Identifying the Green Supply Chain for Environmental Sanitation Management in Banda Aceh, Indonesia

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Abstract. **This study aims to identify the effect of green supply chain management on environmental sanitation management in Banda Aceh. It caused by a high level of diversity and population density and circular migration in these city. This quantitative study conducted to 3 districts along case, namely densest, most diverse population and circular migration characteristics. A total of 400 respondents spreading in 3 districts were participated in this study. The result of the study shows that the behavior of Banda Aceh people is categorized as standard. Furthermore, the awareness level of Banda Aceh people on environmental sanitation management is categorized as good. Meanwhile, Green supply chain strategy and people awareness are caused by increased population growth due to massive urbanization and high birth rate. However, the existence of public facilities (such as garbage dump, etc.) and people's awareness about the environment is still lacking. Environmental sanitation management still needs the government to play a key role in improving infrastructures such as green supply chain for garbage dump, clean water tank, waste treatment facilities for residual waste, organic and inorganic waste as well as continuous socialization related to environmental sanitation management issues that can influence behavioral change and emerge high awareness from the community towards a healthier life in accordance with the objectives of sustainable development goals.**

Keywords— *Green Supply Chain Management, Environmental Sanitation, Waste*

1. Introduction

The green supply chain is one of the best ways to protect the environment and improve the current state of the planet. In recent years, supply chain management has become more than just an area of research. By adapting the field of research and various theories, it is involved in engineering, sales, marketing, strategic management, logistics and economics, in other words, the green supply chain has become a complex and, of course, practical process. Production with minimal waste and environmental damage has become one of the serious goals of industries, which has led to the formation of the concept of green supply chain as a concept that elements of sustainability and a combination of global environmental thinking and upstream and downstream members of a management community [1-5].

The issues of environmental sanitation management have been a global discussion since then until now [6]. This is caused by the desire and efforts of the world society to achieve a healthy life, as stated in the objectives of sustainable development goals (SDGs). In many opinions, developing and maintaining the environment to be clean and comfortable for the residents to carry out their lives are the hope of all parties [7]. Environmental sanitation can be interpreted as an activity that aims to improve and maintain the so-called standard environmental conditions that become the place for people to live. Besides, environmental sanitation is also a circumstance that encompasses the means of waste disposal, water supply, and the likes ([8]. Improvement of sanitation facilities and sewerage has an impact that

can yield significant benefits for human's health and quality of life [9].

Widespread sanitation management is still one of the main focus issues for world society. Poor environmental sanitation can be a source of various diseases that can disturb human's health [10]. One of the diseases caused by poor sanitation in several carried out studies is diarrheal disease whose primary source is poor sanitation [11-17]. Data from Aceh's Central Bureau of Statistics revealed that during 2015-2018 approximately 339,518 diarrheal diseases occurred with the case number kept fluctuating each year. Furthermore, as for Banda Aceh, the incidents of diarrheal diseases during 2015-2018 reached a total of 13,374 cases. Moreover, the transmission of infectious diseases including those already mentioned above, cholera, typhus, hepatitis, polio, cryptosporidiosis, ascariasis and schistosomiasis are caused by poor sanitation; such as open defecation practice and households waste. [18, 19].

The management of environmental sanitation in companies is closely related to their performance. This is in accordance with what was conveyed by Sari, who stated that environmental diseases in developing countries are mostly caused by poor supply chain system. To maintain a healthy environment and efficient business, it needs to put attention to proper green supply chain measures. The measures taken here is to stop open defecation practice, clean toilet area, dispose trashes and the waste that comes from children in place [20]. Several studies remarked that continuous behavior of poor sanitation might lead to the risk of stunting in early childhood [21]. A study also revealed that littering children's waste amidst the community environment was significantly related to the disruption of children's growth [22].

The environmental behavior and habitude can be directly influenced by certain attitudes and actions within a society [23]. This is in accordance with the results of several studies that show a significant correlation between social norms and the population's behavior in recycling waste [24]. In addition, improper disposal habits must be stopped and habitual behavior must be changed for the better [25]. Human's behavior and environment existence have a crucial relationship and role in creating better health [26]. In this matter, environmental problems cannot be separated from environmental awareness, one's values and attitude towards the environment [27].

As previously known, behavior and the environment have a significant influence on people's health and well-being. This relationship is also related to the variable of population density as conveyed by Malthus; while the population number is increasing, a decrease in natural resources and the area used as a place of residence for the community will happen which eventually causes unstable environmental conditions [28]. Environmental crisis is also caused by population growth [29]. Judging from the level of population density in Banda Aceh, it was 4,321 people per km2 in 2018. Of the 9 sub-districts in Banda Aceh, Baiturrahman District is the area with the highest population density, reaching a number of 8,250 people per km2. Meanwhile, the area that has the lowest population density is Kutaraja sub-district with 2,617 people per km2.

