STUDY ON PET RECYCLING IN KLANG VALLEY IN MALAYSIA

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Abstract

As integrated ecological solutions combining legislative, educational as well as technological support have been preferentially implemented by countries being among the industrialised world, the recycling industries of developing and emerging nations may comparatively appear to be still caught in its infancy. But recognizing the importance of an environmentally sound industrial development, Malaysia's new governmental policy on the environment aims at a forth going economic, social, and cultural progress and enhancement of the quality of life of its people, through a sustainable development. But for all governmental efforts, Malaysia's objective aiming at 22% of the overall solid waste being recycled by year 2020 might be unattainable. This paper is an attempt to study on Polyethylene Terephthalate (PET) in Klang Valley in Malaysia. PET is used as a raw material in order to produce various kinds of packaging materials serving a wide range of consumer goods such as detergents, soft drinks or pharmaceutical products. Today, PET belongs to one of the most popular consumer plastics used. The survey was conducted by face-to-face interviews from November to December 2005 and via internet from December 2005 to March 2006. The overall sample covers 746 study subjects and is based on a 95% confidence level. The main objective of the survey was to obtain a gross insight into the business environment an entrepreneurial PET recycling endeavour targeting the Klang Valley conurbation would be suited in.

Keywords: PET, recycling, raw materials, Klang Valley, survey, Kuala Lumpur, Malaysia.

1. Introduction

Environmental protection and ecological sustainability have been cause of global importance for a prolonged period – especially the increasing amount of solid waste has become a major concern. Environmental protection industries can help to find a remedy by recycling and waste reduction activities. As integrated ecological solutions combining legislative, educational as well as technological support have been preferentially implemented by countries being among the industrialised world, the recycling industries of developing and emerging nations may

comparatively appear to be still caught in its infancy. But recognizing the importance of an environmentally sound industrial development, Malaysia's new governmental policy on the environment aims at a forth going economic, social, and cultural progress and enhancement of the quality of life of its people, through a sustainable development (MIDA, 2006a). But for all governmental efforts, Malaysia's objective aiming at 22 % of the overall solid waste being recycled by year 2020 might be unattainable (MIDA, 2006b). In Malaysia, an expanding economy in line with a rapid rate of urbanisation has primarily led to an increasing waste generation in certain areas which in turn pose difficulties for waste management and disposal structures. About 25% of the solid waste disposed daily arises solely in the metropolis of Kuala Lumpur and the surrounding Klang Valley conurbation; whereas plastic waste, especially PET plastic bottles, is to be considered a serious contribution essentially due to its non-biodegradable nature (Lim, 2006). Expected annual global PET beverage bottle consumption growth rates of 9% (Zell, 2004) and an extrapolation showing that the Klang Valley area is expected to suffer from a massive shortage of drinking water capacities in best time (Leiste, 2004) could additionally result in an overall increase of the Malaysian per capita bottle consumption as a logical consequence. Out of an entrepreneurial perspective, the beverage consumption intensity covered by PET plastic bottles theoretically equals potentially recyclable waste streams of post-consumer raw materials. Therefore the question arises, why the capacity of post-consumer PET plastic bottles available in Malaysia has not attracted a more widespread attention at a first glance. Given above background, this paper wants to investigate whether the emerging Malaysian economy is in progress to let alleged PET recycling opportunities slip. In this respect, the feasibility evaluation of an innovative German PET recycling concept based on general driving factors and obstacles for entrepreneurial recycling activities is focus of interest. In the course of feasibility considerations, institutional, market-oriented and consumer-related determinants as well as sine qua non conditions for implementable business endeavours are taken centre stage. Subsequently based upon this, entrepreneurial options on how the Malaysian recycling sector for post-consumer PET plastic bottles could be stimulated to attract more entrepreneurial spirit shall further be addressed. A subordinate objective shall be the provision of consultation services for decision makers fancying future business endeavours within the Malaysian plastic recycling sector. This scope of work shall concentrate on the environs of Kuala Lumpur only, as the Klang Valley area is to be considered not comparable to other Malaysian regions in various terms. Furthermore, the simple fictitious profitability estimations are for benchmarking purposes only and shall bear no comparison with real operational calculations. As being successfully implemented in various countries and markets, the Krones Bottle-to-Bottle Recycling Concept shall be regarded sustainable and profitable.

