

Project for recycle bubble wrap, used plastic and patchwork into sitting pillows: Environmental education efforts

Siti Roudlotul Hikamah^{a,1,*}, Riza Rulloh^{a,2}, Devi Nurkholisoh^{a,3}, Tubagus Sholihin^{a,4}, H. Hariyanto^{b,5}

^a Department of Biology Education, Faculty of Teacher Training and Education, Universitas Islam Jember, Jl. Kyai Mojo 101 Jember, East Java 68133, Indonesia

^b Postgraduate Program, Faculty of Teacher Training and Education, Universitas PGRI Argopuro Jember, Jl. Jawa No.10, Tegal Boto Lor, Sumbersari Jember, East Java 68121, Indonesia

¹sitihikamah@yahoo.com; ²arulbio137@gmail.com; ³devi007ahmad@gmail.com;

⁴wandaramat007@gmail.com; ⁵ghost.ary1@gmail.com

***For correspondence:**

sitihikamah@yahoo.com

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Abstract: Waste, a byproduct of human activity, can cause environmental pollution if released without proper processing. It can accumulate in piles, disturbing natural beauty and emitting unpleasant odors. The aim of this research is to from the students to care about the environment by learning with the Bubble Wrap Recycling Project, Used Plastic and Patchwork. The method of this project is a structured experiment. Common waste includes bubble wrap, plastic, and rags from the convection industry. A student project in an environmental science course involved recycling these materials into sitting pillows. Three variants were tested: 10% bubble wrap, 10% plastic waste, 80% patchwork, 15% bubble wrap, 15% plastic waste, 70% rags, and 20% bubble wrap, 20% plastic waste, 60% rags. The pillow's comfort was measured using a Linkert scale of 1-5. The results showed that the pillow measures 40cm. Recycling is a way to promote environmental care and awareness. Cooperation from educational agents, such as supervisors, leaders, and lecturers, is needed to increase students' environmental awareness. This includes examples of good environmental actions in daily routines, such as disposing of waste and implementing 3R practices.

Keywords: bubble wrap; patchwork; plastic waste; recycle; sitting pillow.

Introduction

Waste is the remaining waste from a product or item that is no longer used as a side effect of human activities (Kolodiichuk *et al.*, 2022; Syaharuddin *et al.*, 2020). Waste that is released directly into the environment without prior processing can burden the surrounding environment and, if not handled, can cause an increase in waste (Galih *et al.*, 2017; Hikamah & Muslim, 2018; Nisa & Saputro, 2021; Syaharuddin *et al.*, 2020). Piles of rubbish disturb the natural beauty and unpleasant aroma and can pollute the environment (Sumiarsih & Sarumi, 2021), disrupting the health of humans and other living creatures (Este, 2022). Waste that pollutes the environment consists of various types, including organic waste, rags, B3, and various types of plastic such as bottles, wrappers, and bubble wrap. Indonesia is the country that contributes the second largest plastic waste in the world (Northcoot, 2020; Zulkhanadya & Listriani, 2020). Bubble wrap is a soft, structured plastic packaging with tiny bubbles on its surface (Chopra *et al.*, 2022; Sari *et al.*, 2023). Bubble wrap protects the packaging of fragile objects, especially in delivery services (Galih *et al.*, 2017).

Plastic is an artificial inorganic material consisting of chemicals that are difficult to decompose, thus posing a threat to the environment (Darmastuti *et al.*, 2021; Galih *et al.*, 2017). Research results indicate that 96% of product packaging is wrapped in plastic and covered with bubble wrap, mainly used by online sellers, and there is no better solution yet (Marbun *et al.*, 2021). Using too much bubble wrap and plastic

waste and throwing it into the environment has lethal and sublethal effects on marine, freshwater, and terrestrial organisms. Plastic waste can also change the global carbon cycle by impacting plankton and primary production in marine, freshwater, and terrestrial systems (Este, 2022). Poison from plastic particles that enter the soil kills decomposing animals in the soil, such as insects (Kurniawan & Rahma, 2022). Apart from bubble wrap, rags are inorganic waste produced in the convection industry as small used cloth pieces. Inorganic waste from rags can seriously impact the environment and health if improperly managed. These adverse impacts include, among others, damage to soil biota, such as soil organisms and fauna, over a certain period (Dewi et al., 2020).

