

# Strengthening Environmental Awareness through Community Service Activities: A Collaboration of Waste Bank Programs, Children's Education, and Greening Initiatives

**Solihin\*, Rifki Muhendra, Hauzan Abbad Muzakki, Muhammad Fadil Syaifullah Akmal, Muhammad Ibnu Hilmy, Reza Dwi Fitriani, Ade Saputra Marpaung, Dwi Aliega Fauzi, Rifki Kurniawan, Lisky Fhatimah, Anggito Abimanyu, Muhammad Rafif Firdaus**

Industrial Engineering, Faculty of Engineering, Bhayangkara University, Greater Jakarta, Indonesia  
email: solihin@dsn.ubharajaya.ac.id

---

**Article Info :**

Received:  
16/10/25  
Revised:  
05/12/25  
Accepted:  
08/12/25

**ABSTRACT**

---

*This community service program aims to strengthen environmental awareness through the collaboration of a waste bank, children's environmental education, and a community greening initiative. The project was carried out by students participating in the Kuliah Kerja Nyata (KKN) program as part of the university's commitment to community engagement. The activities included establishing and mentoring a community-based waste bank to manage recyclable waste, organizing creative games and drawing competitions to introduce environmental values to children, and planting fruit trees and herbal plants to create a greener neighborhood. The results indicate an increase in residents' participation in waste sorting, better understanding of the economic value of recyclable materials, and growing environmental concern among children. The greening program also fostered a sense of togetherness and improved the aesthetic quality of the area. The integration of these three initiatives proved effective in promoting lasting ecological awareness and community responsibility. This program provides a practical model for sustainable community empowerment that can be adapted in other regions. Overall, the KKN environmental project demonstrates the important role of students as facilitators in linking academic knowledge with real community action toward sustainable development.*

---

**Keywords :** Environmental Awareness, Waste Bank, Environmental Education, Greening, Community Empowerment

---



©2022 Authors.. This work is licensed under a Creative Commons Attribution-Non Commercial 4.0 International License.  
(<https://creativecommons.org/licenses/by-nc/4.0/>)

---

## INTRODUCTION

Environmental issues, particularly household waste management, remain a major challenge in Indonesia due to rapid population growth, increasing consumption, and low public awareness of proper waste handling [1]–[5]. These national issues are also reflected at the local level in the Masnaga residential area (RW 12, Bintara Jaya, Bekasi). Initial observations revealed low waste segregation practices, insufficient waste-bin facilities, declining participation in community clean-ups, and limited vegetation around public spaces [6]–[8]. According to the Bekasi City Environmental Office, household waste generation in densely populated urban areas such as Bintara Jaya reaches 0.6–0.8 kg per capita per day, highlighting the urgency of improving community-level waste management. These conditions demonstrate the community's urgent need for an integrated empowerment approach to strengthen environmental awareness and participation.

A need assessment conducted through observations and informal interviews further highlighted several key issues: limited household participation in the existing waste collection system, lack of practical tools for reducing plastic waste volume, minimal environmental education for children, and inadequate greening in communal areas [9], [10]. The location was chosen for the Community Service Program (KKN) based on a direct request from local leaders and its status as a densely populated area with limited environmental initiatives.

In addressing these issues, the university plays a scientific and technological role beyond routine community engagement. Under academic supervision, students applied industrial engineering principles to improve waste collection workflow, strengthen waste bank management, and introduce a student-designed bottle and can press tool as a form of simple technology transfer [3], [11]. Basic

assessments of waste types and household behavior provided evidence for targeted environmental interventions.

The design of this program is conceptually guided by recent developments in environmental behavior theories. Recent applications of the Theory of Planned Behavior emphasize that attitudes, social norms, and perceived behavioral control remain strong predictors of waste-sorting and recycling behaviors in community settings [12], [13]. In addition, contemporary Community-Based Social Marketing (CBSM) approaches highlight the importance of using practical, community-driven actions to promote sustained pro-environmental behavior, including waste banks and greening initiatives [14]–[16]. For children's activities, the program adopts principles of Participatory Environmental Education, which recent studies show to be effective in fostering early ecological awareness through experiential and value-based learning [17]–[19]. These theoretical perspectives provide a relevant conceptual foundation for designing integrated interventions that strengthen ecological behavior across different age groups in the Masnaga community.

Based on these frameworks, the three program components, waste bank activities [20], children's environmental education [21], [22], and greening initiatives, were intentionally designed as an integrated and sequential model [23]. Waste bank practices build discipline in sorting waste, children's education promotes intergenerational value formation, and greening activities strengthen collective environmental action. This synergy aims to create long-term, community-based ecological behavior. Previous community service studies have demonstrated the effectiveness of participatory waste management, environmental education, and greening programs, though these initiatives are often implemented separately [24]. The novelty of this KKN program lies in its holistic integration of economic (waste bank), educational (children's learning), and ecological (greening) dimensions, supported by simple technology transfer through the bottle press. This multi-level collaboration among residents, children, and university students offers a replicable model for sustainable environmental empowerment in urban communities.