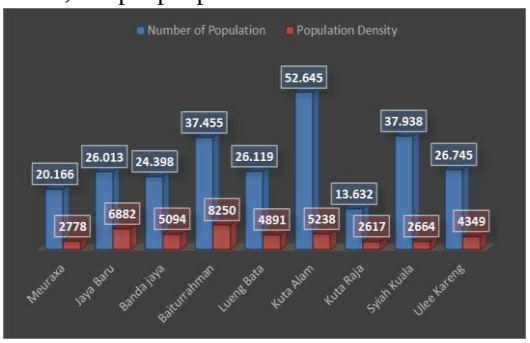

Figure 1. Number of Population and Population density

Every year the number of population in Banda Aceh is constantly increasing. This could inflict the escalation of population density level in the area of Banda Aceh. Furthermore, Banda Aceh is a fancy place for people to purse their studies; thus, every year, tens of thousands newcomers arrive in Banda Aceh. An expansion in urban population will make an impact on increasing waste generated to the environment, including water bodies such as rivers when the river management system is poor [30]. An accretion of poorly managed household waste will endanger the environment, destroy the urban landscape and transmit disease epidemic that threaten human's health [31, 32].

Rivers located in urban areas often severely suffering from the community's activities that directly dump garbage into the rivers [33]. As well as in Banda Aceh, the amount of waste produced from year to year keeps increasing. This is caused by the growing population in Banda Aceh due to urbanization of people from various regions with different reasons—from job seeking to pursuing

higher education in college. This is in accordance with the results of a research which stated that abrupt growth and urbanization would result in rapid river pollution [34]. River pollution is mostly caused by the rubbish that spread throughout Banda Aceh. This is consistent with the results of a research which showed that waste management is still the biggest challenge for the government of Banda Aceh [35]. These challenges include the relatively low level of public awareness and lack of waste collection facilities [36].

Figure 2. Waste Stream in Banda Aceh 2015-2018

Based on the provided table above, the garbage pile in Banda Aceh has increased significantly from year to year. In 2018, there was approximately 230 tons of garbage per day produced by the people of Banda Aceh. A study revealed that waste management in Banda Aceh is still inadequate and requires further processing method. The waste is sent to a landfill (TPA) in Kampung JaWA. The TPA in Kampung Jawa owned by the Aceh government currently in a state of excess capacity, forcing the waste from Banda Aceh to be partially sent to a landfill in Aceh Besar [37]. Waste management has become one of the crucial functions to support the community welfare because one's lives are inseparable from lifestyle, health and environmental conditions in their daily lives. By following the problem statement previously, this study aims to identify the distribution of behavior and public awareness of environmental sanitation management among society in Banda Aceh, Indonesia.

Preventing and controlling industrial environmental pollution can help improve the production process, increase profitability (in the long run), and achieve global markets that have recently become very sensitive to the environment. This study examines the benefits of strategic supply chain participation and environmental green supply chain longevity in the manufacturing industry.

2. Materials And Methods

Study Area

This study was conducted in Banda Aceh, the capital city of Aceh Province which consists of 9 sub-districts (Figure 1). This study selected three distributed sub districts in Banda Aceh as a sample with certain criteria starting from the densest sub-district, in this case Baiturrahman sub-district; the most populous sub-district which is Kuta Alam sub-district and also sub-district with the characteristics of students cluster area namely Syiah Kuala sub-district.

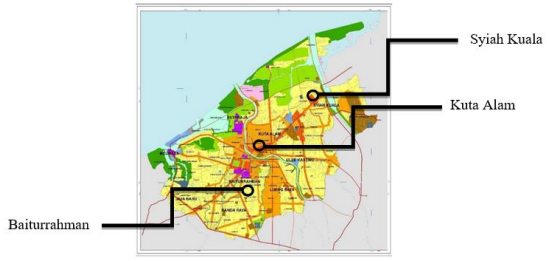

Figure 3. Research sites

Astronomically, Banda Aceh is located between 05016'15''– 05036'16" North Latitude and 95016'15"– 95022'35" East Longitude and is on the northern hemisphere of the Earth. Based on its geographical location, Banda Aceh is at the northern tip of the island of Sumatra as well as the westernmost region of Sumatra Island. The land surface in the city of Banda Aceh averages at an altitude of 0.80 meters above sea level (BPS, 2019).

