's implementation in the schools. For the interviews, a total of 15 informants participated. This group specifically consisted of school principals, members of the Zero Waste Team, teachers, students, and parents of students from the participating Denpasar elementary schools.

Informants were selected using non-probability purposive sampling, meaning they were chosen for their ability to supply information relevant to the research questions. The specific criteria applied in choosing the samples included: 1) schools actively implementing a Zero Waste program; 2) schools with extensive experience in managing Zero Waste programs, particularly those established before government mandates, such as SD N 1 Penatih; 3) schools recognized for achievements related to the Zero Waste program, exemplified by SD 5 Tonja, which achieved first place; and 4) ensuring representation from both public (Negeri) and private (Swasta) schools. Besides, the study builds on secondary data obtained from literature reviews and documentation pertinent to both the formal and material aspects of the research subject, specifically investigating Zero Waste program reports and activity photographs.

### *3.2 Theory*

#### *3.2.1 Constructivism Theory*

Constructivism theory was developed by two figures, Jean Piaget and Lev Semonovich Vygotsky (Rinawati & Dayanty, 2021). The constructivist perspective holds that knowledge cannot simply be transferred directly; instead, it must be interpreted by each individual. Knowledge is also not something that pre-exists but rather a continuously developing process. In this process, an individual's participation is climacteric for developing their understanding. Furthermore, constructivism theory puts forward the idea that students must discover and transform complex information into new situations, so that it becomes their own if they wish (Hendrayanto, 2019).

Based on the point of view above, the constructivism theory put forth by Piaget and Vygotsky regards knowledge as something that is incrementally acquired through contextual learning (Saputra & Muqowim, 2024). This is consistent with the supportive role of educators in scaffolding students and organizing appropriate learning contexts. The theory will be used to examine the difficulties encountered in applying the Hindu Eco-ethics based Zero Waste Program in elementary schools in Denpasar. This breakdown will look at the ways the students engage with the Zero Waste program activities as

well as Hindu Eco-ethics (Piaget, 1972; Vygotsky, 2011) to understand their environmental responsibilities and values on a deeper level. It will also focus on different types of theoretical, socio-cultural, and technical challenges as they pertain to the children's experiential learning concerning waste and the waste management skills and virtues associated with it.

*3.2.2 Stimulus-Response Theory*

The stimulus-response theory, also known as reinforcement theory, can be used to explain various aspects of social behavior. This theory also spells out the formation of attitudes (Oktaria et al., 2023). One theory explaining attitude formation was proposed by Daryl Bem (1964), a follower of Skinner. Bem built upon Skinner's assertion that human behavior develops and is maintained by community members who reinforce individuals for behaving in specific ways (Nitbani, 2020).

Based on the theory discussed, to exert a strong influence and change someone's behavior, a level of trust is essential. The analysis focuses on the development and reinforcement of distinct waste management practices and sustainability habits among students in relation to the organized setting of the Zero Waste program (Skinner, 1965; Zaman, 2015). It will concentrate on assessing the impact of the program on waste reduction at the school level, the holistic character formation of students, their mindfulness in observing religious duties in light of Hindu eco-ethics, stewardship concerning all of God's creatures, and fostering in students sustainable practices pertaining to environmental care and responsibility.

*3.2.3 Hindu Eco-Ethics Theory*

Hindu Eco-Ethics, derived from Balinese Hindu philosophy, offers insights into the sacred bond that exists between humans and nature. One of the central ideas is *Tri Hita Karana,* or three harmonies, which include: humans and God *(Parhyangan),* humans and other humans *(Pawongan),* and humans with nature *(Palemahan)* (Peters, 2013; Sukarma, 2016). The *'Palemahan'* dimension, particularly, imposes moral and spiritual obligations to safeguard ecological equilibrium and treat the environment with respect. This perspective views nature not only as an object to be exploited, but rather a living organism bestowed with divine qualities which calls for reverent protection and sustainable stewardship. Furthermore, offering rituals like *Yadnya* along with established *Karma* principles indicate that caring for the environment results in spiritual benefits and good *Karma* (Pitana, 2010).