Plastic waste causes environmental problems because it is difficult to decompose, thus affecting the survival of living things (Galih et al., 2017). This condition requires a solution to be found so that the natural ecosystem can be balanced and the species that live in it can survive. Efforts to raise awareness of the use of plastic and policies to prevent the public from dealing with the issue of waste pollution need to be promoted (Sari et al., 2023). The majority of Indonesian people do not care about the amount of plastic waste around them and continue to use plastic in their daily activities, such as shopping, which still uses plastic bags, and online sellers who still use bubble wrap in packaging goods; this causes plastic waste to increase every day. Moreover, in Indonesia, special regulations for plastic waste management are needed; this is an obstacle to the government's effective waste management (Suasono et al., 2023). The country should have special regulations and sustainable waste management procedures to minimize the negative impact of plastic waste (Kibria et al., 2023). Previous research was recycling plastic waste into flower pots. In this research, apart from using plastic waste, we also used Bubble Wrap and rags to make sitting pillows. Apart from that, this research was done on learning with projects on environmental knowledge courses.

One alternative that can be done to reduce the continued accumulation of plastic waste includes recycling waste into products that are useful and have economic value (Galih et al., 2017; Mamdudah et al., 2023), such as recycling bubble wrap and used plastic and cloth. The patchwork becomes a sitting pillow. In order to provide learning to students in urban areas, according to the government program through the Merdeka Belajar Kampus Merdeka (MBKM), learning projects are carried out often known as Project Based Learning (PjBL) (Ilma et al., 2022; Khafah et al., 2023; Laelasari & Sholehah, 2021; Nugroho & Dewi, 2022; Prajoko et al., 2023). This project is an educational effort to care for the environment. Because plastic waste is a global problem that must be handled collectively with the highest priority (Chen et al., 2021; Kumar et al., 2021; Ncube et al., 2021), this project aims to foster an environmentally conscious attitude in urban students through recycling plastic waste.

Method

This project was carried out in the study of environmental knowledge courses by groups of students and lecturers who taught the course. The method of this project is a structured experiment. This research was done on environmental knowledge courses. Lecturers as researchers conduct research on learning with projects with student groups. This research method is a structured experiment. The research was carried out in five stages. Stage I, survey of one of the Final Waste Disposal Sites (TPSA). Stage II, analyzing the survey results, and determining the recycling plan that will be done. Stage III, coordinating with several boarding houses to place rubbish bins as a place to dispose of bubble wrap waste, and doing the same thing with convection entrepreneurs in Jember. Stage IV, conducting trials of making sitting pillows using three (3) variants. Stage V, conducting a survey of respondents, to determine the comfort of the sitting pillow. Stage V, Analyze the survey results. In this project, experiments were carried out using 3 (three) pillow-filling composition variants, shown in Table 1.

Table 1. Composition of sitting pillow fillers

Variant	Percentage of Used Bubble wrap	Percentage of Plastic Waste	Patchwork Percentage
1	10	10	80
2	15	15	70
3	20	20	60

The three variants of sitting pillows are inserted into cotton cloth measuring 40 cm. Each pillow is filled with a weight of 90 grams. In order to determine the comfort of sitting pillows, a survey was conducted on 30 respondents. The comfort indicator was adapted from the Linkert scale (Singarimbun, Masri dan Effendi, 2006), shown in Table 2.