Sample

The sample in this study consisted of the people of Banda Aceh spread across 3 districts which had been selected as the research sites. The sample in this study was peoples ranging from 20 to 49 years old, amounting to 400 people with following details: 171 people from Kuta Alam sub-district, 128 people from Syiah Kuala sub-district, and 101 people from Baiturrahman sub-districts. Determination of the samples number is based on the population of each district (Table 1)

Table 1. Demography of Research Sample

Population Demographics	Total	Percentages
Gender		
Man	176	44
Woman	224	56
Age Range		
20-24	70	17
25-29	43	11
30-34	97	24
35-40	115	29
41-44	35	9
45-49	40	10
Location		
Kuta Alam Sub-districts	171	43
Baiturrahman Sub-districts	128	32
Syiah Kuala Sub-districts	101	25

Data Analysis

This study was conducted with quantitative methodology survey using a questionnaire. Data were collected over a 2-month period from September to October 2019 using a Likert scalar questionnaire. Likert scale is a scale that frequently used to measure the attitudes, opinions, and perceptions of a person or group of people about an occurred symptom or phenomenon, especially in the field of green supply chain. The Likert scalar has 5 alternative choices which are 5 = strongly agree, 4 = agree, 3 = neutral, 2 = disagree, 1 = strongly disagree [38]. The questionnaire used in this study consists of 3 parts; the first section regarding sample characteristics, the second section about green supply chain towards environmental sanitation and the third section concerning community awareness on environmental sanitation. The collected data was validated and calculated manually based on the score given by the sample from each question. The data was analyzed using the SPSS program version 22 with descriptive statistics (frequency tables) generated to assess people's behavior and awareness on environmental sanitation management.

3. Results and Discussion

In today's world, Green Supply Chain in leading companies strive to create harmony, desirability and environmental satisfaction across the supply chain, from green logistics and improving its environmental performance across the chain as a strategic advantage to sustainable competitive advantage. Benefit and base your goals on three important themes: green design (product), green production (process), and product recycling. In the Green Supply Chain, each member provides scientific and technical information and support for other components in order to achieve environmental goals. This partnership ensures that the supply chain achieves its goals such as capitalization, customer satisfaction, and health benefits. By adding the word green, the management of the green supply chain, which refers to human procurement, green production, green distribution, and reverse logistics, is introduced. The green supply chain has new dimensions: green design, green procurement, green sourcing, green production, green packaging, green marketing, green distribution, green shopping and reverse logistics, as a new approach to reducing waste to a minimum. It is used to deliver pollution, save energy, protect natural resources and reduce the emission of harmful gases. Many organizations and industries have developed a culture of environmental awareness and, through social media such as conferences and seminars, have made environmentalists aware of environmental issues and the target market. Therefore, the influence of various factors and variables on the optimization of the human supply chain in order to observe its environmental issues creates a kind of unique competitive advantage. On the other hand, just as most individuals, both private and public, are committed to such issues, there are organizations that are less interested in doing so. This research was conducted in Banda Aceh which included three districts as the sample of the study, namely Baiturrahman, Kuta Alam and Syiah Kuala sub-district. The numbers of sample were 400 people who came from those three

mentioned districts, consisted of 171 people from Kuta Alam, 128 people from Syiah Kuala and 101 people from Baiturrahman.

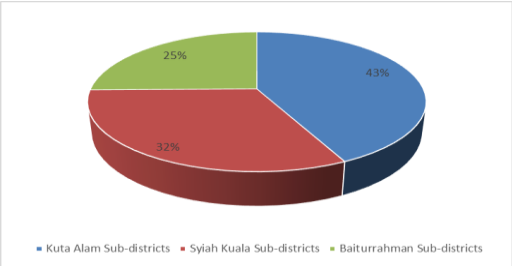

Figure 4. Percentage of community based sub-district

According to the analysis results, the people of Banda Aceh behavior level towards environmental sanitation management reached an average score of 3.27. It indicates that Banda Aceh community behavior is in a fair category. As for the community awareness variable of environmental sanitation management, it reached an average score of 3.44, making the public level of awareness in a good category.

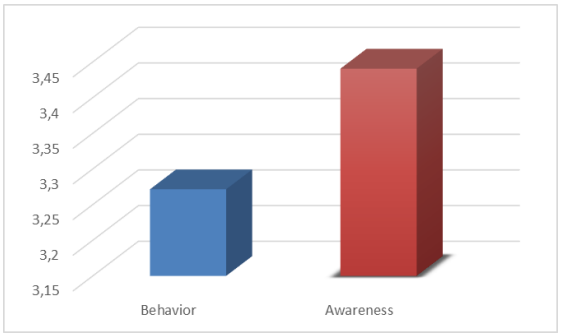

Figure 5. Average Behavior and public awareness

Green Supply Chain Management in Environmental Sanitation

The research findings confirm the main hypotheses that there is a statistically significant relationship between green supply chain management and corporate performance. Also among the five dimensions of green supply chain management, including intra-organizational management, ecological design, customer cooperation, return on investment. And green buying and corporate performance are also statistically significant. Based on the results of descriptive statistical analysis of community behavior in environmental sanitation management in Banda Aceh, the outcome of the processed data using SPSS can be seen in the table 2.