2. Theoretical Background on PET Recycling

2.1 Introductory Information

Recycling is a process in which used materials are collected, broken down and converted into new products (Wikipedia, 2006). Even though an organized recycling movement started only 20 years ago, the idea of recycling reaches way further back. Especially during the two World Wars, the modification and reuse of garbage was an important source to obtain raw materials. Formerly, dealer and gatherer collected, sorted and forwarded garbage, today's recycling activities are undertaken by specialists (Wikipedia, 2006). As main recycling

objectives can be named

- the conservation of valuable resources and protection of the environment,
- generation of new products out of waste,
- the elimination of non-biodegradable waste,
- the reduction and elimination of landfill space and
- the promotion of a clean and healthy environment for future generations (Rajaa, 2006).

During the recycling process, new materials can be generated through usage of energy and addition of new raw materials. Materials such as glass, paper, copper or plastics can be processed to produce new goods (Wikipedia, 2006).

2.2 Key Information on PET

Polyethylene Terephthalate (PET) is used as a raw material in order to produce various kinds of packaging materials serving a wide range of consumer goods such as detergents, soft drinks or pharmaceutical products. Today, PET belongs to one of the most popular consumer plastics used (Wikipedia, 2006). PET resins are entirely manufactured from oil and natural gas processing the feedstock materials Purified Terephthalic Acid (PTA) and Mono Ethylen Glycol (MEG). Approximately 1.9 kg of oil is necessary for 1.0 kg PET granulate (Schweiz, 2006). The energy necessary for the PET production levels off at 84 MJ whereas 55 per cent can be reclaimed in form of heat energy (Wikipedia, 2006). PET is a relatively new packaging resin. The PET bottle was patented in 1973, four years later, the first PET bottle was recycled (Miller, 2006). The production of PET as a secondary raw material saves about 60 per cent of the energy necessary for the production of PET virgin material (Krones, 2005). Different from manufacturing products from plastic or virgin material where the raw material is supposed to be under permanent quality control, a perfect control of post-consumer materials is hardly practical and contamination may occur, as plastics can interact with organic chemicals. In this respect, PET represents fantastic material properties minimizing common plastic related disadvantages and maximizing recycling applications for the food commodity sector (Krones, 2005).

2.3 PET Recycling for Food Packaging Applications

2.3.1. PET Recycling Processes and Technologies

2.3.1.1 Conventional Operations

Conventional recycling processes comprise either the grinding of post-consumer PET with subsequent flake washing procedures or the washing of the original PET container followed by grinding and flake washing operations as principal process steps. For the extrusion into pellets, similar dewatering techniques and surface drying methods are applied (Navarini, 2006). Through the washing and grinding processes, the post-consumer material is homogenized and dirt, labels, glue or residual foodstuff as well as other polymers like closures or barrier materials are to be mainly excluded. The output material of conventional recycling processes is therefore regarded a nearly 100 per cent PET fraction without contamination in the best case (Franz et al., 2005). The process outputs of conventional recycling technologies are ordinarily used for non-food purposes or further feed streamed into super-clean recycling processes (Franz et al., 2005).

2.3.1.2 Super-Clean Operations

Super-clean recycling technologies primarily utilise output material of conventional recycling processes, whereas further deep cleansing steps are applied in order to remove potential remnants of post-consumer substances. Super-clean recycling processes primarily involve special washing methods, high temperature, vacuum or surface treatment as well as melting, melt filtration or melt degassing steps to remove contaminants. A post-condensation phase is often included to restore broken polymer chains or in order to guarantee specific viscosity levels necessary for further processing steps. Another popular super-cleansing mechanism involves chemical depolymerisation of the PET surface layer with subsequent mechanical cleansing steps. Super-clean recycled products do not contain more migrants than those being part of virgin PET granulate (Franz et al., 2005). Provided that regulatory guidelines or legal requirements are met, the processed output is suitable for food packaging applications; with the PET plastic bottle manufacturing sector being a major sales market (NAPCOR, 2006).

2.3.2 Krones Bottle-to-Bottle PET Recycling Concept

2.3.2.1 Plant Design

At commercial scale, the line operates in the output range of 0.5 or 1.0 tons per hour. The smaller plant, whose feasibility is to be investigated in the scope of this work, is able to generate approximately 3,400 tons of reprocessed PET per year in shift work. According to data provided by the developer of the recycling concept, Thomas Friedländer, the bottle-to-bottle recycling plant is anticipated to process annually 689.7 tons in the best, 928.6 tons in the trend case and 1,230.5 tons in the worst case to be operated in a cost-covering way.

