

The effectiveness of household waste management based on the waste alms concept by elementary school students

Aliet Noorhayati Sutisno^{1*}, Noor Novianawati², Dewiantika Azizah³

Abstract

This study aims to find out effectiveness of household waste management based on the concept of waste alms carried out by students and parents of elementary school students in collaboration with the school. This study is quantitative descriptive research that was conducted on 100 students in one of Cirebon sub-district elementary schools. In this research, students donate domestic waste every week. The Purpose of this study was to provide students with an understanding of the importance of protecting the environment trough reducing household waste. The observation sheet was used as the research instrument of this study. The results showed that the concept of waste alms in household waste management which is integrated with elementary school education units can reduce 2.17% of the volume of waste growth.

Keywords: *Alms concept, Waste Management, Elementary School Student*

A. Introduction

Not a few developed countries improve the quality of human resources only by maximizing the processing of their community's waste. There they maximize waste management to form human, environmental, and social cultural patterns. Waste is a natural resource that has not been maximized in many developing countries, including Indonesia. It is no exaggeration if developed countries emphasize waste more on cultural instruments. This means that maximizing waste in massive processing encourages the culture of community resources to be more advanced. Maximizing attention to waste initiates a local zero waste pattern. Thus, there are many developed countries where the rate of use of natural resources is controlled.

Indonesia is the fourth biggest countries in the world (The World Bank, 2020) that now considered as one of the most rapidly urbanizing countries in the world which almost 56% of the Indonesian population lives in urban area (Handayani et al., 2018) . The population growth brings about the increasing amount of the waste which becomes a problem faced by the government (Meidiana & Gamse, 2010; Oliveira et al., 2019; Patel & Meka, 2007). The amount of waste generated is ever-increasing due to population growth, however adequate waste management has never been a focus in everyday life. The action of the household as the beginning stage of waste management is also crucial (Handayani et al., 2018). In 2016, the worlds' cities generated 2.01 billion tonnes of solid waste, amounting to a footprint of 0.74

¹ Universitas Muhammadiyah Cirebon, West Java, Indonesia, aliet.noorhayati@umc.ac.id

² Universitas Muhammadiyah Cirebon, West Java, Indonesia

³ Universitas Muhammadiyah Cirebon, West Java, Indonesia

kilograms per person per day. With rapid population growth and urbanization, annual waste generation is expected to increase by 70% from 2016 levels to 3.40 billion tonnes in 2050 (The World Bank, 2019). However, solid waste management in Indonesia is still inadequate, collection rate is low and still not disposed in sanitary landfill with appropriate environmental and social standards (Handayani et al., 2018; The World Bank, 2019). Waste is only transported and placed in the final disposal without any further treatment (Anjani, 2011).

Waste causes environmental problems for its environmental pollution (both soil, water, and air pollution) and disrupts species in the ecosystem. Any household or industry produces waste materials such as human excreta, feces, garbage, grass, broken bottles and pots (ceramic and glass) etc (Tsiachta & Paraskevopoulos, 2017). It is also one of the factors rise climate change that causes flood disasters (Jambeck et al., 2015; Mohit & Sellu, 2013; Zommers & Singh, 2014). Plastic is also a commonly used material that made a huge social benefits. With the development of the world economy, the output of garbage around the world is also increasing rapidly, especially the use of plastic products is becoming more and more widespread, and disposable plastic are most commonly used in people's lives (Jiang et al., 2020). Plastic waste problems and adverse effects are especially serious and omnipresent in renowned countries (Kong et al., 2017)

According to the Ministry of Environment and Forestry, Indonesia generated 65.2 million tons of waste per year in 2016. In line with this, environmental and health issues caused by garbage and waste are on the rise. In general, the quality of river water in Indonesia is highly polluted. In 2018, 25.1 percent of villages had water pollution, and around 2.7 percent of villages had soil contamination. Garbage also contributes to flood events, which are becoming more common year after year; in 2016 and 2017, 1,805 floods occurred in Indonesia, killing 433 people (Badan Pusat Statistik, 2018).