## 4. Results and Discussion

### *4.1 Implementation of the Zero Waste Program*

In alignment with Hindu Eco-ethics values and Denpasar City's cultural foundation, most elementary schools in Denpasar are formal educational institutions that uphold the philosophical values of *Tri Hita Karana*. This local wisdom guides the pursuit of balance between humans and God *(Parhyangan)*, humans and other humans *(Pawongan)*, and humans and the natural environment along with its contents *(Palemahan)* (Mahendra & Kartika, 2021). As part of their efforts to maintain harmony with nature, elementary schools in Denpasar City implement the Zero Waste program. This program aims to instill environmental awareness in students from an early age. The concept does not just focus on the physical cleanliness of the school environment, but also serves as a practical implementation of sacred scripture teachings and Hindu principles, particularly *Bhuta Yadnya*, in daily life.

In implementing the Zero Waste program, students are taught to take responsibility for waste management by applying the principles of Reduce, Reuse, and Recycle (3R) (Wardi et al., 2024). This program is not just integrated into the school curriculum; it also involves teachers, parents, and the surrounding community. Activities like waste sorting, environmental education incorporated into science and Hindu religious studies, and collaborations with green communities are all part of this Zero Waste initiative. The sorting of waste within the school and the teaching of environmental concepts within science and religious studies exemplify Constructivism (Vygotsky, 2011). Students do not solely collect information; instead, they actively 'build' their understanding of waste management by practicing and applying scientific concepts, religious teachings, and in their daily lives. The contributions from parents and the wider community enhance this constructivist approach by adding different practical dimensions to the learning experience. As one teacher, Komang Eka Putra, stated, "*We do not just tell them about the 3Rs, we have them do it. They learn by sorting, by making compost, by seeing the results of their actions. That is when it clicks*."

Specifically, at schools like SD N 1 Penatih, the 3R principles are implemented through various initiatives. For 'Reduce,' each student is encouraged to bring their own trash bag to collect personal waste throughout the day and take it home, minimizing waste left on school grounds. For 'Reuse,' inorganic waste that can be repurposed is collected and transformed into marketable products by students, while organic waste is utilized for making fertilizer. For 'Recycle,' discarded materials are creatively repurposed into educational media and handicrafts for classroom use. These efforts are further supported by specific programs such as *'Kerja Bakul Pura'* and the *'Stupa*

*Simpatik Team'*. The *'Kerja Bakul Pura'* program focuses on sorting waste for sale and organic fertilizer production, maintaining a *'Lestari Garden'* for planting and seedling, producing organic fertilizer and ecoenzymes, and fostering student entrepreneurship through selling garden produce and recycled crafts. *BAKULPURA* is an acronym for *Bank Sampah* (Waste Bank), *Kebun Lestari* (Sustainable Garden), *Pupuk Organik* (Organic Fertilizer), and *Wirausaha* (Entrepreneurship). These programs, designed according to the *menyama braya* (communal harmony) concept, offer many benefits in the areas of cognition, affective skills, psychomotor skills, and even economics.

Children apply their knowledge and develop their cognitive skills through learning. They make educational tools out of waste through the 'from children, by children, and for children' initiative. Moreover, children engage in innovation by transforming used items into functional learning materials. Children also learn affective and psychomotor skills like discipline, compassion, hard work, and early training in frugality during waste processing, sustainable garden maintenance, and entrepreneurial activities, all while expressing gratitude for their plans and achievements.

Similarly, '*Simpatik'* is the name of the waste bank at SD Negeri 1 Penatih Elementary School, an acronym for *'Siswa Mandiri Peduli Sampah Plastik'* (Independent Students Caring About Plastic Waste). The *STUPA Simpatik Team* consists of students from SD Negeri 1 Penatih, functioning similarly to a student council (OSIS) and serving as environmental pioneers in maintaining the school's cleanliness. The *Stupa Simpatik Team* oversees a *'Waste Bank'* for sorting and selling waste, manages a *'Lestari Garden'* for food crops, creates organic fertilizer and ecoenzymes, facilitates entrepreneurship, ensures adherence to Zero Waste habits, develops innovative teaching media from recycled items, conducts educational field trips, and even runs a *'Mina Tani'* fish farming project. These activities ensure that the 3R principles are deeply embedded in the schools' daily operations and learning experiences. Through these programs, elementary schools in Denpasar City are not only creating a clean and healthy learning environment but also shaping students' characters to be sustainably environmentally conscious and ready to become agents of change in maintaining the planet's cleanliness and sustainability.

