IOP Conference Series: Earth and Environmental Science

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12th Engineering International Conference (EIC 2023) in conjunction with the 3rd International Conference on Engineering, Science, and Technology (ICEST 2023) 20/09/2023 - 20/09/2023 Online

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Open all abstracts

Green Technology System

OPEN ACCESS 012011

Effect of H_2O_2 Catalyst on The Ozonation Process of Sugar Palm Fruit Flour (Arenga pinnata Merr.)

P A Handayani, J E Nethania, D H K Triaji, W D P Rengga and R Wulansarie

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The alternative solution of solid waste management in densely populated settlements in Penjaringan District, North Jakarta

E P Dickals, S Aphirta, S Moerdjoko, P Purwaningrum and N I Simangunsong

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Analysis of Traffic Accidents on Brigjen Sudiarto Road, Pedurungan District, Semarang City

Untoro Nugroho, Rini Kusumawardani, Arief Kusbiantoro and Muhammad Jordan Pratama

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Preface

PREFACE

The 12th EIC, organized by the Faculty of Engineering at Universitas Negeri Semarang, Indonesia, took place successfully on September 20th, 2023. Themed "Innovation and Application of Green Technology for Post-Pandemic Recovery," this year's annual conference adopted a digital format through Zoom meetings and YouTube streaming, similar to the previous year, for enhanced accessibility and operational efficiency.

The conference commenced with the launch by the Academic Vice Rector of Universitas Negeri Semarang, who provided a brief institutional overview. The subsequent plenary session featured four keynote speakers from Thailand, Malaysia, Singapore, and Indonesia, each delivering a 45-minute speech followed by a 15-minute Q&A period. The entire session, conducted via Zoom, was expertly facilitated by moderators from the Faculty of Engineering at UNNES, attracting over 900 enthusiastic participants from the opening ceremony to the conclusion of the plenary session.

Post-plenary, 88 presenters from Indonesia, Malaysia, Thailand, and Taiwan were allocated to nine Zoom meeting rooms based on manuscript content for parallel session presentations. Each room had a moderator overseeing 10-minute presentations and 5-minute Q&A sessions, fostering excellent discussions and promoting idea sharing among presenters and participants.

Deep gratitude was expressed to the committee, partners, keynote speakers, presenters, participants, and all contributors for the success of the virtual conference despite the challenges posed by the pandemic. Attendees actively engaged throughout the session without notable issues. The best presenter from each parallel room was acknowledged at the conclusion, recognizing their exceptional efforts. Certificates were distributed to all keynote speakers, presenters, and conference attendees, serving as recognition of their valuable contributions.

This document compiles the accepted manuscripts of the 69 presenters, presenting research findings, concepts, data, and applications related to green technology theory, design, development, implementation, testing, and evaluation. Various engineering-related subjects are explored, showcasing the diverse areas where green technology is applied.

1) Biodegradable Materials
2) Biomass Conversion
3) Biotechnology and Bioprocess
4) Disaster Resilience Infrastructure
5) Energy Efficiency
6) Energy Management System
7) Environmental Monitoring
8) Green Chemicals
9) Green Construction
10) Green Materials
11) Green Technology System
12) Green Transportation
13) Intelligent Control System
14) Natural Disaster Mitigation
15) Renewable and Sustainable Materials

16) Renewable Energy
17) Renewable Energy Power Generation
18) Renewable Resources
19) Sustainability in the Built Environment
20) Sustainable Architecture
21) Thermal Power Generation
22) Waste Treatment

The objective of this publication is to make a meaningful contribution to the progression of green technology. Additionally, we extend our wishes to all readers of these proceedings, hoping for both enjoyment and success in broadening their comprehension of engineering research. We appreciate the dedication and hard work of everyone involved and look forward to an even more successful conference in the coming year.

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Peer Review Statement

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Peer Review Statement

All papers published in this volume have been reviewed through processes administered by the Editors. Reviews were conducted by expert referees to the professional and scientific standards expected of a proceedings journal published by IOP Publishing.

- **Type of peer review:** Single Anonymous
- **Conference submission management system:** Morressier
- **Number of submissions received:** 95
- **Number of submissions sent for review:** 94
- **Number of submissions accepted:** 70
- **Acceptance Rate (Submissions Accepted / Submissions Received × 100):** 73.7
- **Average number of reviews per paper:** 1
- **Total number of reviewers involved:** 5
- **Contact person for queries:**
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PAPER • **OPEN ACCESS**

The alternative solution of solid waste management in densely populated settlements in Penjaringan District, North Jakarta

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The alternative solution of solid waste management in densely populated settlements in Penjaringan District, North Jakarta