The classic waste problem continues to be the source of a variety of issues and an effect on society's public health. Healthy life can arise when there is a situation that is in harmony with the world, but many people are not conscious of the importance of harmony with nature and the climate. The conduct that occurs in the society is that of burying or burning garbage. The situation is far from being in harmony with nature (Wulandari et al., 2017). Waste problem should immediately be resolved using proper management so that it will not disrupt urban development any further and urban resilience can be reduced (Jambeck et al., 2015).

Governments in developing nations face a variety of issues, including rising trash creation and a lack of understanding of suitable waste management standards (Widyarsana & Agustina, 2020). One of the biggest challenges is the unhealthy disposal of solid waste from human development and survival activities (Ayodeji, 2012). The Indonesian government's efforts in managing waste from the first source in household waste have been regulated by the policy of Presidential Regulation Number 97 of 2017 concerning Policies and National Strategies for Household Waste Management and Household-like Waste (Jastranas) based on the spirit of recycling (form 3R principles) (Asteria & Haryanto, 2021; Bahri et al., 2020; Desa et al., 2012).

Waste growth is much faster than population growth. Challenges that occur in every settlement in many cities in developing countries. As the result of the calculation of waste growth, it can be ascertained that it is faster than the population growth itself. Starting from the rate of population growth, changes in consumption patterns, to the lifestyle of our today's society seems out of control. So that it has an impact on the limited availability of land as a place for final waste processing. Regarding the waste problem, at least the government and private waste management systems are still inadequate. Where there is still a lack of regulatory tools that

support waste management, waste management to credible and professional solid waste service (Windraswara & Prihastuti, 2017). The problem of waste is inseparable from human development due to human progress and industrial progress itself, which increases the acceleration of the volume of waste. So that, in realizing the waste-free Indonesian Ministry of Environment and Forestry 2020 program, innovation is needed as an effort to build a good cooperation between the government and the community. Human awareness is the key where we can begin to restore environmental balance. Realizing environmental balance for human survival requires good cooperation from all levels of society. Thus, we should do the handling of waste by involving humans as a whole.

Nowadays more and more people are taking interest in environmental issues, as they have started to experience the ill-effects of ecological issues. Now environmental education is welcomed by all categories of people. It is an attempt to reorient education so that environmental competence is restored as one of its basic aims along with personal and social competence (Licy et al., 2013; Shobeiri et al., 2007). There is strong evidence which suggests that individual or group awareness and attitudes towards waste generation and management is critical in the effort to respond to the waste management challenge (Ayodeji, 2012).

People who know the environment and take responsibility for the environment are essential to waste management to improve the environment and ensure a sustainable quality of life (Nieblas-Ortiz et al., 2016; Ramadhan et al., 2019). Citizen participation is the key to success in urban waste management (Meng et al., 2019), but in Indonesia, waste sorting behavior at the household level is still very low (Sabarinah, 2017). Waste management can be carried out by various groups anywhere, including education. The school, students, and parents can also contribute to this. Good waste management practices activities were still low at both the school and home environment. Since students are seen as one of the key agent of change to work towards a more sustainable future, they should be engaged as early as possible and given a good quality array of sustainable learning to improve their knowledge on environmental problems, such as poor waste management. The society knowledge improvement would contribute to improve environmental awareness and a pro-environmental attitude (Niekerk, 2014).

The origin of garbage cannot be separated from humans themselves. Because after all, the presence of waste is caused by human activities and activities themselves, both individually and in groups. Thus, it is important to determine the steps for revitalizing waste processing at least on a household scale by involving educational institutions. This step is because education is an institution that acts as the end in realizing the fortress of public awareness. Educational institutions as well as their consistent duties in holding the educational axis, it is not an exaggeration if we want to re-strengthen the role of schools through their involvement with integration with the nearest waste bank.