One of the main and widely implemented policies within the Zero Waste program across Denpasar elementary schools is encouraging students to bring their own trash bins or bags from home. This confirms that waste generated after eating in the canteen is not disposed of at school, but rather taken home to be managed according to the 3R principles. This serves as a unified stimulus with regard to the school ecosystem. The consistent instruction with the expectation

for students to carry their own waste home serves as a stimulus that seeks to create a response of an established habit of self-care waste responsibility according to the 3R principles beyond the school gates (Thorndike, 1913).

The effectiveness of this policy also showcases effective School Management (Clarke, 2007) illustrating that defined policies coupled with their consistent application can lead to change throughout the student population, and even influence alongside indirectly engaging parents into the waste management loop. As one parent, Ni Nyoman Mariani, highlighted, "*At first, it was a bit unusual for my child to bring trash home, but now it is just part of our routine. It has made us as a family more mindful of our own waste."* This policy successfully manages the containment of the physically defined school environment. Consequently, students and other school community members learn to manage waste wisely and understand the importance of maintaining ecological balance as a form of devotion to God and respect for the environment. Beyond the school environment, the Zero Waste program, by requiring students to bring their own trash bags, indirectly asks parents and the wider community to participate and synergize in general waste management.

Here is a more detailed explanation of how the Hindu Eco-ethics-based Zero Waste program is implemented in the three elementary schools in Denpasar City in line with school-based management.

*4.1.1 Case Study at SD Negeri 1 Penatih*

At SD Negeri 1 Penatih, the Zero Waste program has its own unique name: *'BAKULPURA,'* which stands for *'Bank Sampah, Kebun Lestari, Pupuk Organik, and Kewirausahaan'* (Waste Bank, Sustainable Garden, Organic Fertilizer, and Entrepreneurship). Plastic waste collected from the Zero Waste Program is then managed in collaboration with the Bali Wastu Lestari Foundation and stored in a waste bank named *'Simpatik,'* an acronym for *'Siswa Mandiri Peduli Sampah Plastik'* (Independent Students Caring for Plastic Waste). This waste bank aims to spark students' concern for managing their own plastic waste. Essentially, the waste bank also offers a reward for students who actively collect plastic waste, permitting them to exchange it for profit when the time comes (Jaya & Machdum, 2022). This initiative helps students get into the habit of saving and entrepreneurship. It views waste as a resource.

A teacher at SD Negeri 1 Penatih, Komang Eka Putra shared, *"The students get really excited about the Waste Bank. They see their plastic waste is not just trash; it is something valuable they can exchange for money. It teaches them about responsibility and a bit about business too"* (see Pictures 1-5).

Picture 1. A photo capturing students during their mealtime break. It shows that each student at SD Negeri 1 Penatih carries their own waste bag (Photo: Ni Komang Sutriyanti).

Picture 2. Students disposing of waste into the composter bin provided by SD Negeri 1 Penatih (Photo: SD Negeri 1 Penatih Eco-Team, used with permission).

Picture 3. Students queue to weigh their collected plastic waste at SD Negeri 1 Penatih (Photo credit: SD Negeri 1 Penatih Eco-Team, used with permission).


Picture 4. Students weighing collected plastic waste at SD Negeri 1 Penatih (Photo credit: SD Negeri 1 Penatih Eco-Team, used with permission).

Picture 5. Students collect organic waste into the biopori holes at SD Negeri 1 Penatih (Photo: SD Negeri 1 Penatih Eco-Team, used with permission).

Regarding plastic waste management, the school also encourages students to bring their own waste bags, specifically named *'STUPA'* bags. This acronym stands for *'Sampahku, Tanggung Jawabku'* (My Waste, My Responsibility). *STUPA* bags are specifically used to hold inorganic waste such as snack wrappers, beverage containers, and other plastic-wrapped food items. Most of this waste comes from students' own purchases, so it is only right that they manage it themselves. This approach means the school does not need to provide plastic trash bags, and children get used to bringing their own. It directly teaches each student in the school to be responsible for their own plastic waste. One student, Luh Nindya Gayatri, mentioned, *"My STUPA bag is always with me. My mom reminds me, 'Sampahku, Tanggung Jawabku!' It is my waste, my responsibility, even when I go home."*

At SD Negeri 1 Penatih, the Zero Waste program also addresses organic waste by providing *Biopori* and Vertical *Teba* systems as collection points. Both