Table 2. Descriptive Statistics Outcomes of Community Behavior Variables (N=400)

	Range	Min	Max	Mean	Std. Deviation	Variance
Behavior	3.05	1.90	495	3.271	0.542	0294

Table 2 shows that the average value (mean) of community behavior in Banda Aceh in terms of environmental sanitation management amounted to 3.27. It can be seen that the highest score is 4.95 while the lowest score is 1.90. Moreover, the outcomes also show that the range score is 3.05, the deviation standard is 0.54 and the variance is 0.294. Furthermore, to observe the data distribution from the research sample, the number of classes will be counted using the formula of 1 + 3.3 log n, where n is the number of research samples. From the calculation it is known that n = 400 making the obtained classes 1 + 3.3 log 400 = 9.58 then rounded up to 9 class intervals. Then the data range is calculated using a maximum-minimum value, making the obtained data is 4.95-1.90 = 3.05. By knowing the range of data, the class lengths of 0.33 are obtained. The following Figure is the frequency distribution of the green supply chain in environmental management.

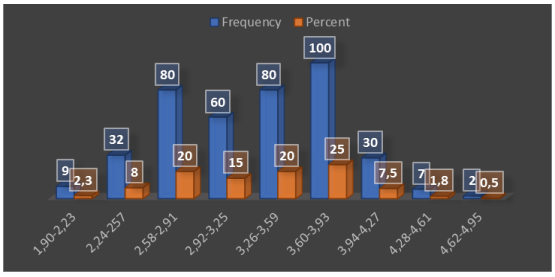

Figure 6. Frequency distribution and percentage of class intervals

Based on Figure 3, the distribution of respondents at intervals of 3.60-3.93 is as many as 100 people (25%), intervals of 3.26-3.59 and 2.58-2.91 is as many as 80 people each (20%), intervals of 2.92-3.25 is as many as 60 people (15%), intervals of 2.24-2.57 is as many as 32 people (8%), intervals of 3.94-4.27 is as many as 30 people (7.5%), intervals of 1.90-2.23 is as many as 9 people

(2.3%), intervals of 4.28-4.61 is as many as 7 people (1.8%) and lastly intervals of 4.62 -4.95 is as many as 2 people (0.5%). Furthermore, the determination of data trends from green supply chain in environmental sanitation management refers to the average calculated score. To categorize the response trends of respondents into the scale, the following formulation can be used:

Minimum Score = 1
Maximum Score = 5
Scale width =

Table 3. Tendency Scale Category

Interval	Criteria
1.00 – 1.80	Very Poor/Very Low
1.81 – 2.60	Poor/Low
2.61 – 3.40	Fair/Medium
3.41 – 4.20	Good/High
4.21 – 5.00	Very Good/Very High

Source : [19]

Based on the results of data research analysis, the following is the distribution of community behavior trends in environmental sanitation management in Banda Aceh.

Table 4. Distribution of trends in community behavior

No.	Score	Frequency	Percentage	Category
1	1.00 – 1.80	0	0 %	Very Poor/Very Low
2	1.81 – 2.60	49	12.30%	Poor/Low
3	2.61 – 3.40	167	41.80%	Fair/Medium
4	3.41 – 4.20	173	43.30%	Good/High
5	4.21 – 5.00	11	2.80%	Very Good/Very High
Total		400	100,0 %	

Based on table 4, it can be concluded that the green supply chain in environmental sanitation management in Banda Aceh is in the Fair/Medium category. The distribution of data are as follows: as many as 167 people are in the Fair/Medium category, as many as 173 people are in the Good/High category, as many as 49 people are in the Poor/Low category and 11 people are in the Very Good/Very High category.

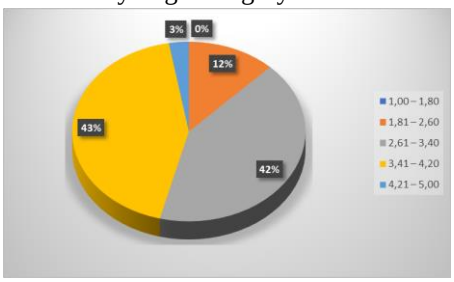

Figure 7. Frequency distribution of the green supply chain percentage

Based on the results of the study, it can be stated that the behavior of Banda Aceh community in terms of environmental sanitation management is in fair and good category. The diffused samples in this study represented the people of Banda Aceh in general because the center area of the study includes Baiturrahman which was selected due to being the most populous sub-districts in Banda Aceh. Kuta Alam as the largest population sub-district and Syiah Kuala as the sub-district of students cluster area. These results associated with the environmental conditions of the research study sites. Most of the respondents in the research are those who are urbanizing to Banda Aceh in large numbers, causing the available location in Banda Aceh to narrow and the public facilities is remarkably limited. As a result, environmental sanitation management in Banda Aceh has been disrupted, resulting in poor environmental sanitation management. This is consistent with [9] which stated that poor behavior of community sanitation is caused by inadequate infrastructure in environmental sanitation management. Moreover, another causative factor is urbanization, which is in accordance with the research that stated high volume of urbanization will cause various problems in social, housing, employment, welfare, infrastructure and also environmental problems.

