

School Community Empowerment through the Digital-Based Bottle Waste Bank (BOTABA) Program at SD Negeri Sumberjati, Mojokerto Regency

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ABSTRACT

Objective: This community service program aimed to strengthen the school community's awareness and participation in sorting plastic-bottle waste and to implement a transparent digital recording system through the BOTABA web application at SD Negeri Sumberjati. **Method:** The program used a descriptive qualitative approach with participatory action research (PAR). Activities included an initial school assessment, stakeholder coordination, preparation of sorting facilities, education and hands-on bottle sorting, development and training in the BOTABA website, routine bottle collection, transaction recording, monitoring, and follow-up assistance. **Results:** Student participation in bottle collection increased, sorted bottle waste obtained a higher selling value than mixed waste, and BOTABA enabled teachers and the principal to record collection, sales, and student rewards transparently. In the recorded transaction on August 26, 2026, 16.00 kg of bottles generated IDR 43,000; 85% (IDR 36,550) was allocated to the reading-corner fund and 15% (IDR 6,450) to student rewards. **Novelty:** The program integrates school-based environmental education, three-category bottle sorting (Natural, BM, and Nutriboost), and a web-based transaction and reward system as one practical model for sustainable waste-bank management in an elementary-school setting.

INTRODUCTION

Plastic waste, particularly beverage bottles, remains a visible environmental issue in households and school environments. Community-based waste banks provide a practical mechanism for collecting, sorting, and assigning economic value to recyclable materials while encouraging participation in waste management [1].

The effectiveness of a waste-bank program depends strongly on source separation. Waste-sorting behavior determines whether recyclable materials can be recovered efficiently and sold according to their type and quality [2]. In the BOTABA program, bottle waste is separated into three locally recognized market categories: Natural, BM, and Nutriboost.

Administrative management is another important element. Manual records of deposits, sales, and rewards are vulnerable to input errors, data loss, and limited access. The development of computerized waste-bank administration has been reported to improve data organization and support clearer management procedures [3].

Digital financial and transaction recording can further improve efficiency because information can be stored, reviewed, and updated without relying on handwritten ledgers. Electronic systems have been introduced in waste-bank management to reduce recurring input errors and make administrative work more effective [4].

More recent community-service initiatives have extended this approach through web-based digital waste banks. Digitalization can support transaction transparency, participation, and more systematic monitoring when the system is accompanied by user training and organizational readiness [5].

In school settings, a waste bank can also function as an environmental-learning activity rather than merely a collection mechanism. School waste-bank revitalization has been used to connect waste management with sustainable environmental education and appropriate technology [6].

Initial observation at SD Negeri Sumberjati, Sumberjati Village, Jatirejo District, Mojokerto Regency, showed that the school did not yet have a structured bottle-sorting system or a transparent waste-bank recording mechanism. As a result, the economic value of collected bottles and the traceability of transactions had not been optimized.

Accordingly, this community service program had three objectives: to increase school-community awareness and participation in sorting and collecting bottle waste; to establish a bottle waste bank that improves the selling value of recyclable bottles through sorting; and to develop and implement the BOTABA website for transparent recording of collection, sales, and student rewards.

RESEARCH METHOD

This community service program used a descriptive qualitative approach combined with participatory action research (PAR). PAR was selected because the implementation involved the school community and related stakeholders in identifying needs, planning activities, implementing the bottle waste bank, and monitoring its continuation. A participation-based bottle waste-bank program has similarly used PAR to organize social mapping, participatory planning, implementation, and evaluation [7].

The partners were SD Negeri Sumberjati, including the principal, teachers, students, parents, and supporting local stakeholders. The educational component emphasized direct explanation and practice so that students could recognize bottle categories and understand the environmental and economic reasons for sorting. Waste-management education for elementary-school teachers and students has also emphasized hands-on learning as a practical route to sustainable environmental education [8].