Based on the identified needs and existing service gaps, this program aims to strengthen environmental awareness through a collaborative approach involving waste banks, environmental education, and greening activities. The objectives are: (1) to increase household participation in waste management; (2) to instill environmental values in children; and (3) to create a healthier and greener environment that encourages sustainable community behavior.

## METHOD

This community service activity was carried out through a participatory and educational approach as part of the Regular Community Service Program (Kuliah Kerja Nyata or KKN) conducted by students of the Industrial Engineering Study Program, Universitas Bhayangkara Jakarta Raya. The methods employed included field observations, interviews, socialization sessions, training, interactive education, and collaborative action with the local community. The program was implemented in the Masnaga residential area, RW 12, Bintara Jaya Subdistrict, Bekasi City, and took place over a period of 30 days from June to July 2025.

### 1. Field Observation

The observation method refers to the systematic recording of phenomena using specific instruments for scientific or practical purposes. According to malli (2019), observation is not merely a process of watching and recording events; rather, it facilitates a deeper understanding of the surrounding environment [25]. In this KKN activity, observation served as the initial stage in which students conducted direct field visits to identify environmental problems in the Masnaga residential area, RW 012. The findings from this stage provided a foundation for designing relevant community service programs addressing local environmental challenges.

### 2. Interview

The interview method is a data collection technique conducted through direct question-and-answer sessions between the interviewer and respondents or key informants [26], [27]. Interviews are intended to obtain detailed and in-depth information related to specific research topics or objectives. Interviews allow researchers to collect more personal and comprehensive data, exploring respondents' subjective views and experiences [28], [29]. Although interviews offer flexibility in exploring

information, they also require strong communication skills and can be relatively time-consuming. In this activity, informal interviews were conducted with neighborhood leaders (RT/RW) and residents to explore local needs, challenges, and potentials that could be developed through the community service programs.

### 3. Program Planning

Based on the results of field observations and interviews with local leaders and residents, several key issues were identified within the research area. Subsequently, a series of work programs were planned to address these problems. Through discussions and deliberations with community representatives, three main programs were agreed upon to be implemented during the KKN activities, as summarized in the table below.

**Table 1. Program Planning**

| No. | Program Name  | Objective   | Target Group   | Main Activities   |
|-----|---|---|--|---|
| 1   | Waste Bank Activity (Recycle Bank) with Bottle and Can Press Equipment                    | To reduce the volume of inorganic waste and increase its economic value.  | Residents of RW 12, Masnaga Housing Area                       | - Socialization on waste management- Utilization of bottle and can press equipment- Waste collection and sorting activities   |
| 2   | Fun Environmental Day for Children  | To instill the values of the 5Rs (Reduce, Reuse, Recycle, Replace, and Respect) and foster environmental awareness from an early age. | Children aged 5–10 years                                       | - Environmental education through storytelling and games- Environmental drawing competition- Recycling creativity competition |
| 3   | Community Clean-Up and Tree Planting around Public Facilities and the Neighborhood Office | To foster a sense of community cooperation ( <i>gotong royong</i> ) and create a cleaner, greener environment.                        | Residents of RW 12, Masnaga Housing Area, and KKN student team | - Community clean-up activities- Tree planting in strategic areas- Environmental maintenance around public facilities         |

As presented in Table 1, the program planning consists of three main activities implemented through the Regular Community Service Program (KKN) at Mas Naga Residential Area, RW 12. The first program focuses on waste management using a bottle and can press machine, aiming to reduce the volume of inorganic waste and enhance its economic value. The second program, Fun Environmental Day for Children, targets children aged 5–10 years and seeks to instill the values of the 5Rs (Reduce, Reuse, Recycle, Replace, and Respect) through engaging activities such as coloring and ball transfer competitions. The third program involves community clean-up and tree planting, conducted collaboratively with residents to foster the spirit of *gotong royong* (mutual cooperation) and to create green spaces within the neighborhood. These three programs are designed to complement one another in improving environmental quality and strengthening community awareness in a holistic manner.

4. Activity Implementation Schedule. The timeline of the community service activities conducted through the Regular Community Service Program (KKN) covered a duration of 30 days, or approximately one month, from June to July 2025. The schedule outlines the list of activities, their sequence, and the duration of each project or event, as presented in Table 2.