Table 2. Indicators of respondents' comfort with sitting pillows

Score	Comfort Level
1	Very uncomfortable
2	Uncomfortable
3	Neutral
4	Comfortable
5	Very comfortable

Data obtained from respondents was analyzed using the following percentage [Formula 1 \(Akbar, 2013\)](#). Information: P: Percentage of the comfort of the sitting pillow; Σx_i : Total score obtained; Σx : Maximum score. Respondent satisfaction is calculated using the categories shown in [Table 3](#).

$$P = \frac{\sum_{i=1}^n x_i}{\sum_{i=1}^n x} \times 100 \% \quad (1)$$

Table 3. Sitting pillow satisfaction categories based on percentage calculations

Value range %	Category
$81,25 \leq x \leq 100$	Very satisfied
$62,5 \leq x < 81,25$	Satisfied
$43,75 \leq x < 62,5$	Less satisfied
$25 \leq x < 43,75$	Not satisfied

Source: adapted from [\(Akbar, 2016\)](#)

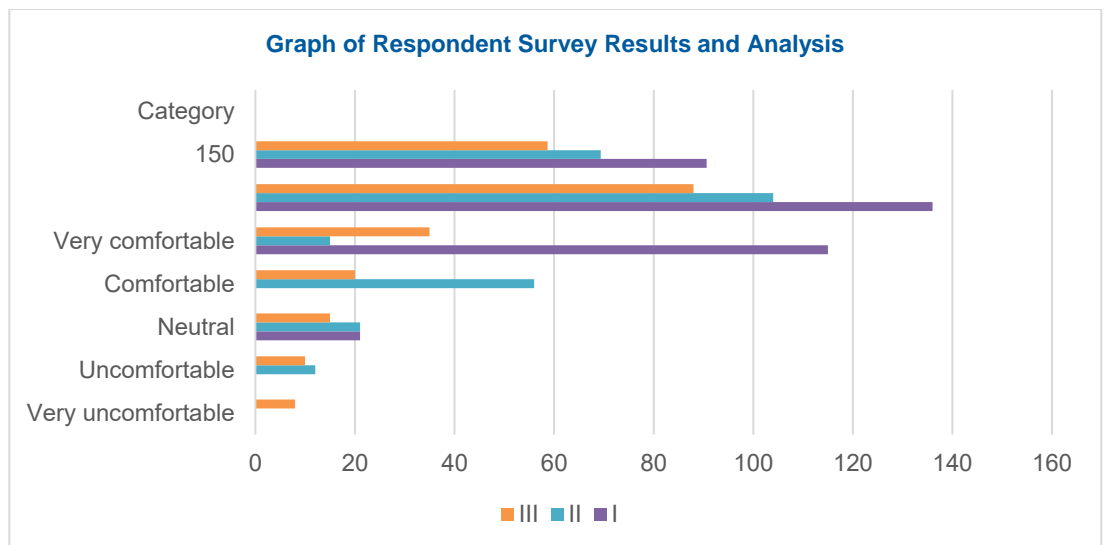
Results and Discussion

The research results regarding the comfort percentage of sitting pillows from the three variants and the satisfaction categories of respondents obtained the values shown in [Table 4](#).

Table 4. Results of analysis of comfort percentage and sitting pillow categories

Varian	Very uncomfortable	Uncomfortable	Neutral	Comfortable	Very comfortable	Total	Persentase	Category
I	0	0	21	0	115	136	90,67	Very satisfied
II	0	12	21	56	15	104	69,33	Satisfied
III	8	10	15	20	35	88	58,67	Less satisfied

[Table 4](#) above shows that the recycled seat cushions in the very satisfied category are at a percentage of 10% used bubble wrap, 10% plastic waste, and 80% rags. The recycling process for this sitting pillow is shown in [Figure 1](#) and [Figure 2](#).


