EEET ECOLOGICAL ENGINEERING & ENVIRONMENTAL TECHNOLOGY

Ecological Engineering & Environmental Technology 2021, 22(3), 91–103
https://doi.org/10.12912/27197050/135517
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Received: 2021.03.02
Accepted: 2021.03.22
Published: 2021.04.06

Analysis of the Composition of Household Waste from the Community within the Framework of a Waste Prevention and Reduction Strategy

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ABSTRACT
Waste management requires reliable waste generation. The generation of waste and the amount of waste estimated based on facts are the factors that can influence it. The ways to reduce the environmental impacts on waste management include planned prevention by processing methods based on the waste features that are processed at designated locations. Factors such as behaviour, culture, energy sources, economic development and climate have impact on the composition of waste. The composition has a great effect on the need for collecting a lot of waste or less from the collection and disposition of waste. The purpose of this study was to analyse and find the main obstacles regarding the composition of waste under warm climate conditions. The results of this study allow the main contents of planned waste management to be established. This also includes advising all residents about how to minimise waste, a recycling scheme that is expanded on the roadside and relationships with stakeholders.

Keywords: analysis composition, waste management, household waste, waste prevention, reduction strategy.

INTRODUCTION

Waste estimation based on data is a factor that influences waste management. The consequences of community life are the elements that influence waste management. For example, the changes in the economic system and demographic conditions, government policies and welfare levels are increasing in line with the increasing amount of waste in the future (Cristóbal et al., 2018; Mazzanti and Zoboli, 2008; Zorpas and Lasaridi, 2013). Thus, a forecasting model for waste generation must require various predictions and factors that are compatible with the economic and social changes (Chung, 2010; Purcell and Magette, 2009).

The concept of urban solid waste management (MSW) in various countries is becoming more complex. Also, remote areas that move to recovery from landfill-based resource solutions must follow national and international targets. This is done to increase recycling, recovery and can also divert waste from landfills. For proper planning, local authorities need the information regarding the composition of waste at the local level, so that they can develop, implement, regulate and observe waste management schemes directly and their contributions can be facilitated to achieve national targets (Burnley, 2007; Zorpas et al., 2013). Over the past few years, the amount of municipal solid wastes has increased steadily; this problem has been felt in small areas, where

waste disposal or management is very difficult due to limited space. In 2008, the EU-27 total waste generation reached more than 2.62 billion tonnes (Zorpas et al., 2018, 2015a). However, this increase was lower than in 2006 and 2002 which reached up to 2.73 and 2.68 billion tonnes, respectively. The total hazardous waste classified in 2008 was 98 million tonnes or 3.7%. This means that every EU citizen in 2008 produced around 5.2 tonnes of waste per capita, on average, 196 kg of which is assumed to be hazardous waste. In 2012, this number increased to 10% from the previous 2% per capita (Pirani and Arafat, 2014; Zorpas et al., 2015a, 2012). This includes small countries such as Malta and Cyprus and other small islands in the Mediterranean such as Sicily, Crete, etc.

Similarly, the cities in Indonesia have a lot of problems regarding solid waste and one of them is Banda Aceh (Nizar, 2018). Increased waste generation continues to occur because these cities are the main destination of urbanization of rural communities and tourists around the world (Gabrielli et al., 2018; Jouhara et al., 2017; Zorpas et al., 2012). These areas also have urban, rural, mountainous and pure tourist attractions. This total amount of waste is possible for the development of central waste as an energy generator because there is no special strategic policy for the processed waste to be stockpiled. On the other hand, to build an incineration plant strategically and economically, it might not be efficient to reduce waste generation for the areas that have small spaces (Chen et al., 2005; Mohee et al., 2015). Furthermore, significant weaknesses for waste management in remote areas are based on infrastructure and the lack of local recycling programmes (Corral and Manrique de Lara, 2017; Santamarta et al., 2014).

As far as the household level is concerned, it is easier to identify valuable qualitative and quantitative information about standards and living costs (Al-Salem et al., 2018; Bandara et al., 2007; Benítez et al., 2008; Dennison et al., 1996a, 1996b; Eder, 1983; Trang et al., 2017). The studies on the analysis of time series from one single place and at the national level that are centralised have a general correlation with the interface of domestic products and MSW (Bogner et al., 1993; Chung, 2010; Daskalopoulos et al., 1998; Mazzanti and Zoboli, 2008), which can attract attention at a higher political level. However, their planning is not appropriate and cannot be used against waste prevention and waste management as well as approaches to the lower regional "zero waste city" concept. This is because the information is inaccurate or there is absolutely no information available for spatial distributions that are considered equally important (Purcell and Magette, 2009).

Furthermore, the use of composition analysis techniques is employed as a detailed estimate of the nature, scale and source of food waste related to surveys of attitudes and household behaviour that are claimed to be sociodemographical (Ventour, 2008; Zorpas and Lasaridi, 2013). This approach is used as a good practice for verifying the data collected separately in the generation of MSW, disposal and treatment, especially in the cases mostly based on modelling. This method is only more accurate than the approach applied above if these countries have better quality waste management, where the data at each end place have been verified (Chen and Lin, 2008; Hwang et al., 2017; Zorpas and Lasaridi, 2013). One of the main factors is the composition of waste that can affect the emissions originating from solid waste treatment. This is due to the type of waste containing different amounts of fossil carbon and organic carbon. The classified waste composition is used to collect the data on the composition of the varied wastes in MSW in various cities of the world (Chen and Lin, 2008; Hwang et al., 2017; Zorpas and Lasaridi, 2013). Moreover, the factors that can influence waste generation include the level of economic development, culture, behaviour, energy sources, geographical location, and also climate (Kolekar et al., 2016; Lebersorger and Beigl, 2011).