As shown in Table 2, the KKN activity schedule illustrates the sequence and time distribution of various community service programs carried out over four weeks. The activities began in the first week with a site survey. In the second week, the opening ceremony and welcoming of KKN students were held, followed by the handover of the press equipment to support the Recycle Bank or Waste Bank program. The third week included two main activities: Fun Environmental Day, featuring coloring and ball transfer competitions for children aged 5–10 years, and a socialization session on the use of parental control features on children's gadgets. In addition, community clean-up, tree planting, and the KKN

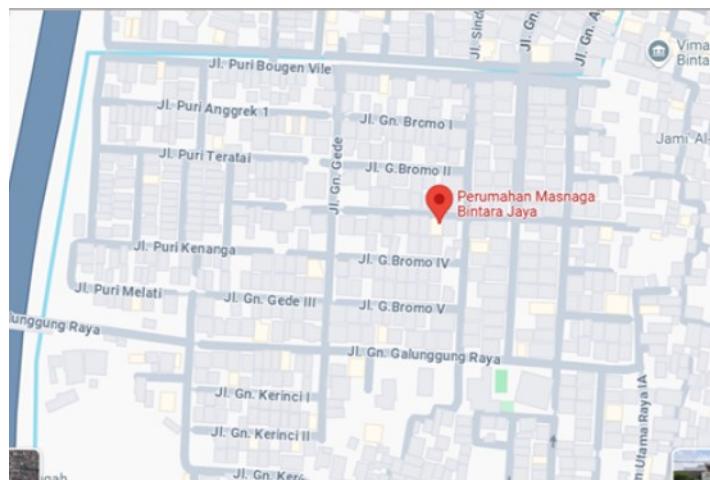
closing ceremony were also conducted during this week. The final activity, which consisted of preparing reports and publishing scientific articles, took place in the fourth week as a form of documentation and academic accountability for the entire series of programs implemented.

**Table 2. Schedule of KKN Activities**

| No. | Activity Name  | Week |   |   |   |
|-----|--|------|---|---|---|
|     |  | 1    | 2 | 3 | 4 |
| 1   | Site Survey  |      |   | ✓ |   |
| 2   | Opening Ceremony and Welcoming of KKN Students   |      |   | ✓ |   |
| 3   | Delivery of Press Equipment for the Recycle Bank/Waste Bank Program                                |      |   |   | ✓ |
| 4   | <i>Fun Environmental Day</i> (Coloring and Ball Transfer Competition for Children Aged 5–10 Years) |      |   |   | ✓ |
| 5   | Socialization on the Use of Parental Control Features on Children's Gadgets                        |      |   |   | ✓ |
| 6   | Community Clean-Up, Tree Planting, and KKN Closing Ceremony  |      |   |   | ✓ |
| 7   | Preparation of Reports and Publication of Scientific Articles                                      |      |   |   | ✓ |

#### 4. Activity Location Map

The map in Figure 1 illustrates the location of the community service activities conducted through the Regular Community Service Program (KKN) at Masnaga Housing Complex, Bintara, specifically at RT.007/RW.012, Bintara Jaya Subdistrict, West Bekasi District, Bekasi City, West Java 17134.



**Figure 1. Activity Location Map**

Based on Figure 1, the Regular KKN program was implemented in the Masnaga Bintara residential area, located in RT.007/RW.012, Bintara Jaya Subdistrict, West Bekasi District, Bekasi City, West Java. Geographically, the area is a densely populated residential neighborhood surrounded by major roads such as Gunung Gede Street, Gunung Bromo Street, and Galunggung Raya Street, with convenient access from the main Kalimalang highway. Institutionally, the area has an active neighborhood and community association (RT/RW) management structure that collaborates with local leaders to support various social activities.

From a socio-cultural perspective, the residents demonstrate a high level of participation in community activities such as neighborhood clean-ups, integrated health service posts (posyandu), and children's programs, reflecting a strong spirit of gotong royong (mutual cooperation) and openness to empowerment initiatives. In terms of infrastructure, the area is equipped with well-maintained internal roads, drainage systems, public facilities, and green open spaces, which support the implementation of KKN programs such as waste management, children's education, and tree planting. Overall, the location is considered highly strategic for implementing community service activities focused on environmental and educational development.

## RESULTS AND DISCUSSION

The Regular Community Service Program (KKN) at Masnaga Residential Area, RT.007/RW.012, Bintara Jaya, was conducted over a period of one month, from June 16 to July 16, 2025. During this program, three main activities were implemented, each designed to address specific issues identified within the Masnaga Bintara Jaya community. The following section presents the series of activities carried out by our KKN team as part of the community service initiative.

### Waste Bank with Bottle and Can Press Equipment

The *Waste Bank with Bottle and Can Press Equipment* program, implemented at Masnaga Residential Area RT.007/RW.012, Bintara Jaya, aimed to support community-based waste management in a more effective and environmentally friendly manner. In this program, students not only assisted residents in collecting and sorting recyclable waste such as plastic bottles, beverage cans, cardboard, and other recyclable materials, but also introduced and educated them on the use of a specially designed press machine. This equipment was used to compress bottles and cans, reducing their volume to facilitate easier storage and transportation. Through a series of socialization sessions, tool demonstrations, and hands-on mentoring, the program sought to reduce household waste volume, increase the economic value of waste through the waste bank savings system, and foster sustainable environmental awareness among residents.

### Design of the Bottle and Can Press Equipment

The concept of the bottle and can press tool was designed using AutoCAD and SolidWorks software. Each component, such as the lever arm, hinge, and pressing plate, was modeled according to precise dimensions and tested through motion simulation features. This design process ensured that the tool could operate optimally, with sufficient strength and efficiency, before the actual fabrication stage. The concept was expected to provide a practical and environmentally friendly solution for the community in managing plastic bottles and cans independently.