Implementation consisted of thirteen operational stages: initial condition identification; program coordination and preparation; preparation of facilities and infrastructure; bottle-waste-bank socialization; education and sorting practice; introduction and practice using the BOTABA website; bottle collection; collection-data recording; bottle sales; sales-result recording; use of sales proceeds; monitoring and evaluation; and preparation of a sustainability plan. School-based waste-bank initiatives show that direct participation by teachers and students can connect sorting activities with environmental awareness and routine school practices [9].

Data were documented descriptively from field observations, implementation records, the BOTABA website, and transaction records. Evaluation focused on

participant involvement, sorting accuracy, use of the digital system, recorded sales, allocation of proceeds, and practical constraints identified during implementation. The program did not apply an experimental pretest–posttest design; therefore, the reported outcomes describe implementation results rather than causal effects.

RESULT AND DISCUSSION

Results

The program began with socialization for students and teachers on the importance of separating bottle waste. Students were introduced to Natural bottles (clear bottles), BM bottles (commonly identified by blue characteristics), and Nutriboost bottles. Sorting containers were prepared so that bottles could be placed directly into the appropriate category before weighing and sale.

After the sorting mechanism was introduced, collection data were recorded through the BOTABA website. The system allows teachers and the principal to enter the student name, type and amount of bottle waste, sales data, and rewards. This digital record makes the management process accessible to authorized school personnel and reduces dependence on a single manual ledger.

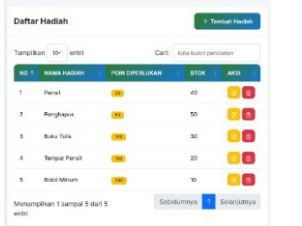
The program records report increased student participation in collecting bottle waste after socialization and routine implementation. Sorting also enabled bottles to be sold according to category rather than as mixed waste, which was reported by the school as increasing the selling value of the collected material.

A transaction recorded on Wednesday, August 26, 2026 documented 16.00 kg of bottle waste with a total recorded sales value of IDR 43,000. The category records listed 8.00 kg of Natural bottles valued at IDR 24,000, 7.00 kg of BM bottles valued at IDR 17,000, and 1.00 kg of Nutriboost bottles valued at IDR 1,500. The recorded transaction total was subsequently used as the basis for allocating program proceeds.

Under the agreed allocation mechanism, 85% of the recorded sales proceeds, or IDR 36,550, was assigned to the school reading-corner fund, while 15%, or IDR 6,450, was used for student rewards. The reward component was intended to maintain student motivation and connect environmental participation with visible recognition of contribution.

Table 1. Implementation Stages of the Digital-Based Bottle Waste Bank Program (BOTABA)

No.	Activity Stage	Description	Documentation
1.	Initial Condition Identification	Observed the existing waste-management conditions at school, students' waste-disposal habits, the availability of sorting facilities, and the school's needs for bottle-waste management.	 
2.	Program Coordination and Preparation	Coordinated with the principal, teachers, bottle collectors, and parents regarding the waste-bank mechanism, division of roles, collection schedule, recording system, and bottle sales.	 
3.	Preparation of Facilities and Infrastructure	Prepared the bottle-waste-bank area, sorting containers, educational media, and supporting devices for the BOTABA website.	
4.	Bottle Waste Bank Program Socialization	Provided students and teachers with an explanation of the background, objectives, benefits, operating mechanism, and rules of the Bottle Waste Bank program.	
5.	Bottle Sorting Education and Practice	Provided education and direct practice in sorting bottle waste according to the predetermined categories: BM, Natural, and Nutriboost.	

No.	Activity Stage	Description	Documentation
6.	Introduction and Practice Using the BOTABA Website	Introduced the BOTABA website to students and teachers and provided practice using the website as a medium for recording and monitoring Bottle Waste Bank activities.	
7.	Bottle Waste Collection	Students collected bottle waste from home and school environments and deposited it in the school Bottle Waste Bank according to the established mechanism.	
8.	Collection Data Recording	Recorded student data, bottle type, and the amount of bottle waste collected through the BOTABA website as program documentation.	
9.	Bottle Waste Sales	Sold the collected and sorted bottle waste to a collector or waste-management partner in accordance with the agreed cooperation mechanism.	 
10.	Sales-Result Recording	Recorded bottle-waste sales through the BOTABA website, including the amount of waste sold and the sales proceeds obtained.	
11.	Use of Sales Proceeds	Allocated bottle-waste sales proceeds according to the program agreement, including support for school needs, student activities, and program sustainability.	