The main focus of this research is to analyse the composition of waste from the community in Banda Aceh city, Indonesia. Waste composition analysis (WCA) will show how management planning is affected and how waste reduction can implemented well. This research method is based on the standard EN 14899, data from interviews with waste experts (academics and practitioners), previous Banda Aceh waste research documents, secondary information from mass media and researchers' observations in the field. This paper assists policy makers, waste management experts, local governments and researchers in formulating sustainable strategies and identifying further studies.

MATERIALS AND METHODS

Region: Banda Aceh City

Banda Aceh is the centre of the city of Aceh Province as shown in Fig. 1. According to Service Statistics analysed in 2016, the last permanent population inventory was 254.904. However, because the city consists of major economic sectors such as several hotels, shopping centres, tourist attractions, etc., the permanent population has increased over the past few periods. There is no primary consumption of waste from industries in the project area, so it is estimated that in the future, the situation will remain the same according to the plant development. There are a number of luxury hotels and middle-low hotels located in the city of Banda Aceh, thousands of homes located in the downtown area, four gas stations, 8 services for cleaning cars, around 15 expertise craftsmen, the bakery industry, drinks, suppliers food, car wash, supermarkets, 87 primary schools, 33 junior high schools, 30 senior high schools, 10 special schools, 7 clinical laboratories, 18 public and private hospitals, athletic training centers and soccer fields, chicken farms and several small industrial activities that do not produce liquid or solid waste which are the main activities of the community in the city of Banda Aceh.

Municipality waste data

The current waste management system collects mixed wastes from one house to another every day by cleaner workers which are then disposed of to the landfill which is about 5 km from Banda Aceh.

Analysis of waste compositional

The analysis of the composition of household waste is separated into several main categories and sub-categories as presented in Table 1. The categories include plastic film, non-recyclable plastic, aluminium, paper from classes, paper from toilets, food waste (type A), food waste (type B), green waste and yards, especially compostable products, stationery, etc. The analysis of the composition of the process waste is adjusted to the EN 14899: 2005 standard. Plastics, beverage cartons and metals are in the PMD streams that can be reused through recycling which can be used as new packaging for hazardous products as well as plastic bags, etc. Food waste is divided into two main types: A and B. Type A is food waste that cannot be avoided, while food waste that can be avoided is included in type B. Sewers cannot accept the processed paper. This is by the policies of the waste treatment plant. This work can be done by following the steps below: first; minimising waste must be done through practice and action, second; there is a place for waste generation to be prepared, third; analysis of the cost benefits for the waste management system must be applied, and fourth: the developed waste management plant must be based on real data. The waste samples from all targeted areas must be able to represent the WCA Programme and this

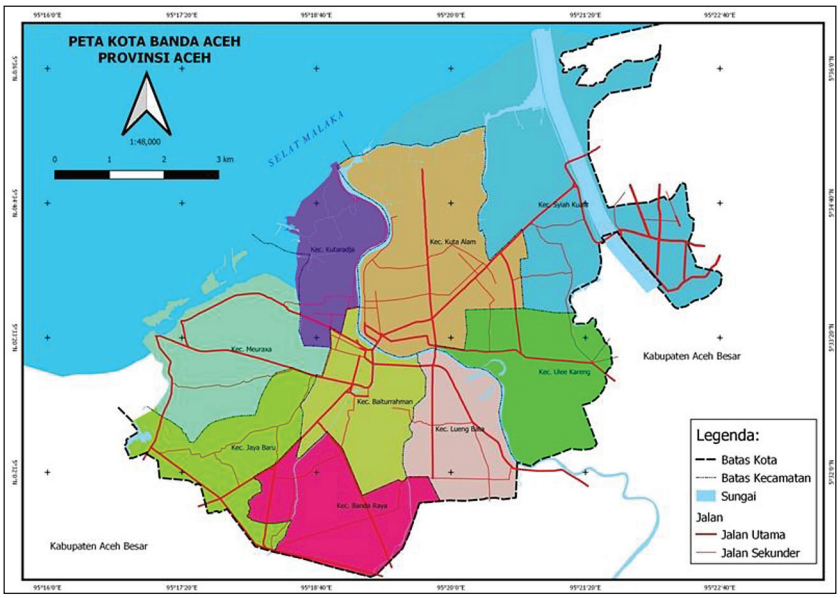

Fig. 1. Map of the Banda Aceh City

Table 1. Categories of waste compositional analysis

Categories	Subcategories
Plastic film	Plastic bottles or pots, metal packages, tetra pack (like juices and milk)
Aluminium waste	Aluminium, tins or cans
Class waste	Bottles and others
Waste food (type A)	Bakery's, confectionery, dairy-farming, meat, fish, cocked
Waste food (type B)	Yoghurt, wine, cooking oil, olives, eggs, banana, apples, pears, peaches, pomegranates, grapes, watermelons, oranges, passion fruits, mandarins, potatoes, girasol, tomatoes, lemons, cucumber, carrots, onions, bread, pasta
Plastics non-recyclable	Straws, yoghurts plastics, butter pots
Paper waste	Package, newspapers, magazines, stationery offices, advertised
Products that can be composted (yard and green waste)	Vegetables, skin fruits, green waste, dust, soil
Others waste	Toys, textile, shoes, medicines, syringe, spays, CD, kitchen brush, lamps, polystyrene, batteries, chandlery, stones, metals (spoons, knives, pans, screws), stationery (pen and pencils)

is usually for local authorities so that variations in waste are sufficient to be calculated against the waste that arises and can be affordable for the project budget itself.