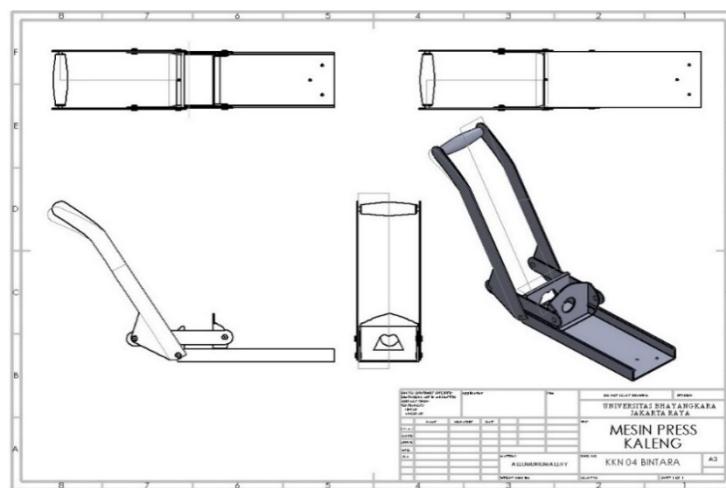
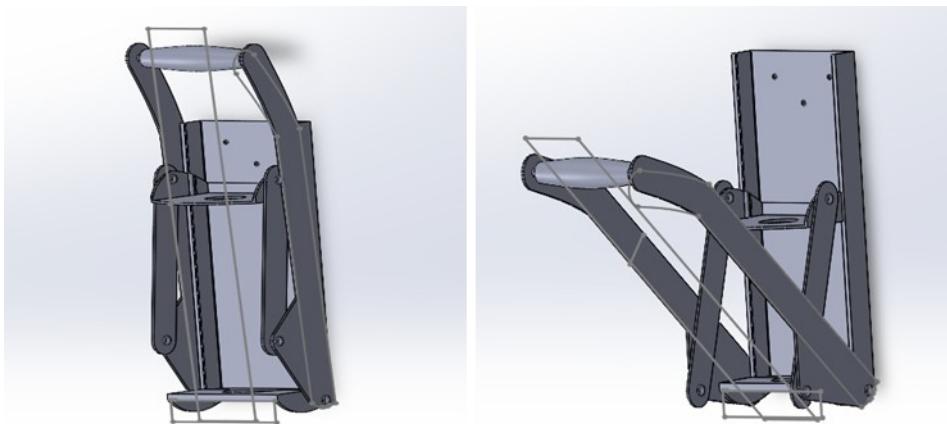


Figure 2. Engineering Drawing of the Bottle and Can Press Tool

As seen in Figure 2, the press tool consists of five main parts, with its entire frame constructed from lightweight yet durable aluminum alloy, while the handle is covered with rubber for user comfort. The first component is the base plate, which serves as the main support structure. It is mounted vertically on a wall and secured with several bolts to withstand the pressing force during operation. The second component, the main arm, is slightly curved forward and functions as the pressing lever. The end of this arm is equipped with a rubber grip to prevent slipping when pressed.



**Figure 3. 3D Design of the Bottle and Can Press Tool**

Additionally, the tool includes linkage arms, two elongated rods connecting the main arm to the pressing plate, functioning as a mechanical linkage that stabilizes and aligns the pressing motion. As seen in Figure 3, the press plate, located at the lower end of the linkage arms, is the component that directly compresses the bottles or cans when the lever is pushed downward. Finally, the rubber handle grip encases the end of the main arm, providing comfort and safety for users during operation.



**Figure 4. Final Product of the Bottle and Can Press Tool**

The entire design was modeled using SolidWorks software, allowing for precise part configuration, motion simulation, and structural strength analysis before real production. The total weight of the tool is approximately 0.882 lbs (around 0.4 kg), making it lightweight, easy to install on walls, and convenient for community use during the KKN program at Masnaga Housing, Bintara Jaya. This innovation supports independent and eco-friendly waste management of plastic bottles and cans by residents.

During the manufacturing process, the bottle and can press tool was produced through several stages of metalworking, including welding, grinding, and drilling. First, each main component, such as the base plate, main arm, and linkage arm was cut according to the specified dimensions and joined using welding to ensure a strong and precise connection. As seen in Figure 4, after the welding process, the joints and rough surfaces were smoothed with a grinding machine to achieve a clean finish and eliminate sharp edges, ensuring safety during use. The next step was drilling at specific points, such as the bolt holes on the base plate for wall mounting and the pivot holes on the linkage arms, which serve as the axis of the lever movement.