In addition, poor behavior of community in environmental sanitation management is also caused by a lack of knowledge from the community regarding environmental conditions. One's level of knowledge will determine the condition of his or her surrounding environment. This is in accordance with studies that stated that there is a significant relationship between knowledge on sanitation and one's level of education. Because formal education provides basic knowledge for a better understanding of the environment. This is also supported by [4] and strengthened by [7] who stated that attitude is the response learned by someone in this matter, in the world of education. So education can be a tool to change someone's behavior in an event or action.

Furthermore, poor environmental sanitation behavior in an area is also very much determined by the ownership of an area or building used as a residence of the community. This is what happens in Banda Aceh, where majority of the community is still living in a rent house. So does in Syiah Kuala sub-district, where most of the area is occupied by students continuing their education at tertiary institutions. They rent boarding house or residence near the campus, which some research found that the environmental sanitation around the campus is poor. This is caused by the students behavior who are still littering around their residential place, assuming that the house is not their own. So the environmental conditions around the campus are not good. This is in consistent [14], who contended that the majority of the community feels that living in a rental place is disturbing because of others behavior around them who do not pay attention to environmental sanitation management.

Based on the results of descriptive statistical analysis towards public awareness on the management of environmental sanitation in Banda Aceh, the results of the data processed using the SPSS can be seen from the table 5.

Table 5. Results of descriptive statistics on public awareness variables (400)

	Range	Min	Max	Mean	Std. Deviation	Variance
Awareness	2.8	2.0	4.8	3.441	0.466	0.217

Table 5 displays that the average value (mean) of community awareness in Banda Aceh on environmental sanitation management is amounting to 3.441. The results also show that the highest value is 4.8 while the lowest is 2.0. Furthermore, the results also show that the range value is 2.8 with the standard deviation of 0.466 and the variance of 0.217. The data range was calculated with a maximum-minimum value, and a score of 4.80-2.0 = 2.8 was obtained. By knowing the range of the data, it can be obtained that the class length is 0.31. The following Figure shows the frequency distribution of green supply chain on environmental management.

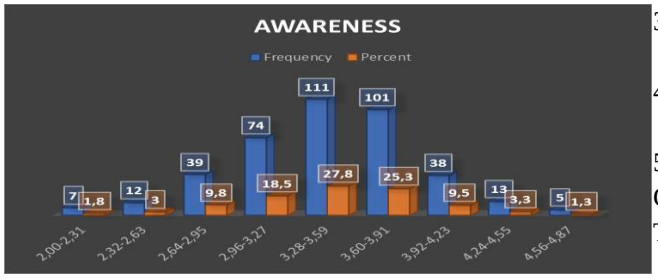

Figure 8. Frequency Distribution and Class Percentage Interval

In this way, carrying out green supply chain management activities will improve the performance of companies in economic, environmental and operational aspects. Therefore, companies that combine and integrate raw materials in product design, selection and supply of raw materials, production and manufacturing, distribution and transfer processes, delivery to the customer and recycling management activities and supply chain management activities with environmental requirements. Based on the results of research data analysis, the following is the distribution of trends in public awareness on environmental sanitation management in Banda Aceh.

Table 6. Distribution of Community Awareness Trends

No.	Score	Frequency	Percentage	Category
1	1.00 – 1.80	0	0 %	Very Poor/Very Low
2	1.81 – 2.60	19	4.80%	Poor/Low
3	2.61 – 3.40	192	48.00%	Fair/Medium
4	3,41 – 4.20	171	42.80%	Good/High
5	4.21 – 5.00	18	4.50%	Very Good/Very High
Total	400	100,0 %		

From table 6, it can be concluded that public awareness in environmental sanitation management in Banda Aceh is in the good category. As for the distribution of the data, as many as 192 people are in the category fair/medium, as many as 171 people are in the good/high category, while as many as 19 people are in the bad/low category and 18 people are in the very good/very high category.