There is an urgent need to streamline and sensitize young minds to the environmental problems and concerns. It is the education which makes human beings knowledgeable to environment and problems related to it. Students must have awareness about environmental problems so that they be aware of environmental problems and consider environmental issues related to their lives (Buldur & Omeroglu, 2018; Özden, 2008; Ramadhan et al., 2019) and can play their role very effectively in proper waste management (Tartiu, 2011). Developing environmental knowledge, environmental awareness, and environmental behavior change is important for students to engage in environmental protection (OKUR-BERBEROGLU et al., 2015; Ramadhan et al., 2019; Schultz et al., 2004). Hence this study was an attempt to find out

the effectiveness of household waste management based on the concept of waste alms carried out by students and parents of elementary school students in collaboration with the school.

B. Methods

This research is an effort to reduce the rate of waste distribution through the application of new habits for elementary school students. A strategy for managing inorganic waste at the household scale by maximizing the mechanisms of related educational institutions. The format of the assignment is by bringing the waste that is sorted by students with their families at home and then they deposit it to the school together with them leaving for school in the morning.

The relevant primary school unit educational institutions work closely with the nearest Waste Bank to jointly commit to suppressing the distribution of waste in the environment. Without putting aside the learning aspect, the assignment mechanism to bring the waste sorted by our students was adopted from several concepts of school children's savings. In this way, the mechanism for the movement of school children to donate waste cannot be separated from the banking mechanism. So that there we will continue to introduce the logical-economic consequences of what students deposit, of course it will have an economic impact. It's just that to further the value of money from waste, we introduce the concept of alms to students. This is just an advancement in environmental education for students.

This research uses a descriptive approach. Descriptive analysis involves tests that include basic statistics on the amount or quantities of something. The definition is generally in the form of statistics such as frequency or ratio, average and occasionally variability. Graphs and other graphic representations of the findings are also used (McMillan, 1996).

This study was conducted in Cirebon. The population of this study was 250 students in one of elementary school in Cirebon academic year 2017/2018. The samples of the data were students from Tukmudal village. The village was chosen because many students of the school were from that village. The samples of this study were 100 students which were from 1st – 5th grades. The details of the samples can be seen at Table 1.

Table 1. The details of samples each class.

Grade	Total Students
1	21
2	22
3	20
4	19
5	18
Total	100

Every Monday, the students hand over the trash that they had previously collected at their homes during the week. Inorganic waste is the type of waste that they collect. The activity lasts for eight weeks.

C. Findings and Discussion

This research is an effort to reduce the rate of waste distribution through the application of new habits for elementary school students. A strategy for managing inorganic waste at the household scale by maximizing the mechanisms of related educational institutions. The format of the assignment is by bringing the waste that is sorted by students with their families at home and then they deposit it to the school together with them leaving for school in the morning.

Based on the findings from the field, the amount of waste collected each week from each class. The waste collected was inorganic waste, waste that was no longer used and difficult to be decomposed. Inorganic waste buried in the soil can cause soil pollution because it is classified as a substance that is difficult to decompose and the waste will be buried in the soil for a long time, causing damage to the soil layer.

At the start of each week, students left the trash they had collected during the week from their homes. Garbage collection is carried out for eight weeks. The results of each class can be seen in the following table.

Table 1. The amount of waste deposited by each class

Grade	Week- (kg)								Total
	1	2	3	4	5	6	7	8	
1	1.47	1.38	1.42	1.5	1.48	1.45	1.49	1.51	
2	1.54	1.44	1.39	1.45	1.48	1.52	1.38	1.5	
3	1.4	1.37	1.42	1.42	1.38	1.36	1.4	1.36	
4	1.33	1.32	1.33	1.37	1.37	1.38	1.36	1.3	
5	1.26	1.25	1.27	1.31	1.24	1.23	1.32	1.33	
Total	7	6.76	6.83	7.05	6.95	6.94	6.95	7	55.48

The table above shows that the waste yield for eight weeks was 55.48 kg from 100 students. The number of 100 students represents the number of household. The collected waste then goes into the waste bank where it is sorted and processed according to each waste. Most of the waste collected was plastic waste, especially in the form of packaging. This type of waste was garbage that had a large enough volume of space so that during the process of asking for garbage, there was a mountain of garbage.