### Handover of the Bottle and Can Press Tool by the Field Supervisor (DPL) to the RW 12 Community of Masnaga Bintara Jaya Housing Complex



**Figure 5. Symbolic Handover of the Bottle and Can Press Tool**

The handover ceremony of the bottle and can press tool by the field supervisor, Drs. Solihin, M.T., to the head of RW 12 was conducted in an enthusiastic and interactive atmosphere. As seen in Figure 5, during the event, Drs. Solihin, M.T. thoroughly explained the functions and benefits of the tool as a practical solution for managing inorganic household waste, particularly plastic bottles and used cans.



**Figure 6. Socialization of the Bottle and Can Press Tool Usage**

Students also demonstrated the proper use of the tool to local residents, emphasizing key safety aspects such as firmly holding the rubber handle to prevent slipping and ensuring that the bottle or can is positioned at the center of the pressing plate to avoid tool damage. As seen in Figure 6, in addition to the live demonstration, the residents were educated on the broader benefits of the device, including simplifying the collection of recyclable waste and maintaining a cleaner environment. The educational session was well-received, as residents found the tool highly useful and easy to operate. It is hoped that the community will continue to use the press tool independently even after the completion of the regular community service program (KKN).

### Application of the Bottle and Can Press Tool in the Waste Bank Activity

The waste bank activity organized by RW.012 of Masnaga Bintara Jaya Housing serves as a collective initiative to enhance residents' awareness of cleanliness and household waste management. As seen in Figure 7, in this program, residents regularly collect and sort waste according to its type, such as plastic bottles, cardboard, beverage cans, and other recyclable materials. The collected waste is then weighed and recorded, with its value credited as waste savings that can later be exchanged for cash

or basic necessities. This initiative not only aims to reduce the volume of waste disposed of in the environment but also helps increase residents' economic value through the waste savings system managed by the local waste bank committee.



**Figure 7. Utilization of the Bottle and Can Press Tool in the Waste Bank Activity**

During this activity, the students participating in the KKN program contributed by introducing and demonstrating the use of a specially designed press tool to simplify the process of reducing the volume of plastic bottles and aluminum cans. The press tool was used alternately by residents to flatten bottles and cans before collection, making the waste neater, more compact, and easier to transport for further recycling. The presence of this press tool was well received by the community, as it not only facilitated waste management but also educated residents on the importance of sorting and processing waste independently. With the students' support, the waste bank activities became more effective and fostered greater community awareness about maintaining a clean and sustainable environment.

**Table 3. Waste Collection Data of Masnaga Bintara Jaya Residents**

| No. | Resident's Name | Type of Waste        | Weight (kg) |
|-----|-----------------|----------------------|-------------|
| 1   | Mrs. Siti       | PET Plastic Bottles  | 2.5         |
| 2   | Mr. Ahmad       | Beverage Cans        | 1.8         |
| 3   | Mrs. Rina       | Cardboard            | 3.2         |
| 4   | Mr. Yusuf       | HDPE Plastic Bottles | 1.0         |
| 5   | Mrs. Lilis      | Mixed Plastics       | 0.8         |
| 6   | Mrs. Dewi       | Food Cans            | 2.0         |
| 7   | Mr. Rahmat      | Cardboard            | 4.5         |
| 8   | Mrs. Fitri      | PET Plastic Bottles  | 1.5         |

Table 3 above presents the waste collection data from the residents of Masnaga Bintara Jaya Housing during the waste bank activity, which also involved the use of the bottle and can press tool. The data records each resident's name, the type of waste collected, its weight in kilograms, and whether the waste was pressed using the tool or not. The waste types include PET plastic bottles, HDPE plastic bottles, beverage cans, food cans, cardboard, and mixed plastics. PET and HDPE plastic bottles, as well as beverage and food cans, were generally pressed using the tool to reduce their volume, making them easier to organize and transport to recycling facilities or waste collectors. Meanwhile, waste such as cardboard and mixed plastics was typically not pressed but instead tied or packed directly. The recorded waste weights per resident ranged from 0.8 kg to 4.5 kg, reflecting the active participation of residents in sorting and collecting recyclable waste with economic value.

### Fun Children's Day

The next community service program conducted by the KKN team at Masnaga Bintara Jaya Housing Complex was the Fun Children's Day, held at the RW.012 office. The main goal of this event was to provide both entertainment and educational value for children living in the community. During

the activity, two competitions were organized: a coloring contest and a ball transfer game, both designed to foster children's creativity, concentration, and teamwork. The coloring contest allowed participants to express their imagination through colors, while the ball transfer competition trained their agility, balance, and sportsmanship. Through the Fun Children's Day activities, the program aimed to promote togetherness, joy, and a memorable positive experience for children as the next generation of environmentally conscious citizens in Masnaga Bintara Jaya Housing Complex.

### Coloring Contest

As part of the *Fun Children's Day* program, one of the main activities held was a coloring competition with the theme of people planting trees and cleaning up waste in Figure 8. This activity was designed to introduce the 5R clean and orderly culture values, *Ringkas* (Concise), *Rapi* (Neat), *Resik* (Clean), *Rawat* (Maintain), and *Rajin* (Diligent), through visual media related to home and school environments. Through this activity, participants were encouraged to understand the importance of maintaining a clean and organized environment from an early age. The coloring contest served as an effective visual learning medium to instill positive habits in daily life, with the hope that the 5R values would become a deeply rooted character trait among children as the next generation who care about cleanliness, order, and environmental discipline.