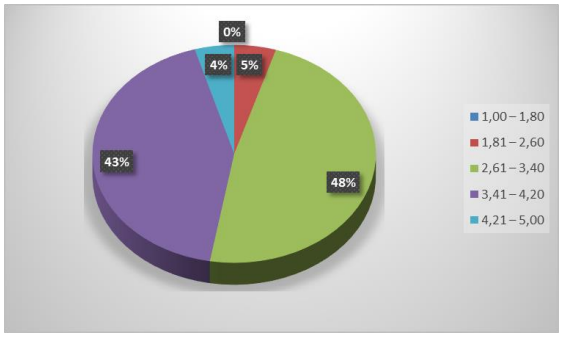

Figure 9. Distribution of Frequency of Public Awareness

Figure 9 shows that the people's awareness level on environment sanitation management in Banda Aceh. Based on the measurement results, it is known that the most of community awareness on environmental sanitation management is in fair category, which is 192 people or 48% of research sample. Furthermore, the level of community awareness in environmental sanitation management is in the good category; 171 people or around 43%. Amongst the factors that influenced environmental sanitation management awareness of Banda Aceh community is urbanization. Increased urbanization causes rapid economic growth and increased population, so then environmental conditions will deteriorate [15]. In addition, the increase in population also causes an increase in waste generated to the environment, including water bodies such as rivers.

Another factor that causes a low level of public awareness is the lack of knowledge that the community has in matters of environmental sanitation management. Environmental knowledge is a determining factor in the management of environmental sanitation. People who have good knowledge of the environment will have a higher level of awareness in terms of environmental management compared to people who have poor environmental knowledge [18]. An effective way to increase environmental knowledge is through counseling or outreach by certain institutions that are responsible for environmental problems. In addition, educational institutions have an important role in the implementation of environmental education at every level of education in schools. Educators must raise environmental awareness for students and society in general. According to [7], environmental education has a significant effect on environmental awareness.

In industries, organizations, companies or any operational body - green supply chain support is used consciously or unconsciously, and in this regard, they are consciously or unconsciously involved in their environment (environment). On the other hand, any institution that exports or imports a product or service is a complete or semi-complete product or service producer. In environmental issues, more than anything else, there are issues such as controlling pollution in the form of standardized quality at a reasonable price, so this is the ideal of a timely or actual customer. It doesn't matter if the physical product is involved, it is important that the phenomenon present in every school of thought, physical and public, has the minimum environmental compliance. The green supply chain, which can manage the use of these factors as the creator of the minimum in terms of standard, quality, competitive advantage, cost and benefit, is green supply chain.

4. Conclusion

One of the fluctuations that environmental issues face today is the green supply chain. The best analysis for environmental issues is to manage the green supply chain. Environmental management have created economic and social changes in today's industry, in other words, due to increasing competition and a number of factors such as current demand, high customer turnover and high cost of attracting new customers in various industries. The results of this study indicates that the behavior green supply chain in environmental sanitation management is in the fair category. Meanwhile, the community awareness on environmental sanitation management is in the good category. This is caused by lack of knowledge and facilities in environmental management in the community and also caused by increasing urbanization in Banda Aceh by people from various remote villages who desire to find decent jobs, continue their education and so on. Strategies that can be taken to improve the behavior and awareness level of Banda Aceh community are by increasing socialization on environmental sanitation, improving facilities in environmental sanitation management and issuing certain regulations regarding migrant communities to put an emphasize in environmental sanitation management. The culture of environmental issues has been created through green supply chain tools. In this article, we will talk about the importance of the green supply chain in environmental issues and discuss the coordination of these two important principles of each industry.

References

[1] KemenKeu, (2016). Alokasi Dana Desa Adu-Boahen, K., Atampugre, G., Antwi, K. B., Osman, A., Osei, K. N., Mensah, E. A., & Adu-Boahen, A. O. (2014). Waste management practices in Ghana : challenges and prospect , Jukwa Central Region. International Journal of Development and Sustainability, 3(3), 530–546.

[2] Agbola, T. (1993). Environmental education in Nigerian schools. Environmental Education in the Commonwealth, the Commonwealth of learning, Vancouver. https://doi.org/10.2166/washdev.2019.055

[3] Anggraini, R., U, I., & Purwaningsih, E. (2019). Kondisi Sanitasi Lingkungan Sekolah (Studi Kasus SD Negeri di Kecamatan Nan Sabaris Kabupaten Padang Pariaman). Jurnal Buana, 3(1), 184–195.

[4] Arora, Lalita, & Agarwal, S. (2011). Arora, L., & Agarwal, S. (2011). Knowledge, attitude and practices regarding waste management in selected hostel students of university of Rajasthan, Jaipur. nt J Chem Environ Pharm Res, 2(1), 40–43.

[5] Aswathy, S. K., & College, N. (2015). Knowledge and practice regarding environmental sanitation and hygiene among general population : A cross sectional survey Lecturer , Community Health Nursing Department , Sree Gokulam Key words : Knowledge ; Practice ; environmental sanitation ; hygiene . Global Journal For Research Analysis, 4(11), 158–159.