*Biopori* and Modern *Teba* are contemporary waste management technologies in the form of vertical cylindrical holes. *Biopori* typically have a diameter of around 10-30 cm and a depth of about 80-100 cm (Yohana et al., 2017), while Modern *Teba* is larger, with a diameter of approximately 1 meter and a depth of 2-2.5 meters (Dwipayana et al., 2023). These technologies are inspired by the activities of small animals like worms and plant roots in the soil. Consequently, *Biopori* and Vertical *Teba* serve as versatile organic waste management tools. They function both as water absorption media and as compost producers from organic waste deposited into the ground (Prima et al., 2024). Both *Biopori* and Vertical *Teba* are technologies and waste management strategies that help reduce organic waste at final disposal sites. A school staff member, Ni Wayan Desi Adnyani, commented, "*The Biopori and Vertical Teba systems are fantastic. We see how much organic waste we prevent from going to the landfill, and the students even help learn how it turns into useful compost."*

Furthermore, the organic waste managed through the Zero Waste Program can be put into composters and transformed into fertilizer for gardening (Hamidah et al., 2023). This also helps prevent inorganic waste from mixing with organic waste, especially food waste. In its application at Denpasar elementary schools like SD Negeri 1 Penatih, the fertilizer derived from organic waste is spread in the Sustainable Garden *(Kebun Lestari).* As a testament to its success, a garden planted with eggplants once yielded a profit of Rp.1.327.000 from its harvest. This shows that the school can generate its own income from waste management. It steers clear of negative contributions to Denpasar City's waste volume. Moreover, students and the school community benefit from a clean and comfortable environment, protected from various diseases. The principal, Ni Made Rusniasa, proudly shared, "*Our 'Kebun Lestari' is not just a garden; it is a living example of Zero Waste in action. When we harvested eggplants and made over a million rupiah, it showed everyone that waste is not just a problem, it is an opportunity."*

*4.1.2 Case Study at SD Saraswati 6 Denpasar*

At SD Saraswati 6 Denpasar, the Zero Waste Program has a specific name derived from its tagline: *'LISA,'* an acronym for *'Lihat Sampah Langsung Ambil'* (See Trash, Pick it Up Immediately). Practically, *LISA* serves as both an initiator and a cultural norm that SD Saraswati 6 Denpasar is striving to embed. This program even began before the Mayor's Regulation or the Governor of Bali's Circular Letter, aiming to accustom students to picking up any trash they encounter. The Zero Waste program also functions to cultivate students' empathy and concern for waste issues. *LISA,* as a reflection of the Zero Waste program, serves as a reminder that waste is everyone's problem, regardless of

who generated it. This approach helps maintain the cleanliness and comfort of the school environment. A student, Ida Ayu Malika Prameswari enthusiastically shared, *"If I see trash, I just pick it up, because it is LISA! Everyone does it, so it feels normal."*

Picture 6. Students of SD Saraswati 6 Denpasar disposing of organic waste into the school's biopori holes (Photo: SD Saraswati 6 Denpasar, used with permission).

Picture 7. Teachers and students of SD Saraswati 6 Denpasar collecting plastic waste (Photo: SD Saraswati 6 Denpasar, used with permission)

In an effort to fully implement the Hindu Eco-ethics-based Zero Waste program, SD Saraswati 6 Denpasar took the rather extreme step of not providing trash bins at school. Instead, all members of the school community, in coordination with students' parents, collectively agreed to bring their own trash bags from home. These trash bags serve as containers for waste generated by students, teachers, and all school members during activities within the school environment. After school, these trash bags are taken home by each individual for further sorting. Consequently, the school genuinely achieves zero waste output or a volume of zero. The school principal, I Gusti Ayu Ari Nuratih explained, *"No trash bins was a big decision, but it forced everyone: students, teachers, even parents to take personal responsibility. We wanted to truly live 'zero waste' within our walls, not just talk about it."*

Specifically for inorganic waste management, the Hindu Eco-ethics-based Zero Waste Program at SD Saraswati 6 Denpasar also collaborates with the Bali Wastu Lestari Foundation to deposit waste into the School Waste Bank. Every Friday, students and teachers take turns bringing plastic waste they have collected throughout the week from home to school. The School Waste Bank partners with Bank Negara Indonesia (BNI), which then handles the collection and measurement of the volume of plastic waste generated by each student and teacher, exchanging it for profit. Thus, a motto resonates throughout this waste management process: 'Sort Waste, Save Gold.' This initiative is hoped to spur active participation in waste management among students and the entire school community. A teacher, Made Mardika remarked, *"'Sort Waste, Save Gold' is more than just a motto, it is how we teach them the value of waste. When they see the money from their plastic, it truly motivates them."*

Furthermore, for organic waste management, SD Saraswati 6 Denpasar's Zero Waste program has also repeatedly conducted compost making workshops in collaboration with academics from Universitas Mahasaraswati Denpasar. Even after Hindu prayer ceremonies at the school, organic waste like flowers, leaves, and used *canang* (offerings) are processed into compost that benefits the soil and plants. This effort is consistently guided and promoted by the Hindu Religious Education teachers at SD Saraswati 6 Denpasar.