RESULT AND DISCUSSIONS

Compositional analysis

The annual waste production in the city of Banda Aceh is estimated to be at around 191,178 kg per year. In 2018, it was determined that the total waste reached 83,0000 tonnes, as presented in Fig. 2. The government can only transport 75% of municipal waste which is then disposed of in landfills. The remaining 25% waste is scattered in the city or collected by scavengers

In Banda Aceh, the analysis of the composition in total as described above and presented in Figure 3 has not been conducted thus far. In the reverse series, the study analysed several indicators which comprised about 24% compostable products including yard waste, green waste and fruits and vegetables, where the waste originating from food (type A and B) is about 18%, waste from toilet, sanitation and kitchen paper – about 15.17%, paper waste – 10%, PMD – 10.97%, plastic film waste – around 5.42%, plastic waste that cannot be recycled – as much as 5.26% and 2%. A more worrying reality is the complete analysis of the composition sourced from the remaining type B at 7.05% b / b which are foods that are safe to eat, such as fruits that are still intact with high quality. Moreover, some foods have not expired and are still in the packaging, namely; cans, pasta, cakes, frozen, etc. These foods can be processed and reused using more high-quality recipes for days to come. For example, homemade jam that can be prepared from several fruits, such as papaya jam. On the other hand, there are leftovers with type A that can be used to produce food for the next few days at 10.95% b / b. The remaining food is sourced from: (1) food stores (such as cheese and tomatoes that can be used to make their own pizza), (2) the chicken leftovers that can be used to prepare sandwiches or salads, (3) vegetables that can be made into soup or any other types of food.

A significant problem is the fact that these wastes can all be recycled (such as 10% PMD waste, 12% paper waste, and 2% aluminium waste). While from other materials, 28% and 6% are taken from household waste and can be processed in recycling bins. The community of Banda Aceh should raise the awareness about recycling in all areas of the city and at the same time, the government must promote volunteerism. Compostable waste of around 26% originating from pure organic includes fruits, green wastes, vegetables and soil. A composition analysis must be adjusted to the cost evaluation at the factory gate of the Municipal Waste Management so that some types of waste, such as recycled materials, green waste, pure soil and most importantly type B food waste can be avoided. This process can cost up to 2 billion with an average amount of 1.67 million that must be paid by the government within 12 months.

From the total number of each month collected, based on the target set by the Banda Aceh city government for 2018 and 2019, 2019 presents the annual data (Green Dot). The goals set by the city government have not been achieved to date, as presented in Table 2. However, the waste from the paper target has been reached. Various reasons