2.3.2.2 Recycling Process Stages

At the first stage, the bottles are separated and crushed into flakes. During this process, post-consumer substances are segregated by conventional dry and wet separation methods and a washing technique newly developed by Krones. At the second stage of the process, both adherent and migrated impurities are removed. At the same time, the surface of the flakes is detached by a chemical process using caustic compounds. At the third stage, the cleaned PET is rinsed and freed of coloured flakes. Any PVC remnant changing colour in the rotary tubular kiln is detected and expelled during a colour segregation process. At this operational stage, migrated particles and tiny impurities left can also be removed (Krones, 2006).

2.3.2.3 Process Accreditation

In the beverage and packaging industries, Krones has obtained a leading position throughout the world by guaranteeing economically viable recycling operations and turn-key recycling lines. As primarily contractor, Krones supplies an entire customised service package for both planning and implementation of its recycling systems. Krones recycling concept is based on the US-American URRC process. Hereby, recollected post-consumer PET bottles sorted by colour can be processed to form a high-quality food grade recyclate suitable for the production of renewed food packaging applications in a 50 per cent blend. According to the American Food and Drug Administration (FDA), the recycled material satisfies all demands regarding purity and quality (Krones, 2006).

2.3.2.4 Process Merits and Advantages

The Krones recycling concept is not tied to any particular bottle return system and offers the opportunity to process almost any kind of input material. Both the form of delivery and the degree of soiling are of subordinate importance (Krones, 2006a). The industrial recovery of reusable PET raw material for food packaging applications amounts to almost 100 per cent (Krones, 2006a). The Krones recycling process works without melting the input material and requires low process temperatures. Skipping the melt-phase offers potentials for energy savings. The recycling process additionally works without any chemical conversion of PET. Traditionally, PET pellets are processed. However, Krones focuses on PET flakes thus achieving higher process speeds. The concept offers full traceability throughout the process chain via sensors and an on-line monitored quality control (Krones, 2006b). To detect and analyse residual post-consumer substances or contamination, the recycled material is inspected via sniffer-technology. Different from common PET recycling processes where small samples are randomly examined, the entire material is continuously inspected; particularly after washing and at the end of the bottle-to-bottle module. The sniffer technology enables precise adjustments of process parameters which in turn results in energy savings and costs-efficiency. Contaminated material can be removed and offered as recycled material suitable for non-food applications (Krones, 2006b).

2.3.2.5 General Sector Profile

Primarily due to financial constraints, necessary investments in resource recovery and recycling concepts have not been undertaken by the public sector (Lim, 2005). In comparison to industrialised nations with appropriate recyclable waste recovery systems and methods being well-established, resource recovery in Malaysia is therefore still operated at a minimal level. Figure 1 exemplifies the ordinary material flow of recyclables from the consumer to the export and local markets for recyclables respectively through the aggregates and sub-aggregates of the formal and informal sector.

3. Research Methodology

The main objective of the survey was to obtain a gross insight into the business environment an entrepreneurial PET recycling endeavour targeting the Klang Valley conurbation would be suited in. The survey does not lay claim to be representative for both Malaysia and the Klang Valley area. However, the survey results are regarded eligible to picture a helpful review of the environment coming across within the Klang Valley. The survey was conducted by face-to-face interviews from November to December 2005 and via internet from December 2005 to March 2006. The overall sample covers 746 study subjects and is based on a 95 per cent confidence level. In the run-up phase, 13 pre-tests had been additionally carried out. Primarily due to both budget and time constraints as well as the degree of precision, different confidence intervals were appointed. Special quotas were not applied, but the sample had been differentiated into 3 sub-groups, namely the general public or consumers, recyclers and students. The consumer survey, averaging approximately 15 minutes, covers a sample size of 200 study subjects randomly interviewed all over the Klang Valley area at different points in time. Due to the survey population, a confidence interval of 7 could be regarded appropriate in the author's

opinion. Different from Germany, English is both widely spoken and understood by the majority of the Malaysian population. But to counter possible empirical marginalisation, the survey was additionally translated into Bahasa Melayu and partially carried out in teamwork through enlistment of a local research assistant. Thus, the study subject was enabled to choose from two types of questionnaires according to individual preferences.