Based on Hindu environmental ethics principles such as *Tri Hita Karana* and *Bhuta Yadnya,* the Hindu teachers constantly remind students that offerings to God are not limited to presenting *canang* or merely praying. Instead, they also involve actively participating in maintaining environmental cleanliness through integrated waste management. A Hindu Religious Education teacher, Made Mardika emphasized, "*We teach them that true devotion is not just in prayer, but in action. Composting our canang is a living Bhuta Yadnya, an offering to the environment itself, showing respect for all of God's creations."*

*4.1.3 Case Study at SD Negeri 5 Tonja*

At SD Negeri 5 Tonja, the Zero Waste Program has a dedicated team called *Sisya Mandala Lestari.* This team is a collaboration between teachers and two student representatives from each class. True to its name, the team is responsible for running the Zero Waste program to keep the school environment clean and green. Historically, this team was formed in line with the *Adi Wiyata Mandala* program, which shares a unified vision for integrated waste management and aims for schools to process their own waste. Through this team, the school closely monitors waste management and strives as much as possible to prevent waste from going to the final disposal site. The principal, Ni Wayan Ari Kusuma Dewi shared, *"The Sisya Mandala Lestari team is our backbone. Having students actively involved alongside teachers makes the Zero Waste program truly owned by everyone, not just a top-down initiative."* Despite this strong teamwork, a challenge remains: consistently accustoming students to bring their own food and drinks without using single-use plastics.

Picture 8. SD Negeri 5 Tonja clean-up activity using repurposed items as trash bags (Photo: SD Negeri 5 Tonja, used with permission)


Picture 9. Processing organic waste through biopori holes at SD Negeri 5 Tonja (Photo: SD Negeri 5 Tonja, used with permission)

Picture 10. Students at SD Negeri 5 Tonja read books purchased with proceeds from waste recycling (Photo: SD Negeri 5 Tonja, used with permission)

Furthermore, the implementation of the Zero Waste program at SD Negeri 5 Tonja also builds in an innovation called *'TASI-TASA,'* an acronym for *'Tabungan Literasi dari Tabungan Sampah'* (Literacy Savings from Waste Savings). Unlike the previous two schools, SD Negeri 5 Tonja's Zero Waste implementation does not require students or school community members to bring plastic bags to school. Instead, the program directly educates and guides students to collect and sort the waste they generate within the school environment. Specifically for plastic waste, school members are directed to place it in the yellow trash bins. The collected plastic waste is then sold to the Waste Bank, and the profits are exchanged for books to enrich the school library's collection. This way, the results of waste processing positively synergize with efforts to enhance the school's literacy culture, and its benefits are directly felt by the school community. A student, Putu Aditya Putra Nugraha expressed, *"My favorite part is TASI-TASA! We sort our plastic, and then we get new books for our library. It feels really good to help buy books just from our trash."*

Regarding organic waste management, the Hindu Eco-ethics-based Zero Waste Program at SD Negeri 5 Tonja also has a waste shredder machine. So, every day during learning hours, students are directed to collect and place organic waste into the green trash bins. Once full, the collected organic waste is shredded by the machine and then placed into composter bins available within the school environment. Similar to the previous two schools, the processed organic waste is turned into compost and applied to plants and trees around the school. This reinforces the routine efforts by SD Negeri 5 Tonja to maintain the cool and green environment that has long been a characteristic of the school. A teacher, I Putu Agus Ivan Juliatmika mentioned, *"The shredder machine makes organic waste management so much more efficient. Students see their food scraps turn into something that feeds our plants, completing the cycle right here at school."*

In addition to the yellow and green trash bins, there is also a red trash bin designated for waste other than organic and inorganic materials. Items such as broken glass, nails, and other sharp or potentially hazardous objects are placed into this red bin. Through all these integrated efforts, systematic team, and equipped waste processing facilities, the entire school community develops a habit of sorting waste comfortably and safely. This approach is also why SD Negeri 5 Tonja once received an award as a model school for source-based waste management under the *Adi Wiyata Mandala* program.