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Abstract. This study aims to plan a holistic waste sanitation planning system in priority areas. The increase in population in Penjaringan District raises problems of sanitation, hygiene and has an impact on Public Health. In Penjaringan Sub-district area, there are still many people who dispose of solid waste carelessly, making it easier for the spread of disease by vectors of flies, rats and others that live in piles of garbage waste. This place also recorded the highest cases of diseases caused by bad environment, namely 31 cases of dengue fever and 1999 cases of diarrhea. The method used in this study is descriptive analytical with proportionate random sampling method. Questionnaires were distributed to 100 respondents. Solid waste data was collected using stratified random sampling method, and 30 samples were collected. It was found that 96% had indoor solid waste containers, but did not have containers in front of the respondents houses, resulting in the accumulation of garbage in front of residents houses. It is also known that the community's knowledge of solid waste or garbage is also still small. which is 36% of the respondents. meaning that there are still many who dispose of garbage carelessly. The priority location for the solid waste management plan is Neighborhood 10, Peniaringan Sub-District. This is in accordance with the results of community interviews and data support from the health service center that the most cases of diarrhea are in that RW, namely 4 respondents. The best solution that can be done for this area is to make eighteen units o communal waste containers with a capacity of 240 liters and add unit of motorized carts. It is expected that the spread of environment-based diseases will also decrease.
Keywords. Sanitation Planning, Solid Waste, Environmental Health, Penjaringan District

1. Introduction

According to UN-Habitat, around 1 billion humans live in areas of deprived living conditions lacking basic necessities of life, where inhabitants and, in particular, children (being more vulnerable than adults) are faced with unhealthy living environments [1].

People living in the area with high poverty rate are generally vulnerable to a range of hazards arising from poverty, poortransportation services, poor sewage services, poor water services and poor electricity services, as wellas high crime rates and dangerous locations. These factors are determinants of the health conditions of people living in these areas such as malnutrition and poor mental health [2]. Even though this area with high poverty rates relatively smaller. This area needs more attention. [3]

Penjaringan Sub-district is an area with a high population density, reaching 10,014.99 people/km^2, which has 5570 units of unorganized buildings and 9592 families living in the area with high poverty rates [4]. The residential environment in this area is polluted due to the disposal of community solid waste directly

into drainage and roads. The same happens with the liquid waste from the surrounding residents, especially Black Water due to the disposal of their latrines directly into the drainage, which causes the drainage channels in this area to be in poor condition so that the environment has an unpleasant odor.

As a result, the drainage channels in this area are contaminated with garbage and black water, which poses a potential threat to public health as flies can spread diseases after landing on the waste discharged by residents. In addition, there are residential areas under the Jakarta Inner Ring Road Toll Road that are unsuitable due to the lack of garbage containers, which will result in increasing the risk of spreading diseases through flies.

Slum public health is critical for a number of reasons. Nearly 1 billion people live in slums. These slums are not going away. Slum health will determine urban and national health indicators. Slums are where some people live. In slums there are unfair disparities in health. All data consistently show that health in slums is much worse than in other urban areas. These visible inequalities. as develoning economies continue to grow, have implications for political stability and increased radicalization of youth. Fifth, there are untapped potential impacts [5].

Therefore, it is necessary to plan better sanitation infrastructure in Penjaringan Sub-district so that the environment becomes healthier for the community. Sanitation itself involves efforts to improve environmental quality through effective management of drinking water, wastewater and solid waste. Sanitation also involves efforts to improve clean and healthy living behavior in the community [6]. community. Steps that can be taken to improve environmental sanitation conditions are building affordable and accessible sanitation facilities, promoting clean and healthy living behaviors, and providing education on the importance of environmental sanitation [6]. Sanitation is one of the sixth Sustainable Development Goals (SDG's) and several targets by 2030 are expected to achieve access to adequate and equitable sanitation and hygiene for all communities and prohibit open defecation, and support local community participation in improving water and sanitation management. Sanitation is defined as the safe management of human excretions. including safe covered treatment. disposal, and hygiene-related practices [8].

Waste management itself is a structured, comprehensive, and sustainable process that includes efforts to reduce and handle waste [9].The purpose of this research is to determine the solid waste management in the Penjaringan Sub-District so this Sub-District could be free from disease that caused from piles of garbage waste.

2. Methods

The initial step taken for data collection is literature study, then proceed with data collection. The data collected in this planning is primary data collection and secondary data. Primary data obtained in the form of data on waste sources. waste generation, waste composition. and community characteristics.

This primary data is obtained from field surveys, sampling and filling out questionnaires. Secondary data in the form of Penjaringan Sub-district maps, demographic data, general description, sanitation data and public health data. After data collection, an evaluation of existing conditions is carried out. After that, the evaluation data will be analyzed and technical planning will be carried out. The last step is to make conclusions and suggestions.