After 8 weeks of this activity, the average waste collected from each class is 6.93 kg / week.

The findings from the waste alms are then compared with the initial data in the form of the amount of waste in the Tukmudal village. Based on data obtained from the local population sector, it is known that the average amount of household waste in the village for 2 months is 318,6 kg. This number comes from 4594 household. It can be concluded that the amount of waste decreased by 2,17% through the waste alms which was carried out on these 100 students.

The number of repetitions of waste is not too large when compared to the total amount of waste. These results are due to using a small sample for the village scale which is densely populated. However, this program is carried out in many schools, so there will be significant changes in the amount of waste. Especially considering a large amount of inorganic waste in the form of plastic bottles which of course pollutes the soil because it is difficult to decompose. If the rubbish is collected and then deposited into a waste bank for processing, the waste alms concept will greatly assist in colouring the waste generated by households.

Waste alms concept is very helpful to the community in the fight against household waste. Students act as waste managers, acting as agents connecting their homes to waste banks. An efficient landfill system can improve solid waste management in cities by increasing the amount of waste that is eventually landfilled. The system will improve waste reduction and waste disposal within the city while extending the life of landfills (Budihardjo et al., 2019; Raharjo et al., 2017). In addition, when these systems work effectively, the amount of residual waste in cities can be reduced, the environment cleaner, and health indicators can be improved (Budihardjo et al., 2019; Ulhasanah & Goto, 2018).

In several developing countries, including Indonesia, waste management is still far from the standard category of health values, particularly those of a cultural nature (Chaerul et al., 2007; Singer et al., 2019). This can be seen in the way waste is handled in several Indonesian cities that continue to use the Kabul system, namely the transportation, collection, and disposal system. Officers transport waste from each house to TDS (Temporary Disposal Sites) on a daily basis, and then the waste is transported back to FDS (Final Disposal Sites) to be disposed of without further processing (Hasrul et al., 2021).

Garbage stores scientific facts and various interesting phenomena as potential assets for the development of student scientific behavior based on its cycle (Davis & Johnson, 2016). Starting with the biotic and abiotic diversity, the formation process within it, and the cycle that includes it, is a scientific fact that is very unfortunate because, on the one hand, its existence is available and very affordable around students, but on the other hand, it is hampered solely because of our lack of a positive perspective on the environment (Jones, 2020). To close this gap, a collective viewpoint is required. By paying attention to how waste continues to grow without regard for our ability to handle it (Yukalang et al., 2017), and educational activities continue to go hand in hand with the impulse of human life itself (Blair, 1952). As a result, we require an integrated waste management technique that is scientifically sound and aligned with national education goals (KLHK RI, 2020).

Handling domestic waste is still not done much (Abdel-Shafy & Mansour, 2018). Although the existence of household waste is so close and very affordable, there are still many parties who do not realize the potential in it (International Labour Organization, 2014), 2014). Most local governments simply collect, transport, and dispose of solid waste in landfills (Nizar et al., 2018). Currently, reduction, reuse and recycling (3R) activities are not optimally implemented (Raharjo et al., 2017).

In terms of elements, household waste is the most representative location for the stage of introducing children to various elements of natural resources, ranging from biological and non-biological elements that are freely available at home (Ferronato & Torretta, 2019). Finally, in terms of waste reuse, domestic waste contributes to the coffers of an environmentally-based populist economy (Fatimah et al., 2020; Granados Franco, 2020; Qu et al., 2019; Yunus, 2020). Our poor attitude toward environmental quality must be addressed immediately, and one of the ways to do so is through integrative activities with elementary school education unit institutions (Development, 2020). Education is a fundamental issue that falls under the collective responsibility of the strategic role holders, which in this case are the government, higher education institutions, schools, and families, as well as the community (Beatriz Pont, Deborah Nusche & PRINCIP, 2010).