Figure 1. Graph of Respondent Survey Results, Analysis and Category

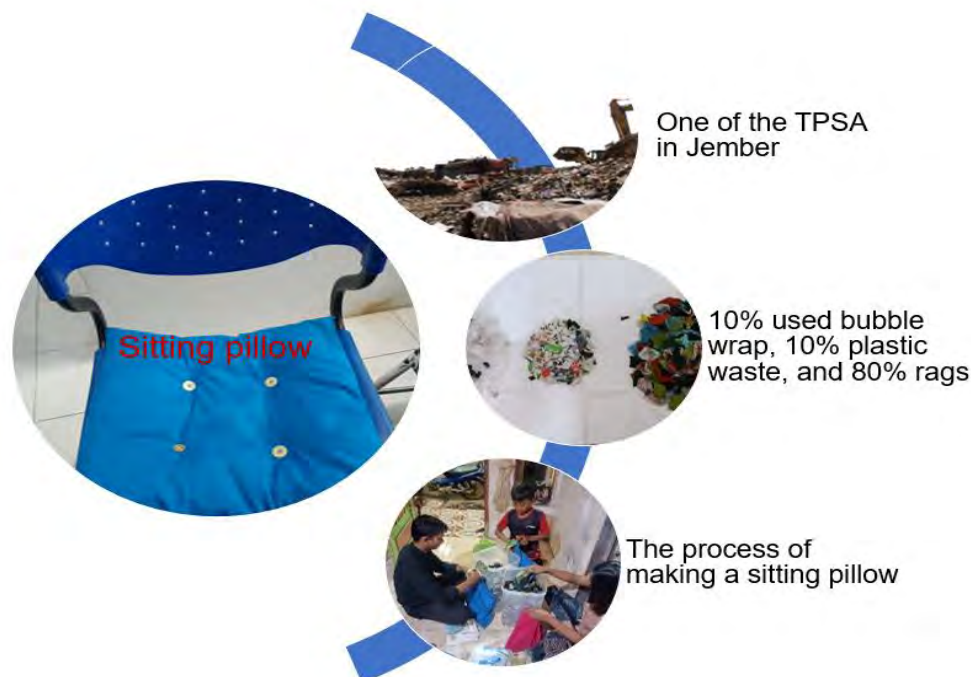


Figure 2. Recycling a sitting pillow starts with TPSA observations, the composition of the pillow contents, filling the pillow, and placing the sitting pillow on the chair

This sitting pillow, which is recycled from used bubble wrap, plastic waste, and rags with a percentage of 10%:10%:80%, is very soft and comfortable to use and makes minimal noise; this is because the mixture of these three wastes becomes soft, resembling kapok. This pillow is comfortable to wear and light, making it easy to move around; production costs are very cheap. This recycling innovation is necessary to reduce plastic waste by empowering the educational community to minimize plastic pollution. Learning through this recycling project is a choice that must be promoted and enforced (Kumar et al., 2021). In Africa, a holistic approach is being taken in plastic waste management involving all stakeholders seeking to achieve a circular economy in order to reduce, reuse, and recycle plastic waste, which is increasing as a result of increasing global food demand due to population growth (Ncube et al., 2021). In Malaysia, alternative efforts are being made, and a plastic waste management model based on a circular and sustainable economy is being proposed to solve the problem of plastic waste on human health and the environment (Chen et al., 2021).

In Dubai, the adverse effects of municipal solid plastic waste (MSPW) significantly negatively impact the environment. Therefore, through advanced waste handling, a sustainable MSPW management system has been developed for sustainable development, including recycling plastic waste into products with economical and practical value (Nahlawi et al., 2022). Recycling plastic waste can improve climate change, water quality, and the health of animals in their habitat (Evode et al., 2021). Discussions about environmental preservation cannot be separated from discussions about plastic waste contributing to environmental disasters. The Circular Economy (CE) concept is a breakthrough in the discussion of environmental conservation that bridges the gap between the economy and the environment (Maitlo et al., 2022; Rizkovic, 2023).

One country in the world that has succeeded in recycling up to 84% of waste is Japan (Gustiawati et al., 2023). Therefore, the country is spotless from plastic waste pollution. Waste management in this country is through reduction, reuse, and recycling (3R) as planned in Indonesia, even adding the concepts of heat recovery and proper disposal. Heat recovery is a technique for handling particular waste that cannot be recycled, such as utilizing waste in renewable energy. An example of what has been done is using a waste incinerator, and the heat from the combustion produced is used to generate electricity. Proper disposal is the final alternative for waste that cannot be carried out by 3R and heat recovery, so the waste is disposed of properly in the TPSA not to damage the environment.