Figure 8. Fun Children's Day Activity – Coloring Competition

### Ball Transfer Competition

In addition to the coloring contest, the *Fun Children's Day* program also featured a ball transfer competition, where children were tasked with moving balls from a rattan plate into three provided plastic cups in Figure 9. The rules required participants to take one ball at a time from the plate and place it into the cups while overcoming a simple challenge, jumping over a ball placed along the track. The process was repeated three times until all cups were filled.



Figure 9. Fun Children's Day Activity – Ball Transfer Competition

As seen in Figure 9, the ball transfer competition, held at Masnaga Housing RT.007/RW.012, Bintara Jaya, was part of the *Fun Children's Day* activities under the Regular KKN Program. It was designed as an educational game that not only trained children's motor skills and coordination but also incorporated the 5R cultural values (*Ringkas*, *Rapi*, *Resik*, *Rawat*, and *Rajin*). Through this game,

children learned to move efficiently (*ringkas*), organize neatly (*rapi*), maintain a clean play area (*resik*), take care of the play equipment (*rawat*), and complete the task diligently (*rajin*). Hence, this activity served not only as entertainment but also as character building, promoting discipline, environmental awareness, and a sense of responsibility aligned with the principles of clean and orderly living from an early age.

### Environmental Conservation

The final community service (KKN) program at Masnaga Bintara Jaya Housing focused on environmental conservation activities carried out collaboratively by students and local residents around the neighborhood office (RW). The activities included tree planting, waste collection, and grass cutting. Tree planting was conducted to increase greenery, create cooler air, and support the balance of the surrounding ecosystem. Meanwhile, waste collection aimed to maintain cleanliness and prevent diseases that could arise from unhygienic conditions, while grass cutting helped improve the aesthetics of the RW office area, making the environment neater and more comfortable. Through these activities, KKN students sought to encourage community awareness toward environmental care while instilling values of togetherness, mutual cooperation, and a sense of responsibility in preserving nature for the collective well-being.

#### Waste Collection

As seen in Figure 10, the waste collection activity was an essential part of the environmental conservation program implemented by KKN students together with residents around the RW office. The main goal of this activity was to create a clean, healthy, and comfortable environment. Scattered waste such as plastic, paper, food scraps, and other unused materials were collected, sorted, and then either disposed of or recycled according to their type. Cleaning was carried out in public areas such as streets, drainage channels, the RW office yard, and other open spaces where waste often accumulated.



**Figure 10. Cleaning Up Waste Around the Neighborhood Office**

Beyond physical cleanliness, this activity also served as an educational platform for the community about proper waste management practices, such as disposing of waste in designated bins and separating organic from inorganic waste. By directly involving residents, the activity fostered environmental responsibility, promoted teamwork, and strengthened collective awareness that maintaining cleanliness is not only an individual duty but a shared responsibility to create a healthier and more orderly environment.

#### Grass Cutting

As seen in Figure 11, the grass cutting activity was part of the environmental maintenance efforts conducted by KKN students and residents around the RW office of Masnaga Bintara Jaya Housing. Overgrown grass around the RW office, walkways, and open areas often disrupted the visual appeal and could become breeding grounds for insects or wild animals. Therefore, this activity aimed

to tidy up these areas, making them cleaner, more organized, and more comfortable for residents' activities.



**Figure 11. Grass Cutting Around the Neighborhood Office**

The process was carried out manually using tools such as sickles, hoes, or lawnmowers, depending on the condition of each location. In addition to improving the visual appeal of the environment, the activity reflected important values such as discipline, cooperation, and care for public facilities. Both students and residents contributed to creating a greener and healthier environment while reinforcing the spirit of mutual cooperation, a positive cultural value that must continue to be preserved in society.

#### **Planting Mango and Bay Leaf Trees**

As seen in Figure 12, the planting of mango and bay leaf trees around the RW office and public facilities of Masnaga Housing, RT.007/RW.012, Bintara Jaya, was the final program conducted by Group 4 of Industrial Engineering students as part of the Regular KKN. This initiative represented a tangible contribution to environmental improvement and sustainability. The selection of mango and bay leaf trees was based on their dual benefits, both ecological and economic. Mango trees can produce fruit for residents to enjoy, while bay leaf trees serve as herbal or family medicinal plants and are commonly used in daily cooking. This activity also involved local residents as a form of collective effort to build a green and productive environment.



**Figure 12. Mango and Bay Leaf Tree Planting Activity**

The trees were planted in strategic areas such as around the RW office and public spaces to provide direct benefits and enhance environmental aesthetics. Furthermore, this activity served as an educational medium to raise community awareness about the importance of greening and plant maintenance. It also strengthened social bonds among residents and reflected a sustainable commitment to environmental stewardship. Through this initiative, it is hoped that Masnaga Housing will become a greener, cooler, and more pleasant area, serving as a public green space that offers comfort for all residents.