D. Conclusion

As the results of the research that we have done for approximately 1 semester, although it cannot be said to be maximal, the results of collecting waste sorted by students of 100 families at least give us an idea where the massive distribution of waste will be suppressed if we apply the alms mechanism waste by students. By integrating between school education institutions and the nearest waste bank, it is not impossible that the quality of our surrounding environment will be even better.

The results showed that the waste alms concept only had a small impact on reducing household waste. This is because the samples taken were too small to see the overall results in large-scale densely populated settlements. This program will have a greater impact if implemented in many schools, from elementary school to high school. The implementation of this activity will enable collaboration between educational institutions and waste managers such as waste banks. And it would be even better if this program could involve local governments and develop policies that would be implemented in the school environment. If this program is implemented on the larger scale, then the idea of waste alms concept can be a solution to reduce inorganic waste, especially plastic waste.

The accommodation of the waste sorted by students as a ratio of 10 households is a glimmer of hope for us to continue the waste alms program with an assignment mechanism for depositing the waste sorted by students, which they then voluntarily donate to the school. The implementation of the waste alms movement along with the integration of educational institutions with surrounding waste banks clearly opens up many prospects for improvement in the community, of course. Good for the economic, environmental, cultural and even health aspects. In the future, this program could be applied to organic waste. Cooperation between official institutions such as schools is also very necessary for organic waste management, given that every household has to produce a lot of organic waste that is not managed properly. Basically, this waste management really requires the cooperation of many stakeholders, especially the community. After all, the community plays an important role in raising awareness of waste management. From home for a better environment.

References

- Abdel-Shafy, H. I., & Mansour, M. S. M. (2018). Solid waste issue: Sources, composition, disposal, recycling, and valorization. In *Egyptian Journal of Petroleum* (Vol. 27, Issue 4). <https://doi.org/10.1016/j.ejpe.2018.07.003>
- Anjani, A. (2011). *Household Waste Management in Indonesia* : 1–100.
- Asteria, D., & Haryanto, J. T. (2021). Empowerment key factors in shaping women's awareness of household waste management. *Global Journal of Environmental Science and Management*, 7(3). <https://doi.org/10.22034/GJESM.2021.03.01>
- Ayodeji, I. (2012). Waste Management Awareness, Knowledge and Practices of Secondary School Teachers in Ogun State, Nigeria. *Journal of Solid Waste Technology and Management*, 37(2), 221–234.
- Badan Pusat Statistik. (2018). Statistik Lingkungan Hidup Indonesia (SLHI) 2018. *Badan Pusat Statistik/BPS–Statistics Indonesia*, 1–43. <https://doi.org/3305001>
- Bahri, R., Rachmaniyah, R., & Darjati, D. (2020). Evaluation of Waste Management Facilities Through Land-Based Marine Litter Data: Case Study of Kenjeran Beach, Surabaya. *Journal of Environmental Science and Sustainable Development*, 3(1), 156–176. <https://doi.org/10.7454/jessd.v3i1.1040>
- Beatriz Pont, Deborah Nusche, H. M., & PRINCIP. (2010). Improving School Leadership. In *Improving School*