No.	Activity Stage	Description	Documentation
12.	Program Monitoring and Evaluation	Monitored student participation, the amount of waste collected, sorting accuracy, use of the BOTABA website, and constraints arising during implementation.	
13.	Program Sustainability Plan	Prepared a continuation mechanism with the school so that the Bottle Waste Bank can continue after the community service period, including assignment of responsible personnel, collection schedules, recording, and sales procedures.	

Discussion

The BOTABA implementation demonstrates how a school waste bank can combine material sorting with simple digital administration. Recent literature on digital waste-bank adoption identifies ease of use, transparency, system quality, infrastructure, training, environmental awareness, and economic incentives as interacting factors that influence continued use [10]. BOTABA addresses several of these elements through a web interface, teacher training, visible transaction records, and a reward mechanism.

The replacement of exclusively manual recording with a web-based system is particularly relevant for traceability. A web-based information system implemented in another waste-bank setting was reported to improve efficiency and transparency where manual transaction records had previously been prone to error and difficult to track [11]. In the present program, BOTABA similarly centralizes collection, sales, and reward information for access by teachers and the principal.

The sorting-education component is also important because technology alone does not ensure better waste management. Educational interventions for elementary-school students have shown that structured waste-sorting instruction can improve knowledge and sorting behavior [12]. The direct practice used in SD Negeri Sumberjati therefore complements the digital system by helping students understand the physical categories that must be recorded in BOTABA.

The reported increase in student participation is consistent with community-service evidence that well-managed waste-bank activities can strengthen awareness of the usefulness and economic value of waste [13]. However, participation in this program

was observed operationally rather than measured using a pretest–posttest instrument, so the finding should be interpreted as a descriptive implementation outcome.

The reward allocation provides an additional motivational element. Participatory school waste-bank programs have used socialization, direct sorting activities, and reward mechanisms to increase student enthusiasm while connecting environmental, educational, and economic aspects [14]. In BOTABA, 15% of the recorded sales proceeds was designated for student rewards, while the larger share supported the reading corner, thereby linking recycling activity with a visible school benefit.

Program sustainability will depend on routine use after the community service team leaves. Digital assistance for school waste banks has emphasized the importance of continued training, institutional involvement, and sustainable environmental education [15]. For SD Negeri Sumberjati, continuation therefore requires a designated school administrator, a regular collection schedule, consistent category definitions, periodic verification of BOTABA entries, and coordination with bottle collectors regarding market prices.

CONCLUSION

Fundamental Finding: The digital-based BOTABA bottle waste-bank program established a structured process for bottle sorting, collection, sales, and digital recording at SD Negeri Sumberjati. The school used three bottle categories—Natural, BM, and Nutriboost—and recorded a transaction of 16.00 kg with total sales proceeds of IDR 43,000, followed by an 85% allocation to the reading-corner fund and 15% to student rewards. **Implication:** Combining environmental education, direct sorting practice, a school-level incentive mechanism, and web-based transaction records can provide a practical framework for more transparent and participatory waste-bank management in an elementary-school environment. **Limitation:** The program was implemented in one school and evaluated mainly through descriptive observation, implementation records, and a limited number of recorded transactions. No experimental baseline, standardized behavioral measurement, long-term follow-up, or formal usability testing of the BOTABA website was conducted. **Future Research:** Future work should evaluate changes in student sorting behavior quantitatively, assess BOTABA usability and data accuracy over a longer period, compare sales values across multiple collection cycles, and examine whether the model can be replicated in other schools with different waste-market conditions.

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