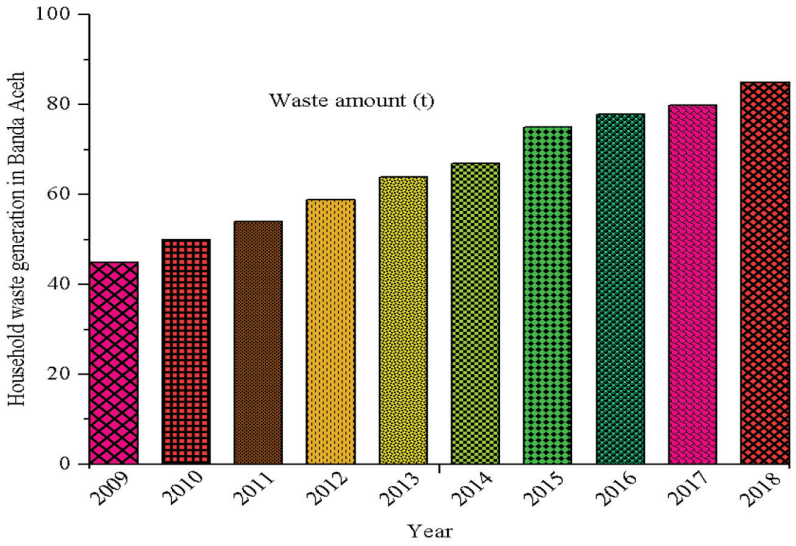

Fig. 2. Generation of household waste in Banda Aceh from 2009 to 2018

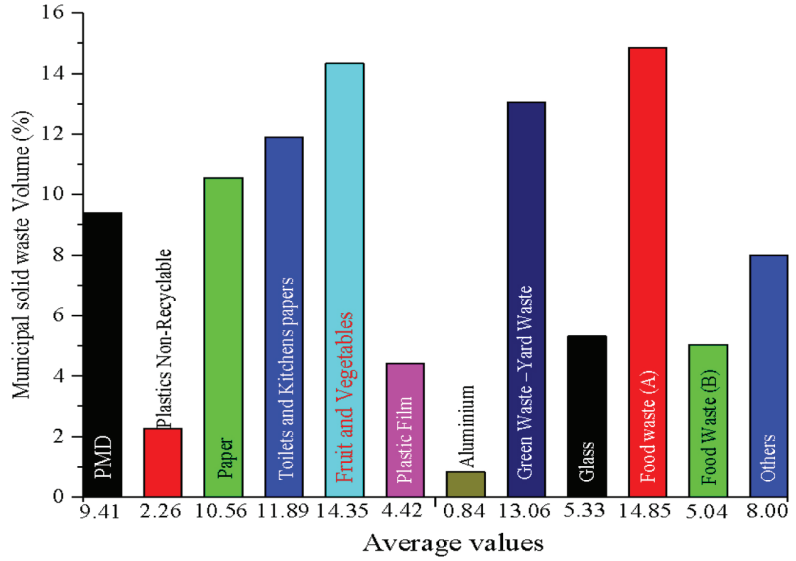

Fig. 3. Compositional analysis of municipal solid waste

Table 2. PMD, paper and glass collected from the GDC municipality of Paralimni

Month		Jan	Feb	March	April	May	June	July	Aug	Sept.	Oct.	Nov	Dec	Total
PMD (kg)	The target set by GDC	8585	9430	23301	23602	28191	33280	31871	35495	32242	25001	22231	10972	291223
	2018	10522	21320	10894	23291	26112	33650	32602	29291	24572	25071	9652	6673	269702
	2019	6734	6652	7682	22790	29413	27562	21551	33673	23501	24901	7881	7081	254461
Paper (kg)	The target set by GDC	28064	26682	36762	52352	57901	67921	67421	66511	69061	52352	28062	26682	559820
	2018	30763	31002	28865	36925	56612	65191	82100	89352	74971	62033	34250	25752	597853
	2019	29134	25802	25145	43441	66962	61523	73533	75981	64242	57661	39042	35113	577621
Glass (kg)	The target set by GDC	10420	21294	21323	25372	32643	54921	47401	65082	62861	35361	27411	22652	415801
	2018	25330	24600	26200	27120	42031	46431	54725	84564	78332	61541	43451	29383	523822
	2019	24434	8352	21632	9031	46443	52382	63932	68181	67282	63781	31874	6151	469621

can hinder these targets, especially the lack of public awareness of waste and lack of training in schools and other educational places, absence from meetings or conferences, limited promotion of local media, and lack of green activities carried out by the government and organisations in cities for socialisation and surveillance teams. Moreover, the articles on the awareness of waste are still limited, while the access to recycling points is difficult to achieve and inefficient.

The analysis of the variation of seasonal compositions is presented in Table 3. The details of further waste streams regarding composition per stream are shown in Fig. 4–8. Plastic bottles and PMD waste are around 8.05%, 2.55% are iron packages and 1.02% are tetra packages of the total amount of waste composition analysis presented in Figure 4. Magazines account for 1.75%, fish materials at 1.50 %, stationeries at 2.20%, and newspapers at 5.50%, as shown in Figure 5.

During the period of September, October and January, the waste compositions are vegetables at 2.85%, fruit residues at 2.55%, and green waste at around 9.15% of the total compared to the other months presented in Fig. 6. This phenomenon can occur, since the community will usually clean the trees in the yard of their house during these months, and then the city clean workers will take the garden waste to the landfill. For similar reasons, the amount of residual meat for milk production is very limited in November, December and February, as presented in Figure 7a. However, from the total amount of waste, as much as 1.53% are meat and fish 2.45% are from the bakery, 3.75% from cooked food and 1% from dairy products.

During the analysis of the composition, what was very worrying, was that some intact foods were found as presented in Figure 7b. These foods (such as yogurt, pomegranate, grapes, oil, potatoes, bananas, apples, eggs, pears, melons,