### *4.2 Challenges in Implementing the Hindu Eco-ethics-Based Zero Waste Program*

*4.2.1 Sustaining Collective Awareness*

While the program has been quite successful in introducing and educating students about the importance of early waste management, the ongoing challenge, according to a teacher at SD Saraswati 6 Denpasar, is how the Hindu Eco-ethics-based Zero Waste program can cultivate collective environmental consciousness that is consistently practiced. From a practical standpoint (Mpuangnan et al., 2023), waste sorting requires not only internal motivation from one or two parties but also sustained awareness from the entire school community. This teacher, Made Mardika elaborated, *"The initial enthusiasm is always high, but keeping everyone consistently aware: students, new teachers, even parents, that is the real mountain to climb for a truly zero-waste culture."*

To truly become an ingrained culture, sustained awareness of the importance of waste processing and sorting in schools also requires a comprehensive, visionary approach. First, continuous monitoring is essential for all members of the school community to confirm their ongoing support and commitment to the Zero Waste program. Second, evaluation must be conducted to assess the program's success in addressing Denpasar City's waste issues. Some schools are already doing this by observing changes in student attitudes towards environmental cleanliness, the reduction in waste volume leaving the school, and the pleasant, green environment the school can demonstrate. Third, based on behavioristic theory (Oktaria et al., 2023), it is also necessary to implement rewards and punishments at specific times to maintain and strengthen awareness patterns regarding the importance of waste management in schools.

This reward and punishment paradigm is implemented through a system of appreciation for active participation and minor sanctions for non-compliance. For instance, students who consistently bring their own reusable lunchboxes and water bottles might earn extra points or stars, accumulating more 'trash savings' as a tangible reward. Public recognition, such as announcements in class or during school ceremonies, also serves as a form of appreciation for students excelling in the Zero Waste program. Conversely, for infractions, mild punishments are applied: students who litter might receive a verbal warning from a teacher or cleaning staff. In cases of more serious or repeated violations, a written warning is issued and recorded in the student's personal log. The objective of this system is not punitive but educational, aiming to foster greater environmental responsibility and integrate zero-waste habits into students' daily lives.

Crucially, the application of these rewards and punishments is consistent and fair, complemented by ongoing education to reinforce understanding of zero waste principles and their environmental impact. A student from SD Negeri 5 Tonja, Putu Aditya Putra Nugraha commented, *"When we get a star for bringing our own bottle, it makes us want to do it every day. And if someone forgets, the teacher just reminds them gently, so we learn."*

*4.2.2 Infrastructure Equalization*

The second challenge in implementing the Zero Waste program in Denpasar's elementary schools is infrastructure equalization. One reason this program started was that adequate and high-quality waste processing infrastructure was not initially available across all parts of Denpasar City (Kurniawan, 2023). While the program has successfully demonstrated simple and feasible waste processing infrastructure for all schools, once widespread collective awareness is established, the next challenge for the Hindu Eco-ethics-based Zero Waste program is how to scale up waste processing infrastructure across all schools in Denpasar City. Practically, waste sorting technologies like *Biopori,* Vertical *Teba,* and Composters require sufficient funding to support the Zero Waste program.

Moreover, schools also need to take the initiative to invest long-term in developing waste management infrastructure (Achmad, 2024). Collaborating with the Education Office, the City Government, and private organizations, as demonstrated by SD Negeri 1 Penatih, can be effectively implemented. Private entities, in particular, can serve as providers of necessary technology and resources, while the City Government can offer material assistance for maintenance and development. By addressing this challenge of infrastructure equalization, the implementation of the Hindu Eco-ethics-based Zero Waste program in Denpasar's elementary schools is expected to become more effective and efficient. Crucially, infrastructure forms the vital technical foundation for creating a clean and healthy school environment and a medium that supports cultivating awareness about the importance of environmental ethics.

*4.2.3 Support from External Parties*

The third challenge in implementing the Zero Waste program in Denpasar's elementary schools is securing support from external parties. One of the program's initial motivations was the uneven awareness and backing from the broader community regarding source-based waste management. While the program's implementation has been quite positive in demonstrating the practical application of Mayor Regulation No. 15 of 2023 concerning Culture-Based Waste Management and Bali Governor's Circular Letter No. 9 of 2025 on

the 'Clean Bali from Waste Movement,' the next challenge for the Hindu Eco-ethics-based Zero Waste program is to garner optimal external support. Parents, the community, various organizations, private sectors, and most importantly, the government must all collaborate to massively raise this awareness.