4. Results and analysis on PET Recycling Issues in the Public Consciousness

4.1. Awareness and Information

Facing the detrimental effects caused by continuously increasing amounts of solid waste generated, the Malaysian government started launching various campaigns to create environmental awareness and consciousness among from 1983 onwards; but the awareness among the general public just increased slightly. A survey carried out in 1999 indicates that solely 59.41% of the respondents were moderately aware of solid waste issues having some basic knowledge on waste and waste recycling while 10 per cent were considered completely unaware. Only 55.3% showed their willingness to cooperate and/or participated in recycling programs, 44.70 per cent were completely unwilling (Aga, 2004). In 2001, a large-scale recycling program primarily focussing on public education via mass media was initiated by the Ministry of Housing and Local Government (MHLG), (MIDA, 2006). Collaborations with non-governmental organisations (NGOs) on promoting the reuse, recycling and reduction of waste were further intensified (MIDA, 2006). In 2003, the medial campaigns to raise public awareness on recycling reuse and reduction of waste were further intensified (MIDA, 2006). Over the years, the public awareness towards recycling and recycling programs has increased. A survey carried out in 2003 shows that 93 per cent of the Malaysians were aware of the national recycling program. However, from the 93% being aware, solely 28% actually practised source-reduction. The survey indicated further that the recycling method preferably stated by 72% of the recycling respondents was to sell the recyclables to itinerant dealers. The survey carried out in the course of this paper additionally shows that:

- 64.6% of the total respondents did not know that mineral water plastic bottles are predominantly made up of PET,
- 68.1% of the survey participants believe that using a plastic bottle could cause diseases or were not sure, while 74.1% think that the plastic of a beverage bottle could pollute the content or were not sure,
- 43.7% of the questioned are not aware of numbers being stamped on the bottom of mineral water bottles or were not sure, while 41.7% indicated that the numbers would provide information on the number of possible reuses and 34.6% do not know what the numbers stand for,
- 50.9% further stated that the quality of recycled products is worse than of non-recycled products or were not sure,
- 37.3% of the recyclers, 63.5% of the consumers and 86.9% of the students would like to have more information on recycling and
- 64% of the consumers, 55.9% of the students and 73.4% of the recyclers feel that recycling of household waste is important.

4.2 Recycler Survey

The recycler survey was approved by the private waste concessionaire responsible for the Klang Valley area provided that findings are shared. The survey, averaging 8 minutes, covers the statements of 158 interviews undertaken in recycling/collection centres located at Desa Pandan, Wangsa Maju and Midvalley at different points in time. The author regards the sample size eligible for a confidence interval of 8. The survey participants were also provided the opportunity to choose the type of survey according to individual language preferences. The recycler survey was partially undertaken in teamwork, supported by a local research assistant.

4.3 Student Survey

The online survey covers the statements of 388 students enrolled with Open University Malaysia in Kuala Lumpur. The survey, averaging 6 minutes, was accessible after the login and provided in Malay language only. In case of the student survey's sample size, a confidence interval of 5 appears appropriate in the authors' opinion.

4.4 Household Evaluation

The main objective of the household survey was the extrapolation of an extemporaneous worst case scenario of the PET plastic bottle consumption intensity in the Klang Valley conurbation based on pessimistically driven low-levelled values. The survey ought to enable the author to estimate the potential minimum availability of post-consumer PET raw material usable for recycling purposes. A subordinate objective was to get a gross insight into the usage behaviour. This simplified small-scale investigation does not lay claim to be representative, but was improvised in order to compensate the author's lack of statistical data on both PET plastic bottle consumption and usage in Malaysia. In the course of the household evaluation, 24 households affiliated to the school 'SK Sri Kelana' in Petaling Jaya were appointed to count the PET beverage bottle containers arising in the household according to container volumes from 0.5 l to 5.0 l and above, over a four-week period on a daily basis. The participants were further appointed to determine the validity of the data provided by stating the scope of daily participation on a scale from 1-3, whereas 1 means that all bottles in usage have been stated and 3 means that solely some or none of the bottles used have been indicated. The households were ensured that participating to the best of each's knowledge and believe was sufficient and even randomly recorded data was a highly appreciated contribution. This concession was made in order to minimise misconduct arising from social desirability and to maximize both participation through easy handling and the validity of the data generated.