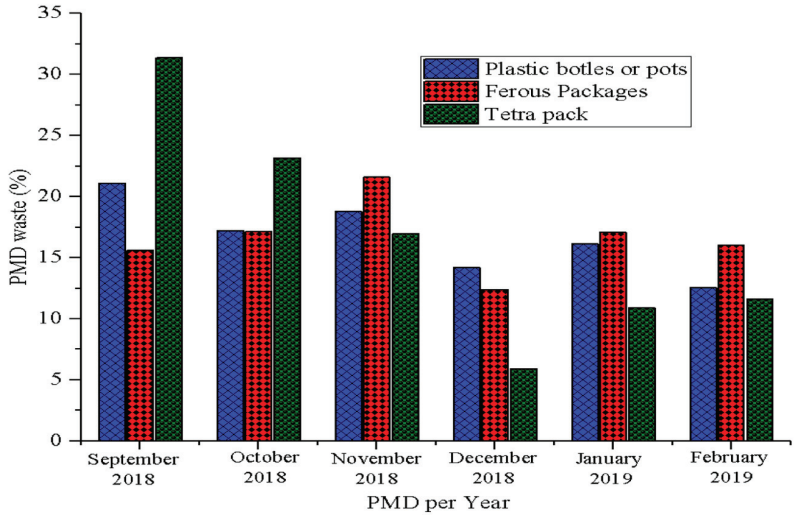

Fig. 4. PMD waste stream compositional analysis

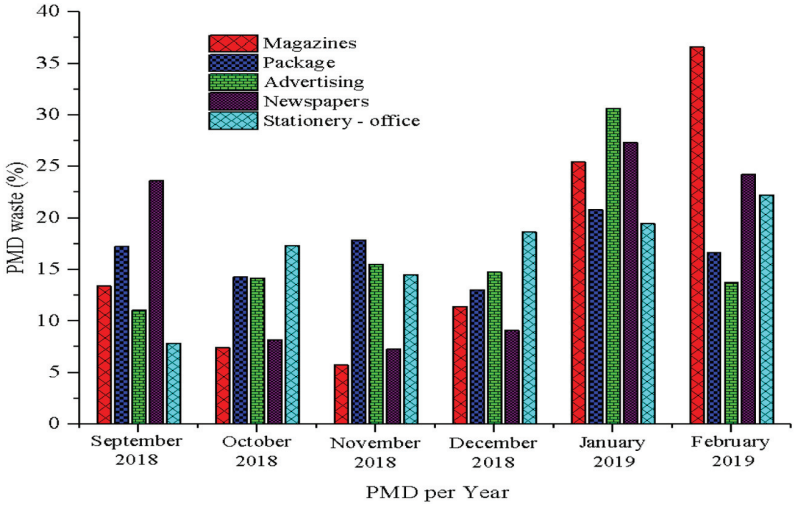

Fig. 5. Compositional analysis of paper waste stream

Table 3. Seasonable analysis of composition

Category	Sep. 2018(%)	Oct. 2018(%)	Nov. 2018(%)	Dec. 2018(%)	Jan. 2019(%)	Feb. 2019(%)	Average (%)
Paper	12.05 ± 3.41	9.79 ± 2.44	12.1 ± 3.00	10.95 ± 2.20	7.6 ± 1.43	16.86 ± 4.60	11.56 ± 3.08
Plastic film	6.59 ± 2.52	5.25 ± 1.95	5.18 ± 1.41	4.91 ± 1.04	3.9 ± 1.72	6.67 ± 2.42	5.42 ± 1.05
Glass	6.07 ± 1.41	6.35 ± 1.40	6.51 ± 1.95	4.86 ± 0.83	8.1 ± 1.01	6.09 ± 0.85	6.33 ± 1.03
Plastics non-recyclable	3.35 ± 1.43	3.21 ± 0.83	2.73 ± 0.41	2.56 ± 0.52	4.1 ± 1.83	3.59 ± 0.71	3.26 ± 0.55
PMD	13.55 ± 3.12	10.5 ± 2.04	13.05 ± 3.75	8.53 ± 2.43	8.1 ± 1.75	8.75 ± 2.94	10.41 ± 2.38
Aluminum	1.83 ± 0.40	2.14 ± 0.83	2.05 ± 0.12	1.71 ± 0.61	0.76 ± 0.10	0.75 ± 0.15	0.94 ± 0.20
Food waste (Type A)	19.93 ± 3.5	16.84 ± 2.12	16.08 ± 2.32	13.40 ± 1.83	15.2 ± 3.01	13.66 ± 2.62	15.85 ± 2.30
Food waste (Type B)	2.28 ± 1.01	5.85 ± 1.43	8.95 ± 1.20	6.98 ± 1.31	5.98 ± 0.95	6.19 ± 1.93	6.04 ± 2.06
Green waste/yard waste	8.52 ± 2.15	15.12 ± 6.05	9.37 ± 3.20	2081 ± 5.12	22.3 ± 2.33	8.24 ± 1.16	14.06 ± 6.32
Vegetables and fruit	14.65 ± 1.5	14.56 ± 1.0	14.57 ± 0.93	15.33 ± 1.03	16.1 ± 0.82	16.86 ± 1.21	15.35 ± 0.94
Kitchens and toilets papers	13.19 ± 1.0	13.31 ± 3.74	13.68 ± 1.21	13.25 ± 2.11	11.6 ± 0.91	11.33 ± 0.63	12.89 ± 1.13
Others	8.99 ± 3.02	9.08 ± 1.93	7.73 ± 2.60	8.71 ± 3.40	7.36 ± 2.25	12.11 ± 1.52	9.00 ± 1.62

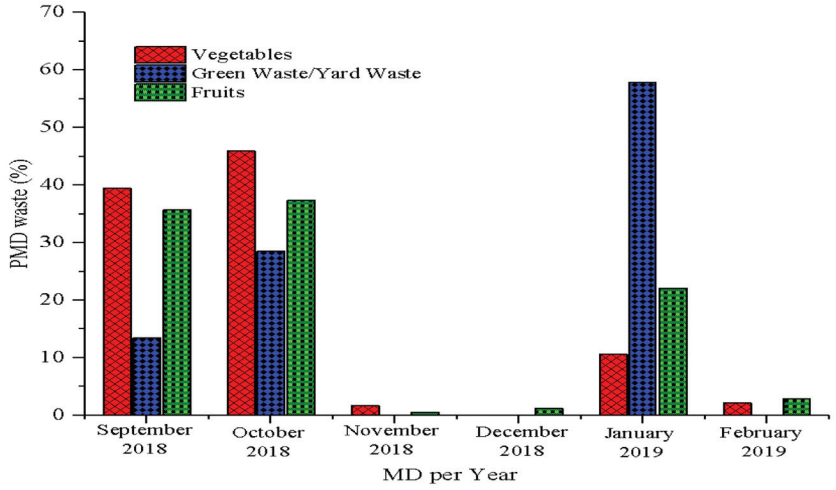

Fig. 6. Composted compositional analysis of waste stream

peaches, grapes, oranges, mandarins, onions, tomatoes, carrots, bread, pasta and cucumber) are the most preferred by the community in general and majority of these have not expired yet. For example, some bananas, apples, melons, etc. had black spots on the surface, and most consumers cannot accept this problem, but in fact, these fruits can still be eaten and accepted by most of the people. The details of the analysis of the composition of other waste streams are presented in Fig. 8. The flow of waste like clothing, toys, and shoes is performed very often. It is important to note that as much as 4.5% of the total waste stream are waste from land, rocks, and building debris. This has a close relationship with a local culture that is often used by the community to clear bloom dreams of their homes.