## CONCLUSION

The community service program demonstrated that a collaborative approach effectively enhances public awareness and participation in environmental management. The establishment of a waste bank encouraged residents to sort and recycle household waste while recognizing its economic value. Environmental education activities for children fostered environmental responsibility from an early age, and the greening initiative promoted social cooperation and improved the community's living environment. Together, these programs proved that community-based and student-led initiatives can bring sustainable ecological change. The findings indicate that building environmental awareness requires continuous education and participatory engagement rather than short-term interventions. Collaboration among students, community leaders, and residents was essential to achieving program goals. Through shared activities, the community not only gained knowledge but also developed lasting habits of environmental care. Future activities should focus on program continuity and wider community adoption. The waste bank could be expanded and linked with local waste management systems, while children's environmental education can be integrated into schools and community programs. Sustained greening activities are also recommended to maintain ecological benefits and strengthen social bonds. Overall, this KKN project exemplifies how higher education can contribute directly to sustainable community development through education, participation, and empowerment.

## REFERENCES

- [1] P. C. Taraya and A. P. Wibawa, "Mewujudkan Society 5.0 Melalui Pemanfaatan Teknologi Kecerdasan Buatan," *J. Inov. Tek. dan Edukasi Teknol.*, vol. 2, no. 8, 2022. <https://doi.org/10.17977/um068v2i82022p378-385>
- [2] A. Lis, "Energy Security in National Security Strategies: A Multiple Case Study," *Barom. Reg. Anal. i Prognozy*, vol. 19, no. 2, 2023. <https://doi.org/10.56583/br.2280>
- [3] E. Sayed, A. Ahmed, and M. E. Yousef, "Internet of things in Smart Environment: Concept, Applications, Challenges, and Future Directions Article Contents," *World Sci. News An Int. Sci. J.*, vol. WSN 134 (1), 2019.
- [4] Q. Zuo, "National multi-level guarantee system for the water ecological health," *Shuili Xuebao/Journal Hydraul. Eng.*, vol. 52, no. 11, pp. 1347–1354, 2021.
- [5] A. Siddiqua, J. N. Hahladakis, and W. A. K. A. Al-Attiya, "An overview of the environmental pollution and health effects associated with waste landfilling and open dumping," *Environmental Science and Pollution Research*, vol. 29, no. 39. 2022. <https://doi.org/10.1007/s11356-022-21578-z>
- [6] S. Suhairi, N. H. Panjaitan, L. A. Lubis, and D. R. Amwa, "Pengaruh Lingkungan Pemasaran Global terhadap Perekonomian di Indonesia," *J. Educ.*, vol. 5, no. 3, 2023. <https://doi.org/10.31004/joe.v5i3.1728>
- [7] C. Kerdpitak, W. Mekkham, and L. Girdwichai, "Effective waste management as a predictor of competitive advantage: Mediating role of green purchasing and logistics," *Int. J. Supply Chain Manag.*, vol. 8, no. 5, pp. 830–841, 2019. <https://doi.org/10.59160/ijscm.v8i5.3675>
- [8] Y. A. Hidayat, S. Kiranamahsa, and M. A. Zamal, "A study of plastic waste management effectiveness in Indonesia industries," *AIMS Energy*, vol. 7, no. 3, 2019. <https://doi.org/10.3934/energy.2019.3.350>
- [9] C. Y. Manullang, M. P. Patria, A. Haryono, S. T. Anuar, S. Suyadi, and R. D. A. Opier, "Status and Research Gaps of Microplastics Pollution in Indonesian Waters: A Review," *Indonesian Journal of Chemistry*, vol. 23, no. 1. 2023. <https://doi.org/10.22146/ijc.73485>
- [10] A. M. S. Asih, F. Trapsilawati, B. M. Sopha, and N. M. E. Normasari, "Waste Bank Program for Households as A Means of Processing Inorganic Waste," *J. Pengabd. Kpd. Masy. (Indonesian J. Community Engag.)*, vol. 8, no. 4, 2022. <https://doi.org/10.22146/jpkm.73409>
- [11] R. Purwandari, D. Daniel, and F. Hafidz, "Analysis of water, sanitation, and hygiene facilities using the WASH-FIT approach and its relation to patient satisfaction and maternal mortality at hospitals in Indonesia," *Front. Public Heal.*, vol. 12, 2024. <https://doi.org/10.3389/fpubh.2024.1322470>
- [12] M. Mehrabioun, "A multi-theoretical view on social media continuance intention: Combining theory of planned behavior, expectation-confirmation model and consumption values," *Digit. Bus.*, vol. 4, no. 1, 2024. <https://doi.org/10.1016/j.digbus.2023.100070>