4.5 Motivation

To get a gross insight into the motivation to practise recycling, the survey participants were asked to state their individual motivations to recycle their plastic bottles by ranking following categories according to their importance on a scale from 1 to 5; whereas 1 means that a category is regarded totally unimportant and 5 means that a category is considered very important for the survey participant's motivation to recycle plastic bottles. Figure 2 combines the survey results differentiated by general public or consumers, recyclers and students.

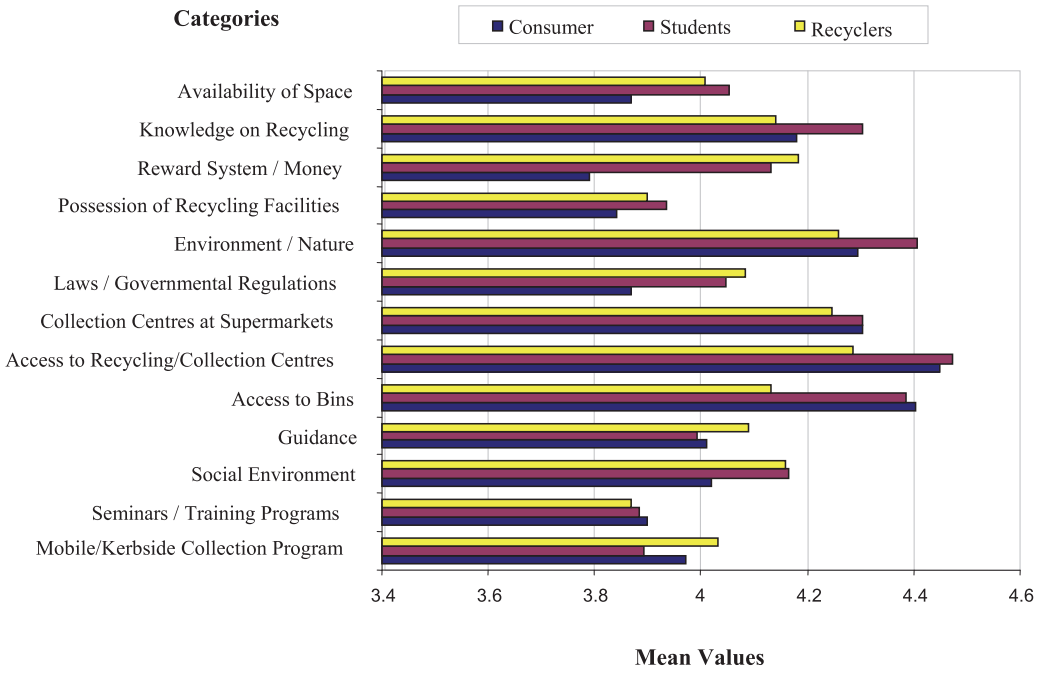

Figure 2: Reported Motivations to Recycle

The survey indicates the existence of three major motivating categories, namely convenience, the environment and economic prudence.

4.6 Comfort

The survey indicates that the access to recycling/collection centres is the major determinant for potential recycling activities for consumers (53%), students (58.8%) and recyclers. 43.7% of the recyclers consider both the access to recycling/collection centres and the environment likewise very important. 54% of the total respondents consider more recycling/ collection centres very important. The accessibility of recycling/collection centres could be accumulated under a general roof, namely comfort. The impression of comfort being a major motivation is additionally emphasised through the fact that 45.8% of the overall respondents regard recycling/collection centres located at supermarkets or places of bottle purchase very important; most probable to connect bottle purchase and bottle return while doing grocery. Out of a differentiating perspective, the consumers (46%) and the students (47.9%) responded comparable, while solely 40.5% of the recyclers consider bottle exchange a very important motivation to recycle. Furthermore, the access to bins, and herewith indirectly the number of bins being available, is regarded very important and implies motivating characteristics, especially for students (53.9%) and consumers (52%). Solely 35.4% of the recyclers regard the access to bins very important.