[6] Bortoleto, A. P., Kurisu, K. H., & Hanaki, K. (2012). Model development for household waste prevention behaviour. Waste Management, 32(12), 2195–2207. https://doi.org/10.1016/j.wasman.2012.05.037

[7] Botetzagias, I., Dima, A., & Malesios, C. (2015). Resources , Conservation and Recycling Extending the Theory of Planned Behavior in the context of recycling : The role of moral norms and of demographic predictors. “Resources, Conservation & Recycling,” 95, 58–67. https://doi.org/10.1016/j.resconrec.2014.12.004

[8] Brown, F. (2000). Characterizing Effective Environmental Education and Its Impact on Preservice Students ’ Environmental Attitudes. Journal of Elementary Science Education, 12(1), 33–39.

[9] Burton, M., Cobb, E., Donachie, P., Judah, G., & Curtis, V. (2011). The Effect of Handwashing with Water or Soap on Bacterial Contamination of Hands. International Journal of Environmental Research and Public Health, 8(1), 97–104. https://doi.org/10.3390/ijerph8010097

[10] Cameron, L., Shah, M., & Olivia, S. (2013). Impact Evaluation of a Large-Scale Rural Sanitation Project in Indonesia. The World bank.

[11] Chan, N. W. (2012). Managing Urban Rivers and Water Quality in Malaysia for Sustainable Water Resources Managing Urban Rivers and Water Quality in Malaysia for Sustainable Water Resources. International Journal of Water Resources Development, 28(2), 343–354. https://doi.org/10.1080/07900627.2012.668643

[12] Chengula, A., Lucas, B. K., & Mzula, A. (2015). Assessing the Awareness , Knowledge , Attitude and Practice of the Community towards Solid Waste Disposal and Identifying the Threats and Extent of Bacteria in the Solid Waste Disposal Sites in Morogoro Municipality in Tanzania. Journal of Biology, Agriculture and Healthcare, 5(3), 54–66.

[13] Chu, Z., Xi, B., Song, Y., & Crampton, E. (2013). Taking out the trash : Household preferences over municipal solid waste collection in Harbin , China. Habitat International, 40(145), 194–200. https://doi.org/10.1016/j.habitatint.2013.05.001

[14] Djaali, H., & Muljono, P. (2008). Pengukuran dalam bidang pendidikan. Jakarta: Grasiondo.

[15] Duru, C. B., Iwu, A. C., Diwe, K. C., Uwakwe, K. A., Merenu, I. A., Madubueze, U. C., … Nwaigbo, E. (2017). Environmental Sanitation Practices : A Case Study of Solid Waste Management in Semi-Urban Communities in Orlu , Imo State Nigeria. Occupational Diseases and Environmental Medicine, 5, 88–105. https://doi.org/10.4236/odem.2017.54009

[16] Faisal, M. (2014). ANALISIS LAJU ALIR SAMPAH DAN EMISI CARBON YANG DIHASILKAN. Jurnal Teknik Kimia USU, 3(4), 6–11.

[17] Freeman, A. M. C., Garn, J. V, Gloria, D., Boisson, S., Medlicott, K., Alexander, K. T., … Clasen, T. F. (2017). The impact of sanitation on infectious disease and nutritional status: a systematic review and meta-analysis. International Journal of Hygiene and Environmental Health, 220(6). https://doi.org/10.1016/j.ijheh.2017.05.007

[18] George, F. (2007). Problems of Solid Waste Management in Nima, Accra. Undergraduate Research. Journal for the Human Sciences, 6(26).

[19] Head, L., Klocker, N., & Aguirre-Bielschowsky, I. (2019). Environmental values , knowledge and behaviour : Contributions of an emergent literature on the role of ethnicity and migration. Progress in Human Geography,

43(3), 397–415. https://doi.org/10.1177/0309132518768407

[20] Kavaz, D., & Öztoprak, H. (2017). Environmental Awareness of University Students on White Cheese Waste Water. EURASIA Journal of Mathematics, Science and Technology Education, 13(12), 8003–8015. https://doi.org/10.12973/ejmste/80740

[21] Khadiyanto1, P., Soetomo2, S., & Hadi, S. P. (2020). Is Unfavorable Environmental Quality Will Result Poor Human Quality As Well , Case Study At Trimulyo Village , Genuk District , Semarang - Indonesia Is Unfavorable Environmental Quality Will Result Poor Human Quality As Well , Case Study At Trimulyo Villa. In The 1st International Conference on Urban Design and Planning. IOP Publishing. https://doi.org/10.1088/1755-1315/409/1/012042

[22] Khair, H., Rachman, I., & Matsumoto, T. (2019). Analyzing household waste generation and its composition to expand the solid waste bank program in Indonesia : a case study of Medan City. Journal of Material Cycles and Waste Management, 21(12 July 2019), 1027–1037. https://doi.org/10.1007/s10163-019-00840-6

[23] Li, Y. (2018). Study of the Effect of Environmental Education on Environmental Awareness and Environmental Attitude Based on Environmental Protection Law of the People ' s Republic of China. Eurasia Journal of Mathematics, Science & Technology Education, 14(6), 2277–2285.