This research exhibited differences and similarities with the international data found. In the study from (Department of the Environment, 2000) in Wales and England, it focused on Waste Strategy. In the report, 33.2% of waste came from waste paper and cards, around 20.2% of food waste and plantation waste, 2.1% plastic, 5.7% ferrous metal, 9.3% glass and 2.1% of textiles. In turn, 1.6% are non-ferrous waste, 8.1% – miscellaneous flammable waste, 3.9% – baby diapers and 6.8%. According to Burnley et al. (2006) the composition of waste in Wales was analysed by presenting 17% of green waste, 7% of paper and cards, 13% of wood waste, 7% of metal waste, 18% inert waste, 2% glass waste, 2% plastic waste, 1% hazardous waste, 3% textile waste and 3% others. The main components of waste composition according to Burnley (2007) can be presented as follows: as many as 23–25% are card and paper waste, as many as 35–38% are kitchen and plantation waste, as much as 8–10%

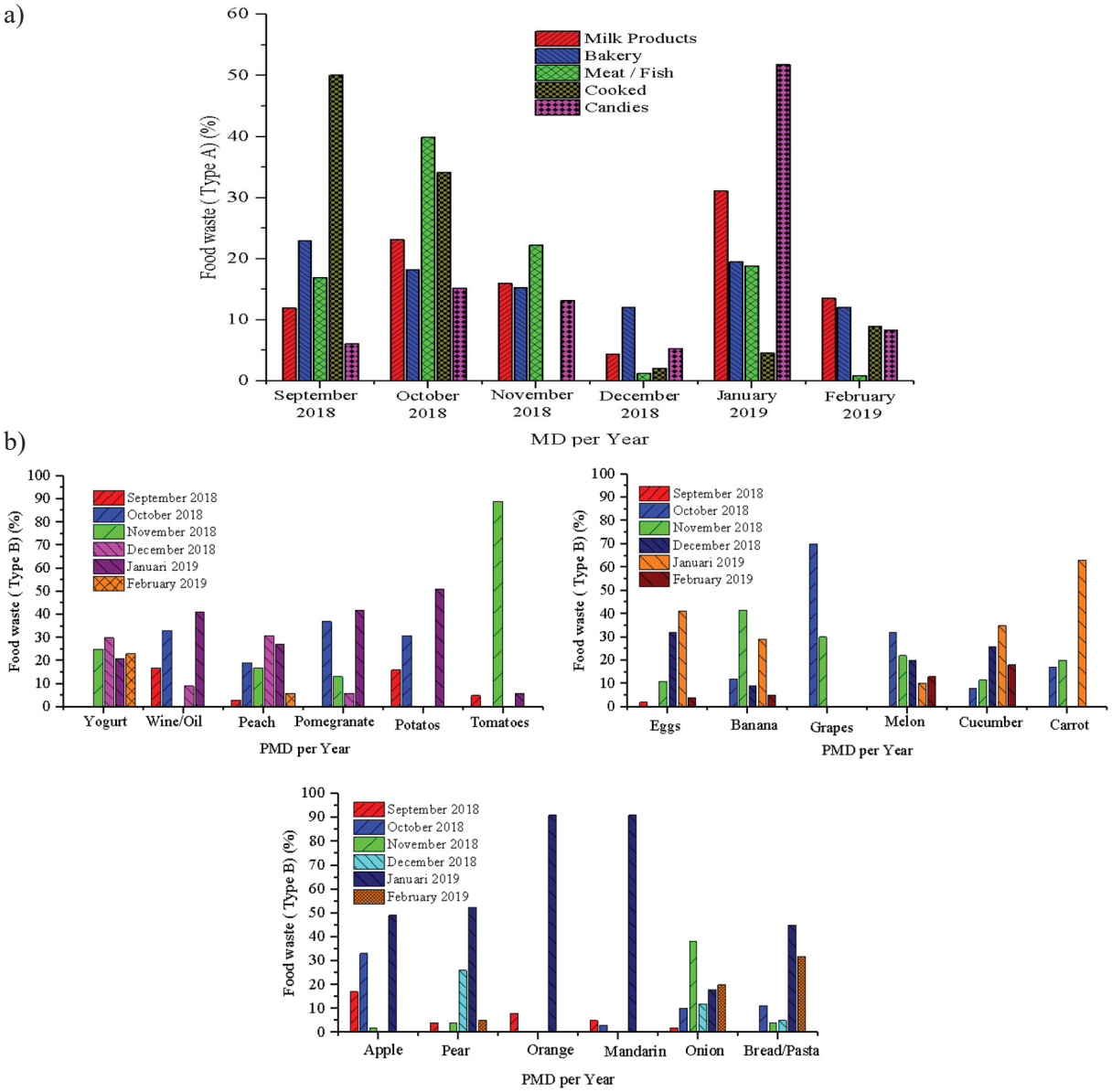

Fig. 7. Food waste compositional analysis of the stream: a) type A, b) type B

plastic waste, 6–7% of glasses and 3–5% of metal waste. In the analysis of the waste composition carried out in Thallalliki by (Poulios and Papachristou, 2005), 29.21% came from paper waste, 26.66% were compostable waste, 17.90% came from plastic waste, 3.61% from glass and as much as 4% were inert waste. A different study by (Duran Moreno et al. 2013) stated that half of the waste material produced and processed in Mexico City is organic waste at 49.5%, while half can be treated using biological technology that can be provided such as biogas or composting. Plastic waste is about 13.16%, and the waste from low density polyethene bags is 6.46% which is the main component, while cardboard and paper waste are 4% and 5.7%, respectively. These materials have enormous potential for recycling. In addition to these materials, 2.65% were glass, 1.16% originated from ferrous metals, and 0.13% were non-ferrous metals. Sanitary waste which was included in a significant category was found at 10.77%. Special and hazardous waste with a low proportion must be removed from the MSW waste stream.