Plastic waste management in Indonesia is very dependent on the government. Policies that impact many sectors require synergistic participation from relevant stakeholders, namely employers, investors, academics, and civil society. China and the European Union have regulations related to an integrated waste management system, so there are no overlapping regulations. Waste management must also consider market availability for environmentally friendly goods (Subekti, 2023). Promoting and

introducing recycled products must be carried out to create a market that enables the sustainability of the recycling industry (Soemadijo et al., 2022). In Europe, guidelines have been prepared to design policies to prevent environmental pollution for sustainable waste management of natural resources, change mitigation, and adaptation and conservation of biodiversity (Bernués et al., 2022).

Plastic waste management through academics has started through a recycling project into sitting pillows; this is an effort to realize an environmentally caring character. The results of previous research have informed that environmental education is influential and effective in realizing environmentally caring character at the high school level (Rohayati et al., 2021). Apart from that, there is a close relevance between school environmental education policies, individual attitudes, community behavior, and industrial behavior to maintain a healthy, sustainable environment (Gani et al., 2023). This information is supported by other researchers that, to increase students' environmental awareness, cooperation is needed from several educational agents, such as education supervisors, leaders, and lecturers, to provide students with examples of good deeds towards the environment in their daily routines, starting from throwing away waste in its place until the 3Rs are implemented (Mamdudah et al., 2023; Wibowo et al., 2021). This is to increase student awareness about environmental education to realize environmentally caring character (Ali et al., 2023).

Conclusion

The project to recycle sitting pillows from bubble wrap, plastic waste, and rags is beneficial in utilizing waste to reduce the accumulation of plastic waste, which can cause various negative impacts on society and the environment. This utilization can create a clean and healthy environment. In learning about this recycling project, students learn about environmental sustainability material through direct practice, with the activity of providing an alternative solution. They have made observations at TPSA and convection, conducted experiments on the composition of pillow contents, and produced and conducted user satisfaction surveys. Apart from implementing learning through projects, this activity is also an effort to awaken environmentally caring character for urban students. The suggestion is to carry out further research regarding the implementation of sitting pillows on the environmentally caring character of students.

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Conflicts of Interest

The authors declare that there is no conflict of interest regarding the publication of this paper.

Author Contributions

S. R. Hikamah: methodology, analysis and writing original draft preparation; **R. Rulloh, D. Nurkholisoh,** and **T. Sholohin:** conducted observations and projects; and **H:** translation, review and editing

References

- Akbar, S. (2013). *Instrumen Perangkat Pembelajaran* (Kedua). PT Remaja Rosdakarya. <https://www.rosda.id/pendidikan-keguruan/instrumen-perangkat-pembelajaran/>
- Akbar, S. (2016). *Instrumen Perangkat Pembelajaran*. Remaja Rosdakarya. <https://www.rosda.id/pendidikan-keguruan/instrumen-perangkat-pembelajaran/>
- Ali, M. I., Abduh, A., Mahmud, R., & Dunakhir, S. (2023). Raising Students' Awareness on Environmental Education Issues. *Indonesian Journal of Educational and Review*, 6(1), 1–8. <https://doi.org/10.23887/ijerr.v6i1.59146>
- Bernués, A., Tenza-Peral, A., Gómez-Baggethun, E., Clemetsen, M., Eik, L. O., & Martín-Collado, D. (2022). Targeting best agricultural practices to enhance ecosystem services in European mountains. *Journal of Environmental Management*, 316(March 2021), 1–11.