- Leadership* (Vol. 1). <https://doi.org/10.1787/9789264082915-et>
- Blair, R. (1952). Democracy, Art and Education. *Educational Forum*, 16(4), 431–435. <https://doi.org/10.1080/00131725209341529>
- Budihardjo, M. A., Wahyuningrum, I. F. S., Muhammad, F. I., & Pardede, R. (2019). The role of waste banks in the reduction of solid waste sent to landfill in Semarang, Central Java, Indonesia. *IOP Conference Series: Earth and Environmental Science*, 337(1). <https://doi.org/10.1088/1755-1315/337/1/012028>
- Buldur, A., & Omeroglu, E. (2018). An Examination of the Relationship between Pre-school Children's and Their Teachers' Attitudes and Awareness towards the Environment. *Journal of Education and Learning*, 7(2), 221. <https://doi.org/10.5539/jel.v7n2p221>
- Chaerul, M., Tanaka, M., & Shekdar, A. V. (2007). Municipal Solid Waste Management in Indonesia : Status and the Strategic Actions. *Journal of the Faculty Environmental Science and Technology, Okayama University*, 12(I), 41–49.
- Davis, K. G., & Johnson, C. D. (2016). Childhood Development and Behavior. *Pediatric Clinics of North America*, 63(5), i. [https://doi.org/10.1016/s0031-3955\(16\)41065-5](https://doi.org/10.1016/s0031-3955(16)41065-5)
- Desa, A., Kadir, N. B. A., & Yusooff, F. (2012). Waste Education and Awareness Strategy: Towards Solid Waste Management (SWM) Program at UKM. *Procedia - Social and Behavioral Sciences*, 59. <https://doi.org/10.1016/j.sbspro.2012.09.244>
- Development, R. (2020). National education policy 2020. *Economic and Political Weekly*, 55(31), 4L.
- Fatimah, Y. A., Govindan, K., Murniningsih, R., & Setiawan, A. (2020). Industry 4.0 based sustainable circular economy approach for smart waste management system to achieve sustainable development goals: A case study of Indonesia. *Journal of Cleaner Production*, 269, 122263. <https://doi.org/10.1016/j.jclepro.2020.122263>
- Ferronato, N., & Torretta, V. (2019). Waste mismanagement in developing countries: A review of global issues. *International Journal of Environmental Research and Public Health*, 16(6). <https://doi.org/10.3390/ijerph16061060>
- Granados Franco, E. (2020). Global Risks 2020: An Unsettled World. *World Economic Forum*, 8–17.
- Handayani, D., Gitaharie, B. Y., Yussac, R. N., & Rahmani, R. S. (2018). How does household characteristics influence their waste management? *E3S Web of Conferences*, 74, 1–5. <https://doi.org/10.1051/e3sconf/20187406005>
- Hasrul, Muh, . F., & Malik, I. (2021). Waste Management in Makassar City Based on Regional Regulation Number 4 Year 2011. *Journal of Advances in Education and Philosophy*, 5(4), 103–109. <https://doi.org/10.36348/jaep.2021.v05i04.003>
- International Labour Organization. (2014). *Tackling informality in e-waste management: The potential of cooperative enterprises*.
- Jambeck, J. R., Geyer, R., Wilcox, C., Siegler, T. R., Perryman, M., Andrady, A., Narayan, R., & Law, K. L. (2015). Entradas de residuos plásticos desde la tierra al océano. *Ciencia*, 347(6223), 768–771. <http://www.sciencemag.org/cgi/doi/10.1126/science.1260879%0Ahttps://www.sciencemag.org/lookup/doi/10.1126/science.1260352>
- Jiang, B., Yu, J., & Liu, Y. (2020). The Environmental Impact of Plastic Waste. *Journal of Environmental & Earth Sciences*, 2(2). <https://doi.org/10.30564/jees.v2i2.2340>
- Jones, A. M. (2020). An introduction to environmental biology. In *Environmental Biology* (pp. 18–19). <https://doi.org/10.4324/9780203137574-9>
- KLHK RI. (2020). *National Plastic Waste Reduction Strategic Actions for Indonesia*. 46. <https://wedocs.unep.org/bitstream/handle/20.500.11822/32898/NPWRSL.pdf?sequence=1&isAllowed=y>
- Kong, S. C., Wong, T. L., Yang, M., Chow, C. F., & Tse, K. H. (2017). Emerging practices in scholarship of learning and teaching in a digital era. *Emerging Practices in Scholarship of Learning and Teaching in a Digital Era*, 1–373. <https://doi.org/10.1007/978-981-10-3344-5>