The first step taken in data collection is to determine the distribution of questionnaires, after which sampling the waste. The questionnaire distribution was carried out using the simple random sampling method using the Slovin formula because this method is the right method for the planning location because the planning area has a homogeneous sample.

The area to be selected is a densely populated area. Therefore, the selected area of Penjaringan District is Penjaringan sub-district, which has 18 neighborhood and is the area with the highest population density compared to other villages, which is 28,626.81 people/km^2. The slovin method uses a precision of 10% due to time constraints, so 100 respondents were obtained. Furthermore, waste sampling was carried out. This waste sample uses the stratified random sampling method. This method is a research sampling method by determining the grouping of population members in certain level groups such as high, medium, and low levels. The waste sample obtained is 30 samples.

3. Results and discussions

3.1 Existing condition

Environmental conditions in the Penjaringan Urban Village area have a lot of garbage and liquid waste that is disposed of carelessly so that the area has an unpleasant odor. This can be caused by the lack of public awareness of waste and its consequences

The accumulation of garbage will trigger health problems in the community in the area because a lot of garbage accumulates in front of the house. This can result in a crowd of flies that come from garbage will enter residents' homes and stick to food. The flies not only stick to the garbage on the side of the road but also the garbage in the puddle, while the puddle has also been contaminated by black water liquid waste from residents' homes.

The waste collection and transportation process in this Kelurahan depends on RW or apartment/flat house managers. Waste disposed of by residents in apartments or flats is directly disposed of at TPST Bantargebang. The transportation of waste in residential areas is not directly disposed of to TPST Bantargebang, but the waste disposed of by residents will be disposed of first in front of the residents' homes before the motorized carts come to pick up the waste. After the waste is transported by motorized carts, the waste is first deposited at the Muara Baru Dipo TPS. After that, the garbage is transported by garbage trucks to be taken to Bantargebang TPST

3.2 Analysis

In Figure I, it can be seen that 89 respondents did not contract any environmentally-induced diseases this year. There were 27 respondents who contracted diarrhea this year. Many cases of diarrhea in Penjaringan Village were infected because of the large amount of garbage placed in front of residents' homes which was then transported which resulted in many flies that landed on the garbage and then landed back on residents' food, while for dengue disease there were 5 respondents who contracted dengue cases this year caused by stagnant water and 2 respondents contracted Typhus disease. Accumulated garbage can cause flies to land on the food. This can cause diarrhea. In addition, another condition is that there are puddles of water coming from drainage channels that are clogged with garbage, which can cause dengue mosquitoes to emerge. With these unhygienic environmental conditions, it can also cause typhus.

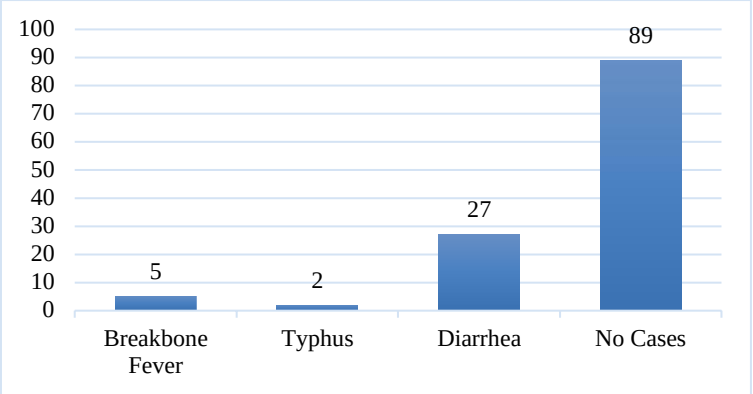

Figure 1. Diseases caused by the environment.

According to BPS, community income is divided into 4, namely, low income with an average of <Rp. 1,500,000. Medium income of Rp. 1,500,000 - Rp. 2,500,000. High income of Rp. 2,500,000 - Rp.3,500,000 and very high income of > Rp. 3,500,000. In Figure 2, it can be seen that as many as 12% of people in Penjaringan Village have incomes above R. 3,500,000. As many as 25% of people have an income of Rp. 2,500,000 - R. 3,500,000. Most of the people of Penjaringan Village have an income of

Rp. 1,500,000 - R. 2,500,000, namely 44% of the total number of people and as many as 19% of people have an income of <Rp. 1,500,000.

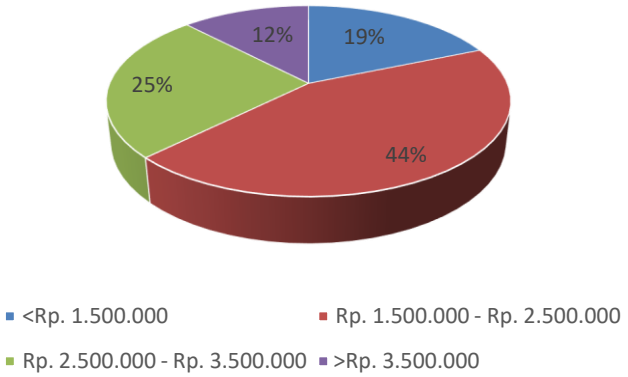

Figure 2. Community income.