- <https://doi.org/10.1016/j.jenvman.2022.115255>
- Chen, H. ling, Nath, T. K., Chong, S., Foo, V., Gibbins, C., & Lechner, A. M. (2021). The plastic waste problem in Malaysia : management , recycling and disposal of local and global plastic waste. *SN Applied Sciences*, 3(4), 1–15. <https://doi.org/10.1007/s42452-021-04234-y>
- Chopra, N., Satyan, D., & Sahni, H. (2022). Evaluating Bubble Wrap and Proposing Post-consumer Textile Waste as Alternative Material: A review. *International Journal of Innovation and Business Strategy (IJIBS)*, 17(2), 51–74. <https://ijibs.utm.my/index.php/ijibs/article/view/124/100>
- Darmastuti, S., Cahyani, I. P., Afrimadona, A., & Ali, S. (2021). Pendekatan Circular Economy Dalam Pengelolaan Sampah Plastik di Karang Taruna Desa Baros, Kecamatan Baros, Kabupaten Serang. *Indonesian Journal of Society Engagement*, 1(2), 1–18. <https://doi.org/10.33753/ijse.v1i2.13>
- Dewi, N. A. K., Pratiwi, R., & Muzayyanah, L. (2020). Pelatihan Keterampilan Kain Perca untuk Mengurangi Limbah Anorganik. *Sasambo: Jurnal Abdimas (Journal of Community Service)*, 2(2), 49–56. <https://doi.org/10.36312/sasambo.v2i2.196>
- Este, P. Del. (2022). Pastic pollution science. *United Nations Environment Programme*, 1(7), 1–31. https://wedocs.unep.org/bitstream/handle/20.500.11822/41263/Plastic_Science_E.pdf
- Evode, N., Qamar, S. A., Bilal, M., & Iqbal, H. M. N. (2021). Case Studies in Chemical and Environmental Engineering Plastic waste and its management strategies for environmental sustainability. *Case Studies in Chemical and Environmental Engineering*, 4(September), 1–8. <https://doi.org/10.1016/j.cscee.2021.100142>
- Galih, A., Edy, S., Purwidi, A., & Devina, P. S. (2017). Pemanfaatan Limbah Plastik dan Kain Perca Menjadi Kerajinan Tangan Guna Meningkatkan Kualitas Sumber Daya Manusia. *Seminar MASTER PPNS*, 1509, 173–176.
- Gani, S. A., Muthalib, K. A., Yusuf, T. R., & Gani, B. A. (2023). The Environment Education Policy in Behavior Commitment of Stakeholders for the Environmental Sustainability. *The Environment Education Policy*, 32(2), 1491–1505. <https://doi.org/10.15244/pjoes/158147>
- Gustiawati, B. L., Herdiansyah, H., & Frimawaty, E. (2023). A Review of the Implementation of Sustainable Plastic Waste Management. *International Journal of Science and Society*, 5(5), 690–705.
- Hikamah, S. R., & Muslim, I. B. (2018). Pemanfaatan Limbah Pasar dan Feses Ayam untuk Meningkatkan Produktivitas Tanaman Jagung (*Zea mays*). *Warta Pengabdian*, 12(1), 212. <https://doi.org/10.19184/wrtp.v12i1.7530>