- [13] D. A. E. van Aalst, G. Huitsing, and R. Veenstra, "Understanding Teachers' Likelihood of Intervention in Bullying Situations: Testing the Theory of Planned Behavior," *Int. J. Bullying Prev.*, 2024. <https://doi.org/10.1007/s42380-024-00209-w>
- [14] I. A. Udo and B. Willard, "Community-Based Social Marketing: A Supplemental Approach to Improve Environmental Attitudes and Environmental Health in Nigeria," *Environ. Commun.*, vol. 17, no. 2, 2023. <https://doi.org/10.1080/17524032.2023.2175005>
- [15] N. Vantamay, "'3S project': A community-based social marketing campaign for promoting sustainable consumption behavior among youth," *J. Komun. Malaysian J. Commun.*, vol. 35, no. 4, 2019. <https://doi.org/10.17576/JKMJC-2019-3504-03>
- [16] D. Streimikiene, "Community based social marketing for greenhouse gas emission reduction in households," *Manag. Mark.*, vol. 17, no. 4, 2022. <https://doi.org/10.2478/mmcks-2022-0027>
- [17] S. Komonkanjanakul and R. Supapongpichate, "A model of participatory learning process for management of environmental health impacts in industrial communities area," *J. Heal. Res.*, vol. 36, no. 6, 2022. <https://doi.org/10.1108/JHR-07-2020-0277>
- [18] C. D. Trott, A. E. Weinberg, S. M. Frame, P. Jean-Pierre, and T. L. Even, "Civic science education for youth-driven water security: A behavioral development approach to strengthening climate resilience," *Int. J. Behav. Dev.*, vol. 48, no. 2, 2024. <https://doi.org/10.1177/01650254231188661>
- [19] H. Baohua, Y. Rongzhen, L. Jie, and Z. Qiao, "Practice and exploration of participatory environmental education in colleges and universities," *Chinese Educ. Soc.*, vol. 43, no. 2, 2010. <https://doi.org/10.2753/CED1061-1932430209>
- [20] I. Ahmad, "Evaluation of the Implementation of Waste Bank Activities," *J. Ilmu Lingkung.*, vol. 20, no. 2, 2022. <https://doi.org/10.14710/jil.20.2.414-426>
- [21] S. Collado, C. D. Rosa, and J. A. Corraliza, "The effect of a nature-based environmental education program on children's environmental attitudes and behaviors: A randomized experiment with primary schools," *Sustain.*, vol. 12, no. 17, 2020. <https://doi.org/10.3390/su12176817>
- [22] M.-J. Joe and S.-H. Kim, "The Composition and Effects of a Young Children's Environmental Education Program connecting to Family," *Korea Assoc. Early Child. Educ. Educ. Welf.*, vol. 27, no. 2, 2023. <https://doi.org/10.1080/00958960309603483>
- [23] L. Y. Alexandrova, O. F. Kireeva, E. V Krasilnikova, A. Y. Munshi, and S. V Timofeev, "Approaches to solving the existing problems in green logistics," in *Studies in Systems, Decision and Control*, vol. 316, Cheboksary Cooperative Institute (Branch) of the Russian University of Cooperation, Cheboksary, Russian Federation: Springer Science and Business Media Deutschland GmbH, 2021, pp. 857–868. [https://doi.org/10.1007/978-3-030-57831-2\\_92](https://doi.org/10.1007/978-3-030-57831-2_92)
- [24] R. Muhendra, A. Jatmiko, and Y. Reviyanti, "Pendampingan dan Pengembangan Sistem Pengolahan Sampah serta Perancangan Produk Pupuk Cair Bernilai Market sebagai Produk Inovasi di Kelurahan Perwira Kota Bekasi Jawa Barat," *J. Sains Teknol. dalam Pemberdaya. Masy.*, vol. 3, no. 1, 2022. <https://doi.org/10.31599/65q68w44>
- [25] R. Malli, "Landasan Ontologi Ilmu Pengetahuan," *TARBAWI J. Pendidik. Agama Islam*, vol. 4, no. 01, 2019. <https://doi.org/10.26618/jtw.v4i01.2133>
- [26] J. Moore, P. Goffin, J. Wiese, and M. Meyer, "An interview method for engaging personal data," *Proc. ACM Interactive, Mobile, Wearable Ubiquitous Technol.*, vol. 5, no. 4, 2021. <https://doi.org/10.1145/3494964>
- [27] D. van de Bongardt and M. Verbeek, "New Interview Method for Sketching the Dynamic Relational and Sexual History of Young Adults," *Sex. Res. Soc. Policy*, vol. 18, no. 4, 2021. <https://doi.org/10.1007/s13178-020-00514-1>
- [28] C. Von Soest, "Why Do We Speak to Experts? Reviving the Strength of the Expert Interview Method," *Perspect. Polit.*, vol. 21, no. 1, 2023. <https://doi.org/10.1017/S1537592722001116>
- [29] B. DiCicco-Bloom and B. F. Crabtree, "The qualitative research interview," *Medical Education*, vol. 40, no. 4. 2006. <https://doi.org/10.1111/j.1365-2929.2006.02418.x>