Erry Trisna Nurhayana, an informant as well as a school supervisor from the Office of Education, Youth, and Sports in Denpasar, noted that the purpose of carrying out Zero Waste initiatives is twofold; minimizing waste generation and enhancement of school cleanliness. From his observations, canteens are the prominent waste producers and emphasized the importance of (1) segregation for student waste separation at the household level, and (2) parent's awareness of the initiative (Personal communication, July 18th, 2025). It is apparent that these are subordinate to larger frameworks, as the broader government strategy of reducing waste plastic serves as the backbone for the school to design independent methodologies which constitute self-governing strategies. The reason why the fundamental differences in the application of Zero Waste policies remain across different primary schools in Denpasar while the sustainability goals set by the city are in line with each school's compliance on overarching municipal policies stems from this decentralized approach.

### *4.3 Implications of the Zero Waste Program on Strengthening Student Character*

The implementation of the Zero Waste program by elementary schools across Denpasar City has demonstrably led to positive outcomes, aligning with its initial goals of effective waste management, minimizing outgoing waste volume, and creating clean and healthy school environments. Beyond these benefits, the program's implications extend to the essential strengthening of student character, deeply rooted in its Hindu Eco-ethics foundation. The specific implications of the Hindu Eco-ethics-based Zero Waste program on strengthening elementary student character in Denpasar City are detailed below:

#### *4.3.1 Fostering Awareness of Waste Management*

The first implication of implementing the Zero Waste program in Denpasar's elementary schools is to foster awareness about the importance of waste management. This directly addresses an initial problem concerning the lack of knowledge and awareness among Denpasar's population regarding how to process and sort their own waste. Through this Hindu Eco-ethics-based Zero Waste program, students are not merely taught to pick up, collect, or discard trash as something useless. Instead, students and the entire school community learn to develop a character that is caring and conscious of the importance of maintaining environmental cleanliness, while also recognizing the value of

what is considered waste. This initiative aligns with the purpose and essence of environmental ethics (Eba, 2019), transforming school community members from being apathetic about waste and environmental issues to becoming committed to integrated waste management efforts.

From an observational standpoint, the Hindu Eco-ethics-based Zero Waste program is also integrated into students' classroom learning. During intracurricular activities, students are consistently reminded to check for hidden trash under desks or in classroom corners, and they are guided to take responsibility for the waste they generate while at school. Furthermore, teachers in the classroom are consistently encouraged to link teaching topics with efforts to raise awareness about the importance of waste management. For example, mathematics problems involving calculations are tied to issues of waste volume, and in Hindu Religious Education, students are guided to collect and deposit flowers used after prayers into *Biopori,* with similar examples in other subjects. This massive effort, when linked to the concept of environmental ethics, can instill a lasting sense of concern for waste issues in students through meaningful learning experiences (Long, 2025).

*4.3.2 Fostering Sustainable Environmental Love*

The second implication of implementing the Zero Waste program in Denpasar elementary schools is to bring up a sustainable love for the environment. This implication directly counters those who pollute the environment in Denpasar. Through this Hindu Eco-ethics-based Zero Waste program, students are not just directed to manage their own waste; the entire school community, especially students, is guided to understand why waste processing and sorting are important. This understanding leads to efforts to cultivate a lasting love for the environment within students, teachers, other school members, and the wider community of Denpasar City. This initiative also aligns with another core essence of environmental ethics (Eba, 2019), where school community members are molded into environmental champions committed to maintaining a safe and comfortable life.

Furthermore, some elementary schools in Denpasar City are known to regularly invite students to participate in community service *(gotong royong)* to clean the school's surrounding environment. This communal cleaning effort is part of the Hindu Eco-ethics-based Zero Waste program, particularly the *Palemahan* teaching from *Tri Hita Karana*. Through this initiative, teachers also encourage students to be sensitive to their surroundings and the living beings within them. After completing the communal work, teachers typically provide a reflection on how comfortable and safe an environment can be when it remains clean and healthy. This reflection is also part of the effort to cultivate awareness

and indirectly provides a suggestion to students to love a clean and healthy environment as an integral part of shared life.