[24] Mensah, J., & Enu-kwesi, F. (2019). Implications of environmental sanitation management for sustainable livelihoods in the catchment area of Benya Lagoon in Ghana sustainable livelihoods in the catchment area of Benya Lagoon in Ghana. Journal of Integrative Environmental Sciences, 16(1), 23–43. https://doi.org/10.1080/1943815X.2018.1554591

[25] Moraes, L. R. S., Cancio, J. A., Cairncross, S., & Huttly, S. (2003). Impact of drainage and sewerage on diarrhoea in poor urban areas in Salvador ,. Transactions of the Royal Society of Tropical Medicine and Hygiene, 97(2), 153–158.

[26] Nieblas-ortiz, E. C., Arcos-vega, J. L., & Sevilla-garcía, J. J. (2017). The Construction of an Environmental Management Model Based on Sustainability Indicators on a Higher Education Institution in Mexico. Higher Education Studies, 7(1), 15–22. https://doi.org/10.5539/hes.v7n1p15

[27] Nizar, M., Munir, E., & Irvan, E. M. (2018). Implementation of zero waste concept in waste management of Banda Aceh City Implementation of zero waste concept in waste management of Banda Aceh City. In SEMIRATA- International Conference on Science and Technology 2018. IOP Publishing. https://doi.org/10.1088/1742-6596/1116/5/052045

[28] Ogunbode, C. A., Arnold, K., Ogunbode, C. A., & Arnold, K. (2014). A Study of Environmental Awareness and Attitudes in Ibadan , Nigeria. Human and Ecological Risk Assessment: An International Journal, 18(3), 669–684. https://doi.org/10.1080/10807039.2012.672901

[29] Othman, F., Eldin, M. E., & Mohamed, I. (2012). Trend analysis of a tropical urban river water quality in Malaysia. Journal of Environmental Monitoring, 14(12), 3164–3173. https://doi.org/10.1039/c2em30676j

[30] Prüss-ustün, A., Wolf, J., Bartram, J., Clasen, T., Cumming, O., Freeman, M. C., … Johnston, R. (2019). International Journal of Hygiene and Burden of disease from inadequate water , sanitation and hygiene for selected adverse health outcomes : An updated analysis with a focus on low- and middle-income countries. International Journal of Hygiene and Environmental Health, 222(5), 765–777. https://doi.org/10.1016/j.ijheh.2019.05.004

[31] Safo-adu, G., & Hanson, R. (2019). Practices And Knowledge About Environmental Sanitation And Hygiene Among Urban Dwellers In Gomoa East District , Ghana. European Journal of Earth and Environment, 6(1), 1–11.

[32] Samuel, E. S. (2006). Environmental sanitation knowledge among primary School pupils in Idemili North Local Government Area of Anambra State. Journal of Environmental Health, 3(1), 5–12.

[33] Sari, S. Y. I., Setiadi, A. A., Sanjaya, D. K., & Raksanagara, A. S. (2019). Community-Led Total Sanitation Program Attain to Increase Knowledge , Attitude and Intention but Fail to Change the Community ' s Behavior ; Case Study in Urban Slum Area in Bandung Municipality Community-Led Total Sanitation Program Attain to Increase Kn. In IOP Conference Series: Earth and Environmental Science. https://doi.org/10.1088/1755-1315/248/1/012007

[34] Singh, M. P., Chakraborty, A., & Roy, M. (2017). Resources , Conservation & Recycling Developing an extended theory of planned behavior model to explore circular economy readiness in manufacturing MSMEs , India. Resources, Conservation & Recycling, 135(January), 0–1. https://doi.org/10.1016/j.resconrec.2017.07.015

[35] Tadesse, T. (2009). Resources , Conservation and Recycling Environmental concern and its implication to household waste separation and disposal : Evidence from Mekelle , Ethiopia. Resources, Conservation and Recycling, 53(4), 183–191. https://doi.org/10.1016/j.resconrec.2008.11.009

[36] Torlesse, H., Cronin, A. A., Sebayang, S. K., & Nandy, R. (2016). Determinants of stunting in Indonesian children : evidence from a cross-sectional survey indicate a prominent role for the water , sanitation and hygiene sector in stunting reduction. BMC Public Health, 16(1), 1–11. https://doi.org/10.1186/s12889-016-3339-8

[37] Umar, H. (2000). Riset Pemasaran & Perilaku Konsm. Jakarta: Gramedia Pustaka Utama.

[38] Zobeidi, T., Yazdanpanah, M., & Bakhshi, A. (2020). Climate Change Risk Perception among Agriculture Students : the Role of Knowledge , Environmental Attitude , and Belief in Happening. Journal of Agricultural Science and Technology, 22(1), 43–55