- Licy, C. D., Vivek, R., Saritha, K., Anies, T. K., & Josphina, C. T. (2013). Awareness , Attitude and Practice of School Students towards Household Waste Management. *Journal of Environment*, 02(06).
- McMillan, J. H. (1996). Educational Research ; Fundamental for Research. In *HarperCollins College Publisher*.
- Meidiana, C., & Gamse, T. (2010). Development of waste management practices in Indonesia. *European Journal of Scientific Research*, 40(2), 199–210.
- Meng, X., Tan, X., Wang, Y., Wen, Z., Tao, Y., & Qian, Y. (2019). Investigation on decision-making mechanism of residents' household solid waste classification and recycling behaviors. *Resources, Conservation and Recycling*, 140. <https://doi.org/10.1016/j.resconrec.2018.09.021>
- Mohit, M. A., & Sellu, G. M. (2013). Mitigation of Climate Change Effects through Non-structural Flood Disaster Management in Pekan Town, Malaysia. *Procedia - Social and Behavioral Sciences*, 85, 564–573. <https://doi.org/10.1016/j.sbspro.2013.08.385>
- Nieblas-Ortiz, E. C., Arcos-Vega, J. L., & Sevilla-García, J. J. (2016). The Construction of an Environmental Management Model Based on Sustainability Indicators on a Higher Education Institution in Mexico. *Higher Education Studies*, 7(1), 15. <https://doi.org/10.5539/hes.v7n1p15>
- Niekerk, I. van. (2014). *Waste management behaviour : a case study of school children in Mpumalanga , South Africa*. May.
- Nizar, M., Munir, E., Munawar, E., & Irvan. (2018). Implementation of zero waste concept in waste management of Banda Aceh City. *Journal of Physics: Conference Series*, 1116(5). <https://doi.org/10.1088/1742-6596/1116/5/052045>
- OKUR-BERBEROGLU, E., OZDILEK, H. G., & YALCIN-OZDILEK, S. (2015). The Short Term Effectiveness of an Outdoor Environmental Education on Environmental Awareness and Sensitivity of In-service Teachers. *International Electronic Journal of Environmental Education*, 5(1), 1–19. <https://doi.org/10.18497/iejee-green.03640>
- Oliveira, M. L. S., Izquierdo, M., Querol, X., Lieberman, R. N., Saikia, B. K., & Silva, L. F. O. (2019). Nanoparticles from construction wastes: A problem to health and the environment. *Journal of Cleaner Production*, 219, 236–243. <https://doi.org/10.1016/j.jclepro.2019.02.096>
- Özden, M. (2008). Environmental awareness and attitudes of student teachers: An empirical research. *International Research in Geographical and Environmental Education*, 17(1), 40–55. <https://doi.org/10.2167/irgee227.0>
- Patel, V., & Meka, S. (2007). Forecasting of Municipal Solid Waste Generation for Medium Scale Towns Located in the State of Gujarat, India. In *International Journal of Innovative Research in Science, Engineering and Technology (An ISO (Vol. 3297, Issue 9)*. www.ijirset.com
- Qu, S., Guo, Y., Ma, Z., Chen, W. Q., Liu, J., Liu, G., Wang, Y., & Xu, M. (2019). Implications of China's foreign waste ban on the global circular economy. *Resources, Conservation and Recycling*, 144(October 2018), 252–255. <https://doi.org/10.1016/j.resconrec.2019.01.004>
- Raharjo, S., Matsumoto, T., Ihsan, T., Rachman, I., & Gustin, L. (2017). Community-based solid waste bank program for municipal solid waste management improvement in Indonesia: a case study of Padang city. *Journal of Material Cycles and Waste Management*, 19(1), 201–212. <https://doi.org/10.1007/s10163-015-0401-z>
- Ramadhan, S., Sukma, E., & Indriyani, V. (2019). Environmental education and disaster mitigation through language learning. *IOP Conference Series: Earth and Environmental Science*, 314(1). <https://doi.org/10.1088/1755-1315/314/1/012054>
- Sabarinah, Z. (2017). The Importance of Waste Management Knowledge to Encourage Household Waste-Sorting Behaviour in Indonesia. *International Journal of Waste Resources*, 07(04). <https://doi.org/10.4172/2252-5211.1000309>
- Schultz, P. W., Shriver, C., Tabanico, J. J., & Khazian, A. M. (2004). Implicit connections with nature. *Journal of Environmental Psychology*, 24(1), 31–42. [https://doi.org/10.1016/S0272-4944\(03\)00022-7](https://doi.org/10.1016/S0272-4944(03)00022-7)
- Shobeiri, S. M., Omidvar, B., & Prahallada, N. N. (2007). A comparative study of environmental awareness among secondary school students in Iran and India. *International Journal of Environmental Research*,