Varied waste flows throughout the year have a variety of reasons, especially in remote communities. In turn, (Burnley, 2007) stated that communal garden waste which falls into a minor category is inconsistent, for example; diapers produced from households at 28% and diapers from flats at 2%. Therefore, the cause for this could be due to random variations compared to seasonal trends. The

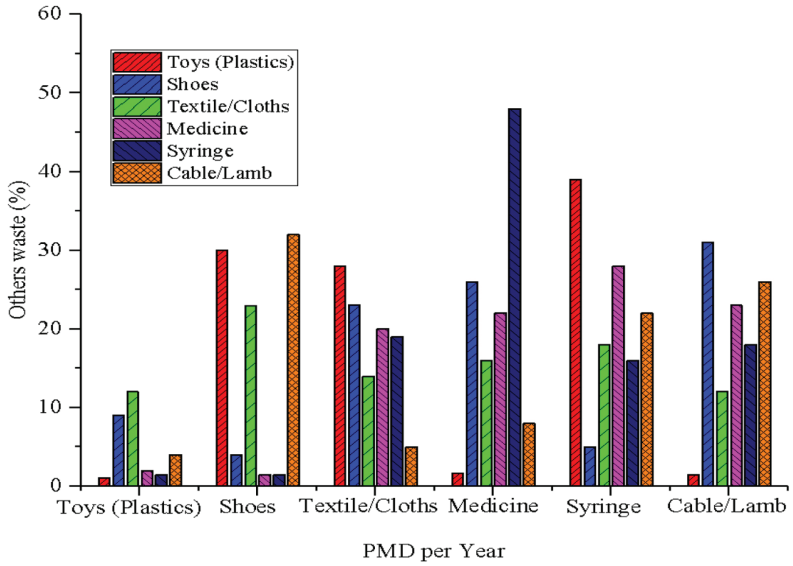

Fig. 8. Other compositional analysis of waste stream

city of Banda Aceh in recent years has been the main tourist destination for local and international tourists so that has significantly increased its waste generation. In the opinion of (Zorpas et al., 2014), the hospitality industry does not pay attention to the environment even though it is is their responsibility. However, the primary concern of the hospitality industry is focused on solid waste. Every day, hotel guests can usually produce 1 kg/person of waste and that can accumulate into thousands of tonnes of waste each year. In order to reduce, minimise or recycle waste, there is little interest from some hotel operators. They consider such activities unprofitable; the process is too expensive and consumes a lot of time.

The proposed waste management plan

This composition analysis was carried out so that measurable data can be given and quantified; then, they can be left to the local authorities to implementing and designing strategies for the prevention of waste and new waste management. The analysis of waste composition is very important and must be done before the existence of management policies and other plans; this is in line with several studies (Brook, 2007; Cox et al., 2010; Filimonau and De Coteau, 2019; Jacobsen et al., 2002; Schanes et al., 2018; Zorpas and Lasaridi, 2013). In order to reduce waste disposal, several related systems can be applied as follows:

From the aspect of policy, the government must make a pro-waste reduction policy from the source. For example, by encouraging households to make compost from the organic waste they produce a lot. The government can also issue a policy of buying valuable used goods, so that these used goods do not become waste or ban the use of disposable plastic packaging such as styrofoam, cups and so on.

From the institutional aspect, the government formed a waste management organization starting from the sub-district level to the village level. The waste management institution is important, considering that waste generation arises continuously, it needs serious and sustainable management. Waste management from the city will not be able to manage waste from remote areas.

The aspect of community participation must be increased even stronger. The community, as a producer of waste, can prevent waste generation if given wider participation. Communities, as stakeholders, provide input and participate in managing waste. The people, before attaining expertise in managing waste, are given training first.

Waste management requires a lot of funds, where the costs charged from the community are insufficient for waste management operations. The government must look for creative ways to increase funds to manage waste, for example by applying a retribution to pay waste, according to the amount of waste (pay as your throw), asking for the responsibility of the producer who generate waste. The discipline of the community in paying waste fees must be increased, for example by implementing waste payments together with clean water fees (the customers of both services are almost the same). Sufficient waste

management funds can become capital in adding personnel and waste infrastructure.

Currently, the technology used is still very conventional, unchanged for decades. Creating appropriate waste processing technology so that it is easily applied. For example breeding bacteria that decompose waste in a short time (currently the average decomposition of waste takes 20 days) so that composting is fast. The addition of a greater number of waste transport compactors enables to load more waste for the same route. There are many more technologies that can be applied but this requires skill and funds.

Giving awards to green businesses, green communities and green school areas as a development and promotion of good waste management. Appreciation can spark enthusiasm and appeal for other parties to participate in managing their waste. Award-winning figures become role models in their communities so it is relatively easy for them to spread the idea of waste management practices.

Programming a waste prevention plan cannot only be listed as steps determined by the government but plans that have been made must be able to integrate all the attention of those concerned and those affected by the commitment to continue the programme as planned. Various actions exist, initiatives and instruments for preventing waste that can be linked to the programme. This programme has the primary task which is the result of the vision given to the framework that will be built. This initiative is based on what is available as the addition of complementary steps to be more effective and efficient. The waste prevention strategy planned in the Banda Aceh city starting from 2014 is shown in Figure 9. In 2014, which continued until 2018, the public awareness activities were carried out. At least 5–7 of these campaigns are carried out at the end of each year. It is hoped that after the campaign ends, the community will continue to inspire and encourage other citizens about waste-free cities or better known as "zero waste cities". The campaigns carried out for public awareness include seminars for groups and specific targets such as schools, NGOs, etc., conferences open to the public, interviews at local radio stations, and house-to-house information and leaflets.