- Ilma, S., Al-Muhdhar, M. H. I., Rohman, F., & Saptasari, M. (2022). Students Collaboration Skills in Science Learning. *Proceedings of the 2nd International Conference on Innovation in Education and Pedagogy (ICIEP 2020)*, 619(Iciep 2020), 204–208. <https://doi.org/10.2991/assehr.k.211219.037>
- Syaputra, E. M., & Handayani, S. (2021). Microplastic Pollution in Waters and its Impact on Health and Environment in Indonesia : A Review. *Journal of Public Health for Tropical and Coastal Region (JPHTCR)*, 4(2), 63–77. <http://ejournal2.undip.ac.id/index.php/jphtcr/index>
- Khafah, F., Suprpto, P. K., & Nuryadin, E. (2023). The effect of project-based learning model on students' critical and creative thinking skills in the ecosystem concept. *JPBI (Jurnal Pendidikan Biologi Indonesia)*, 9(3), 244–255. <https://doi.org/10.22219/jpbi.v9i3.27461>
- Kibria, M. G., Masuk, N. I., Safayet, R., Nguyen, H. Q., & Mourshed, M. (2023). Plastic Waste : Challenges and Opportunities to Mitigate Pollution and Effective Management. In *International Journal of Environmental Research* (Vol. 17, Issue 20). Springer International Publishing. <https://doi.org/10.1007/s41742-023-00507-z>
- Kolodiichuk, V., Dubnevych, Y., Voynych, L., Cherevko, I., & Kolodiichuk, I. (2022). *Definition and Classification of Waste Agricultural Enterprises ' Business Activity in*. 22(1), 331–340.
- Kumar, R., Verma, A., Shome, A., Sinha, R., Sinha, S., Sharma, P., & Prasad, P. V. V. (2021). Impacts of Plastic Pollution on Ecosystem Services , Sustainable Development Goals , and Need to Focus on Circular Economy and Policy Interventions. *Sustainability*, 13(9963), 1–40. <https://doi.org/10.3390/su13179963>
- Kurniawan, M. A. R., & Rahma, A. S. (2022). Dampak PPKM Terhadap Sampah Plastik di Jakarta. *Jurnal Pengabdian Masyarakat Biologi Dan Sains*, 1(1), 28–42. <https://doi.org/10.30998/jpmbio.v1i1.952>
- Laelasari, I., & Sholehah, I. (2021). The Relationship Between Student's Creativity And Cognitive Learning Outcome Through The Implementation Of Project Based Learning On Biology. *Journal Of Biology Education*, 4(1), 61–71. <https://doi.org/10.21043/job.e.v4i1.10178>
- Maitlo, G., Ali, I., Maitlo, H. A., Ali, S., Unar, I. N., Ahmad, M. B., Bhutto, D. K., Karmani, R. K., Naich, R., Sajjad, R. U., Ali, S., & Afridi, M. N. (2022). Plastic Waste Recycling , Applications , and Future Prospects for a Sustainable Environment. *Sustainability*, 14(11637), 1–27. <https://doi.org/10.3390/su141811637>
- Mamdudah, E. A., Kustini, S. M., Alwi, K. S. M., Hikamah, S. R., & Ichsan, M. T. (2023). Pemanfaatan Limbah Plastik Ecobrick Menjadi Rak Buku. *Dedication: Jurnal Pengabdian Masyarakat*, 7(1),