3.3 Regional planning solutions

After analyzing the results of questionnaire data along with location surveys and secondary data analysis, the next thing to do is to find the right solution for the Penjaringan Village area, Penjaringan District, North Jakarta.

The community of RW 10 Penjaringan Village is still not aware of waste management, because their current waste management isn't optimal. This can be triggered by the absence of garbage containers in their yard, which causes people to dispose of their garbage carelessly. Therefore, the solution that will be planned to reduce waste and so that the community has a clean environmental condition is planned to optimize waste management by planning a closed communal waste container and waste ritation to reduce the condition of the poor sanitation environment.

3.4 Waste generation

Based on the sampling results from the field, waste disposed of from people's homes (domestic waste is divided into 3 (three), namely, waste from permanent housing, waste from semi-permanent housing. and waste from non-permanent housing [10]. The following is the total waste generation from 3 (three) types of houses, The waste generation rate generated by permanent housing is 0.54 kg/person/day. Semipermanent housing is 0.53 kg/person/day. Non-permanent housing is 0.43 kg/person/day. With an average waste generation rate of 0.50 kg/person/day and an average waste volume of 0.50 kg/person/day.

3.5 Planning

Based on the results of the analysis and survey of existing conditions, it is planned to improve existing waste management which is useful for reducing the spread of disease. Waste management is a structured. comprehensive, and sustainable process that includes efforts to reduce and handle waste [8]. The improvement is carried out by planning a 240 Liter communal trash can due to the limited availability of space and changing the collection pattern from an indirect individual pattern to an indirect communal pattern, so that it is hoped that environmental conditions will become hygienic or feasible. Based on the results of the calculation, it is necessary to require 18 units of containers with a capacity of 240 liters that need to be collected every day. The location of the waste storage unit can be seen in Figure 3 and requires 3 units of motorized carts so that rotation is carried out once per day. Then the motorized cart unit needs to be added as much as I unit of 1500 liters so that the waste can be collected thoroughly. The waste collection route can be seen in Figure 4, Figure 5, and Figure 6.

Figure 3. Location of container units.

Figure 4. Route collection 1.

Figure 5. Route collection 2.

Figure 6. Route collection 2.

4. Conclusion

The conclusion of solid waste management in Penjaringan District is that the large amount of waste in the kW IU area will result in a large crowd of flies which will result in a decrease in public health conditions in the area. This can be handled by optimizing waste management by planning 18 units of waste containers and adding unit of motorized carts

References

[1] UN-Habitat. Slums Almanac 2016 Tracking Improvement in the Lives of Slum Dwellers; UN-Habitat: Nairobi, Kenya
[2] Mberu B U, Haregu T N, Kyobutungi C and Ezeh A C 2016 Health and health-related indicators in slum, rural, and urban communities: A comparative analysis *Global Health Action* **9**(1)
[3] Saleh Arifin and Lutfi Basit 2016 Pengembangan Model Corporate Social Responsibility (CSR) Agincourt Resources Dalam Pemberdayaan Masyarakat Miskin di Kabupaten Tapanuli Selatan Propinsi Sumatera Utara *Prosiding SNHP3M Untar* **3**(1)
[4] Kecamatan Penjaringan Dalam Angka 2021
[5] Lilford R, Kyobutungi C, Ndugwa R, Sartori J, Watson S I, Sliuzas R, Kuffer M, Hofer T, Porto De Albuquerque J and Ezeh A 2019 Because space matters: Conceptual framework to help distinguish slum from non-slum urban areas *BMJ Global Health* **4**(2)
[6] Ahmad F and Yulianti Y 2019 Perilaku masyarakat dalam meningkakan sanitasi lingkungan di wilayah permukiman kota *Jurnal Ilmiah Mahasiswa Bidang Teknik Sipil* **4**(2) 136-146
[7] Sari W P 2017 Pengaruh sanitasi lingkungan terhadap kesehatan masyarakat *Jurnal Kesehatan Masyarakat* **5**(1) 57-66
[8] Showkat N 2016 Coverage of Sanitation Issues in India *SAGE Open* **6**(4) 1–3
[9] PP Nomor 81 Tahun 2012 Tentang Pengelolaan Sampah Rumah Tangga Dan Sampah Sejenis Sampah Rumah Tangga
[10] Badan Standarisasi Nasional 1994 *SNI-19-3964-1994 Tentang Metode pengambilan dan pengukuran contoh timbulan dan komposisi sampah perkotaan*.