1(1).

- Singer, J., Kieu, K. T., & Pravitasari, A. E. (2019). *Solid Waste Management in Tourist Destinations in Developing Nations: Case Studies in Hoi An, Vietnam, and Puncak, Indonesia*. Springer Singapore. https://doi.org/10.1007/978-981-13-9173-6_11
- Tartiu, V. E. (2011). Evaluation of Attitudes & Knowledge Regarding Municipal Waste among Students. Case study: Bucharest Academy of Economic Studies. *Economia : Seria Management*, 14(1).
- The World Bank. (2019). *Solid Waste Management*. The World Bank Group. Solid Waste Management
- The World Bank. (2020). *The World Bank In Indonesia*. %3Cdiv class=%22csl-entry%22%3EThe World Bank. (n.d). %3Ci%3EThe World Bank In Indonesia%3C/i%3E. <https://www.worldbank.org/en/country/indonesia/overview#1.%3C/div%3E>
- Tsiachta, V., & Paraskevopoulos, S. (2017). *European Journal of Education Studies DESIGN AND ASSESSMENT OF AN INTEGRATED*. 74–98. <https://doi.org/10.5281/zenodo.1035405>
- Ulhasanah, N., & Goto, N. (2018). Assessment of citizens' environmental behavior toward municipal solid waste management for a better and appropriate system in Indonesia: a case study of Padang City. *Journal of Material Cycles and Waste Management*, 20(2), 1257–1272. <https://doi.org/10.1007/s10163-017-0691-4>
- Widyarsana, I. M. W., & Agustina, E. (2020). Waste Management Study In The Archipelago Tourism Area (Case Study: Nusa Penida District, Bali Province, Indonesia). *E3S Web of Conferences*, 148, 05002. <https://doi.org/10.1051/e3sconf/202014805002>
- Windraswara, R., & Prihastuti, D. A. B. (2017). ANALISIS POTENSI REDUKSI SAMPAH RUMAH TANGGA UNTUK PENINGKATAN KUALITAS KESEHATAN LINGKUNGAN. *Unnes Journal of Public Health*, 6(2). <https://doi.org/10.15294/ujph.v6i2.15360>
- Wulandari, D., Utomo, S. H., & Narmaditya, B. S. (2017). Waste bank: Waste management model in improving local economy. *International Journal of Energy Economics and Policy*, 7(3), 36–41.
- Yukalang, N., Clarke, B., & Ross, K. (2017). Barriers to effective municipal solid waste management in a rapidly urbanizing area in Thailand. *International Journal of Environmental Research and Public Health*, 14(9). <https://doi.org/10.3390/ijerph14091013>
- Yunus, I. (2020). *Waste Management in Improving Community Economy (Case Study of Central Mamuju)*. 456(Bicmst), 274–277. <https://doi.org/10.2991/assehr.k.201021.066>
- Zommers, Z., & Singh, A. (2014). Reducing disaster: Early warning systems for climate change. *Reducing Disaster: Early Warning Systems for Climate Change*, 9789401785, 1–387. <https://doi.org/10.1007/978-94-017-8598-3>