- 21–30. <https://doi.org/10.31537/dedication.v7i1.1022>
- Marbun, A. P., D, A. E. N., Nabila, D. T., Samara, G. A., Sani, M. A., Negari, N., Deviani, N., W, S. A. W., Setiawan, S., Fauhan, Z. A., & Erwandi, D. (2021). Upaya Penggantian Sampah Plastik dalam Pengemasan Komoditi Online Shop oleh Pelaku UMKM. *Jurnal Pengabdian Kesehatan Masyarakat (Pengmaskemas)*, 1(2), 145–152. <https://doi.org/10.5646/pengmaskemas.v1i2/5646>
- Nahlawi, M. Al, Al-shihabi, S., & Aydin, R. (2022). Sustainable Plastic Waste Management Using a System Dynamics Approach. *Proceedings of the 7th North American International Conference on Industrial Engineering and Operations Management*, 792–802.
- Ncube, L. K., Ude, A. U., Ogunmuyiwa, E. N., Zulkifli, R., & Beas, I. N. (2021). An Overview of Plastic Waste Generation and Management in Food Packaging Industries. *Recycling*, 6(12), 1–25. <https://doi.org/10.3390/recycling6010012>
- Nisa, S. Z., & Saputro, D. R. (2021). Pemanfaatan Bank Sampah sebagai upaya Peningkatan Pendapatan Masyarakat di Kelurahan Kebonmanis Cilacap. *Bantenese : Jurnal Pengabdian Masyarakat*, 3(2), 89–103. <https://doi.org/10.30656/ps2pm.v3i2.3899>
- Northcoot, M. S. (2020). Rubbish, Recycling and Religion: Indonesia's Plastic Waste Crisis and the Case of Rumah Kompos in Ubud, Bali. *International Journal of Interreligious and Intercultural Studies (IJIS)*, 3(1), 1–19. <https://doi.org/10.32795/ijis.vol3.iss1.2020.680>
- Nugroho, A. E., & Dewi, S. E. P. (2022). Implementation Of Project Based Learning (PjBL) Method On Music Learning In Junior High School Regina Pacis Surakarta. *Jurnal Seni Musik*, 11(1), 102–111. <https://doi.org/10.15294/jsm.v11i1.56645>
- Prajoko, S., Sukmawati, I., Maris, A. F., & Wulanjani, A. N. (2023). Project Based Learning (Pjbl) Model With Stem Approach on Students' Conceptual Understanding and Creativity. *Jurnal Pendidikan IPA Indonesia*, 12(3), 401–409. <https://doi.org/10.15294/jpii.v12i3.42973>
- Rizkovic, A. (2023). Plastic Packaging Waste Management by L' Oreal and Unilever : A Circular Economy Perspective Introdug on. *Journal of World Trade Studies*, 7(1), 60–75. <https://journal.ugm.ac.id/v3/JWTS/article/download/4816/2241>
- Rohayati, E. A., Safrina, R., & Purwanto, A. (2021). International Journal of Multicultural and Multireligious Understanding The Effect of Environmental Education on Students' Environmental Care Attitude : A Meta-Analysis Study. *International Journal of Multicultural and Multireligious Understanding*, 8(2), 353–361. <https://doi.org/10.18415/ijmmu.v8i2.2395>
- Sari, M. M., Inoue, T., Rofiah, R., Septiariva, I. Y., Prayogo, W., Suryawan, I. W. K., & Arifianingsih, N. N. (2023). Transforming Bubble Wrap and Packaging Plastic Waste into Valuable Fuel Resources. *Journal of Ecological Engineering*, 24(8), 260–270. <https://doi.org/10.12911/22998993/166554>
- Singarimbun, Masri dan Effendi, S. (2006). *Metode Penelitian Survei* (S. Singarimbun, Masri dan Effendi (ed.); Kedelapan). Pustaka Lembaga Penelitian dan Penerangan Ekonomi dan Sosial Indonesia.
- Soemadajo, P., Anindita, F., Trisyanti, D., Akib, R., Abdulkadir, M., Nizardo, N. M., & Rachmawati, R. L. (2022). A Study of Technology Availability for Recycling Low. *Journal of Environmental Science and Sustainable Development*, 5(2), 436–457. <https://doi.org/10.7454/jessd.v5i2.1128>
- Suasono, E., Linardi, A., Yudinata, M. V., Hasibuan, F. J., Yuniar, D., & Yohana, S. (2023). The Effectiveness of Plastic Waste Management Based on The Legal System in Indonesia. *Dialogia Iuridica*, 15(1), 38–58. <https://doi.org/10.28932/di.v15i1.6596>
- Subekti, R. (2023). A Circular Economy-Based Plastic Waste Management Policy in Indonesia (Compared to China and EU). *Yustisia Jurnal Hukum*, 12(2), 168–184. <https://doi.org/10.20961/yustisia.v12i2.72177>
- Sumiarsih, S., & Sarumi, R. (2021). Penyuluhan Dampak Limbah Masker Bekas Pakai (Medis dan Non Medis) Terhadap Lingkungan dan Kesehatan Masyarakat. *Promotif : Jurnal Kesehatan Masyarakat*, 11(2), 122–129. <https://doi.org/10.56338/pjkm.v11i2.2036>
- Syahrudin, S., Hidayanti, H., & Mutiani, M. (2020). The Role of Waste Banks to Improve Community Environment Awareness. *The Innovation of Social Studies Journal*, 1(2), 129. <https://doi.org/10.20527/iis.v1i2.2026>
- Wibowo, N. A., Sarwono, & Yusup, Y. (2021). Environmental Care Attitude of the Students. *Jurnal GeoEco*, 7(2), 165–177.
- Zulkhanadya, Z., & Listriani, S. (2020). The Implementation Of State Responsibility Principle in Indonesia Concerning Plastic Waste of Pacific Ocean. *Syiah Kuala Law Journal*, 4(2), 218–233. <https://doi.org/10.24815/sklj.v4i2.17871>