*4.3.3 Fostering Noble Habits Towards the Environment Based on Noble Values*

The third implication of implementing the Zero Waste program in elementary schools across Denpasar City is fostering noble habits towards the environment based on noble values. This implication gives out as a response to environmental damage, which often reflects a departure from the noble values of local wisdom and religion. Through this Hindu Eco-ethics-based Zero Waste program, students are not merely directed to manage waste and love the environment. Instead, students and the entire school community collectively re-engage with noble habits rooted in ethical values that serve as guiding principles for human life. These noble values guide the maintenance of harmonious relationships with humanity and the natural environment, which are considered equally valuable to maintaining a harmonious relationship with God (Sari et al., 2024). This encouragement also aligns with the essence of environmental ethics (Eba, 2019), many of whose teachings are drawn from religious values deeply embedded in the human heart.

From an observational standpoint, the Hindu Eco-ethics-based Zero Waste program, integrated into student learning, explores these noble values from local wisdom. During extracurricular activities, students are constantly reminded to manage waste and maintain environmental cleanliness as a culture that should be ingrained. Additionally, acronyms derived from historical and cultural noble values, such as *STUPA, Simpatik, BAKULPURA,* and others, used in various aspects of the Zero Waste program, further reinforce the habit of integrated waste management. This effort, which even targets students' emotional and philosophical understanding, when linked to the concept of environmental ethics, can instill noble habits that will continue into future life (Long, 2025).

## 5. Conclusion

This case study examines the implementation of the Hindu Eco-ethics-based Zero Waste program in selected primary schools in Denpasar City. Through the school implementation issues, the study establishes the uniqueness of the program, its values formation impacts, and the problems it poses in deepening grasp of the readiness and possibilities for broader emulation in other primary schools across Denpasar and the entire educational landscape. The model primary schools provide understanding which is algebraic in nature, enabling the formulation of policies as well as programmed frameworks for comparable situations.

The implementation of the Hindu Eco-ethics-based Zero Waste program in elementary schools across Denpasar City takes various forms with distinct names and approaches. First, at SD Negeri 1 Penatih, waste management is called *'BAKULPURA,'* integrating a waste bank, sustainable gardens, and entrepreneurship as part of school culture. Second, at SD Saraswati 6 Denpasar, the program is named*'LISA,'* emphasizing school members' independence and commitment to managing their own waste, with students bringing personal waste bags from home. Third, SD Negeri 5 Tonja adopts an innovative approach under the slogan *'TASI-TASA,'* directing profits from waste processing to support literacy programs in the school. These examples illustrate that while the names and methods vary, the essence of the Zero Waste program in Denpasar's elementary schools remains the same, an integrated, source-based waste management effort.

The findings consistently show that collective awareness serves as a driver for collaborative waste management efforts that transform waste into resources. The program fosters synergy among students, educators, parents, and the broader community by cultivating shared responsibility for waste processing, evident through practical measures such as requiring personal waste bags brought from home, establishing waste banks for recyclable collection, and strictly adhering to the Reduce, Reuse, Recycle (3R) principles.

The Zero Waste initiative further uses waste-processing technologies including *biopori* holes for organic decomposition, vertical gardens *(Teba Vertikal)* for space-efficient cultivation, and compost bags for organic fertilizer production. Furthermore, the program integrates Hindu environmental ethics through principles like *Tri Hita Karana* (harmony with the divine, humanity and nature), *Bhuta Yadnya* (ritual offerings to natural elements), and religious teachings from the *Manawa Dharmasastra.*

Though the Hindu Eco-ethics-based Zero Waste initiative has potential for enduring sustainability, certain factors must be addressed to guarantee future success. Culturally, the initiative has a foothold among the Balinese Hindu frameworks of *Tri Hita Karana* and *Bhuta Yadnya,* which is to facilitate community appreciation and continuity as children internalize these values through cultural transmission. From an institutional perspective, the program is favorable due to the inclusionary policies of Denpasar Mayor Regulation No. 15/2023 and the Governor's Clean Bali Movement which enable scope for implementation at the school level. Active engagement of students, teachers, and parents in waste management composting and waste bank systems indicates potential grassroots mobilization. There is, however, still a need to improve awareness retention, stable funding for the biopori composters infrastructure, and broaden NGO and private-sector support coalitions.

The incorporation of the program into the school agenda, and character education, helps to entrench the initiatives while parallel to the motivated volunteerism, success stories, and income generation from waste recycling bolster motivation for continued engagement. The program is to become a sustainable model for waste management in Bali's education system if these factors are triaged through sustained supervised initiatives and community engagement.

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