Problems related to WMP implementation

In general, out of all cities, the management of waste has failed due to financial factors. This is

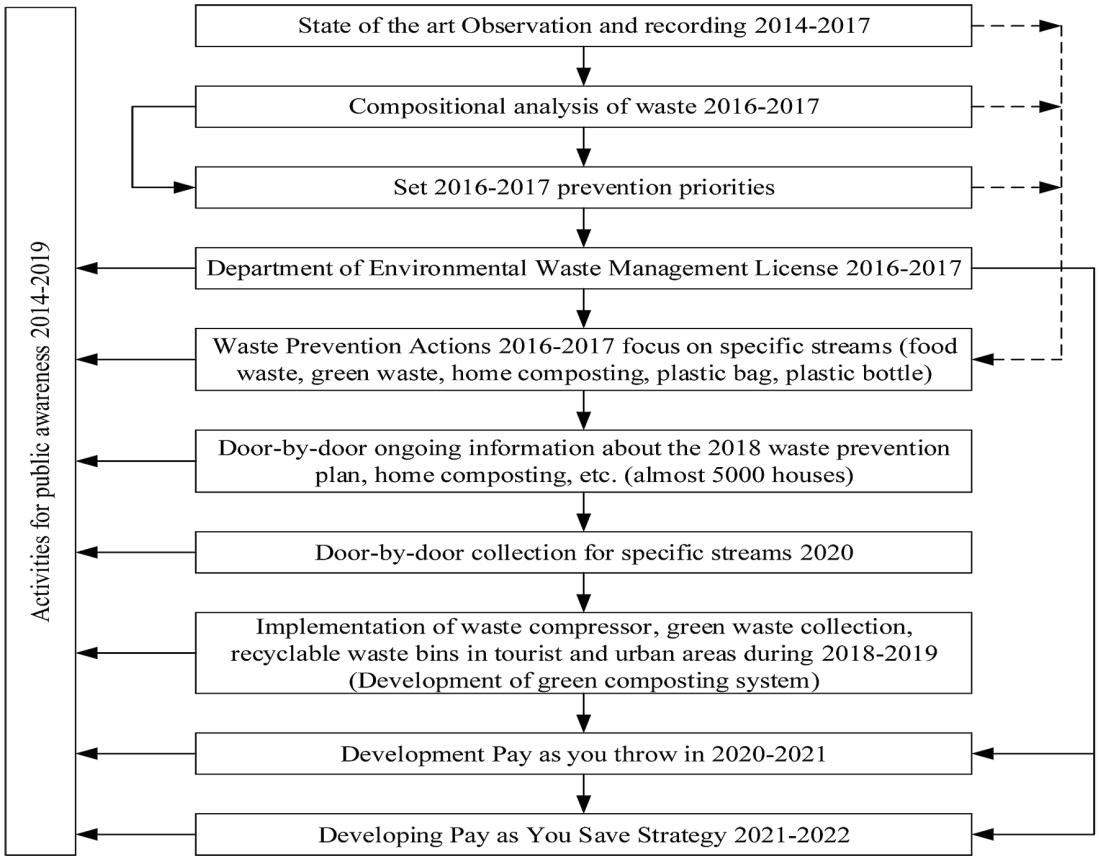

Fig. 9. Strategy for municipal waste prevention

also very common in middle cities where government do not pay attention to the responsibilities in their environment (Zorpas et al., 2014). Providing this service requires a very large cost (Das et al., 2019; Sharholy et al., 2008). This is due to the lack of financial support, limited resources, reluctance of users to pay, the absence of proper use of economic instruments and consequently, the delivery of services for waste management is hampered (Sujauddin et al., 2008; Wang et al., 2018).

The research conducted by Sharholy et al. (2008) stated that the involvement of the private sector can improve the system more efficiently. The factors and aspects of waste management are very influential in supporting and facilitating system performance. The system in question includes financial, technical, socio-cultural, environmental, legal and institutional aspects. Therefore, planned waste management is the duty and responsibility of the city government, and the community here does not need to contribute to this (Phonphoton and Pharino, 2019; Vidanaarachchi et al., 2006). The efficient operation of solid waste management depends on the active participation of municipal and community. Therefore, the aspects of the socio-culture of some scholars include the people who participate in decision making (Mohammadi et al., 2019; Sharholy et al., 2008). Community behaviour awareness and apathy in contributing are solutions (Alavi Moghadam et al., 2009; Behrooznia et al., 2018). Several researchers have investigated the institutional factors that can affect the system. The results of this study concluded that local waste management authorities lacked the organisational capacity and professional knowledge. Moreover, the research concluded that there was little information from the public domain. Therefore, the insights into complex problems with municipal solid waste management are very difficult to obtain (Seng et al., 2011).

CONCLUSIONS

Uncontrolled waste disposal systems can produce contact waste from direct soil populations or contaminated liquid waste, contamination on the surface of the water and leachate from water in the soil, diseases spread by birds, mice, animals, etc., burning of wastes which results in air pollution, littering that causes discomfort, and uncontrolled methane released by anaerobes. The primary tool that must exist before advancing WMP is the result of the waste composition analysis. Waste generation can usually be affected by social and economic impacts at the research site. Most of the waste from the household can be separated for recycling. Therefore, the amount that the city government must pay for Waste Management can be reduced by 30%. The target promised by the Waste Management Authority to the city government leads to the government's plan to become a "zero waste city" in the near future. Improvement of sustainable solid waste management as well as expertise, public awareness, facilities and funding from both the government and non-governmental organisations (NGOs) are still lacking and need to be improved immediately. Collection and disposal are a framework for managing solid waste that must be highlighted and also need to be improved immediately.

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