4.7 Environment

The survey further shoes a strong association between recycling and the environment. For the 43.7% of the recyclers the environment is, together with the access to recycling/collection centres as mentioned above, the predominant motivating influence. While 57% of the students consider the environment a very important reason to recycle, 42.5% of the consumers stated

very important, 44.5% important and 13% neither unimportant nor important. The motivating character of environmental consciousness for recycling activities is regarded to be emphasised by the consumer's opinion on the actual aim and object of recycling and its efficacy. The general public was asked to rank the efficacy of recycling for specific categories on a scale from 1 to 5; whereas 1 means a strong disagreement with the causative relation to a certain category and 5 means a strong agreement. Figure 3 illustrates the survey results.

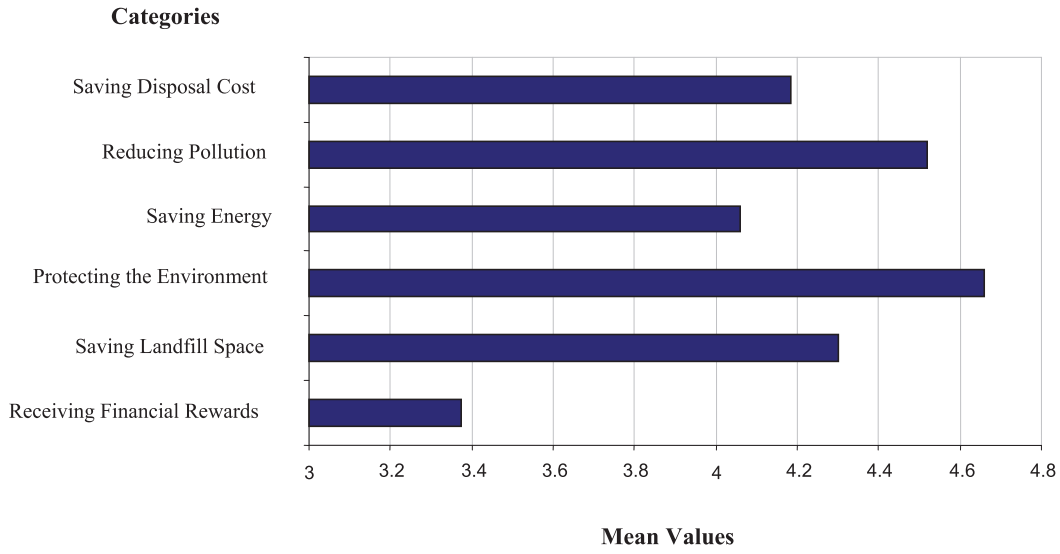

Figure 3. Reported Efficacy of Recycling

99.5% of the consumers think that recycling is a suitable approach to protect the environment, while 66.5% herewith see the strongest efficacy of recycling. 92.5% believe that recycling is able to reduce pollution, whereas 32% agreed and 60.5 strongly agreed in terms of suitability. While the influential capability of recycling towards energy and solid waste management was generally answered in the affirmative, the consumers oppose to the efficacy towards financial rewards; 48% do not agree with the suitability of recycling to generate an additional income.

4.8 Economic Prudence

The consumers' contrary opinion on the connection of recycling to an additional income is reflected by a subordinately ranked motive to recycle. In contrast to recyclers or students with 72.1% or 80.6% being also financially motivated to practise recycling, 39.5% of the consumers do not really feel motivated by financial temptation. The latter appears to be the result of general cost-benefit considerations, excessive expectancies that are emphasised by low-levelled incentive provision for recyclables and/or differentiated valuations related to money in general. To get a gross insight into the consumers' financial expectations, they were further asked to state for how much money per bottle they would collect their plastic bottles and bring them to a recycling centre. 34.6% reported not to do it for money; further outcomes are not statistically significant. But nevertheless, RM0.10 is both the median value and the amount being indicated the most (22.6%). In comparison to incentives provided for recyclables (about RM0.01 per bottle), the consumers' expectation could relatively be regarded inflated.

4.9 Reported Recycling Behaviour

4.9.1 Claimed Participation

Concerning the period of participation, 10.1% of the recyclers reported that they have practised recycling for less than 0.5 years, 24.7% stated between 0.5 and 2 years and the majority of 65.2% indicated a duration of more than 2 years. In order to get an insight into the recycling behaviour, the participants were asked to state individually for specific recyclable items how often recycling is usually practised on average on a scale from 1 to 5; whereas 1 means that a certain material is never and 5 means that an item is recycled very often/almost ever. Figure 4 combines the survey results differentiated by general public or consumers, recyclers and students.

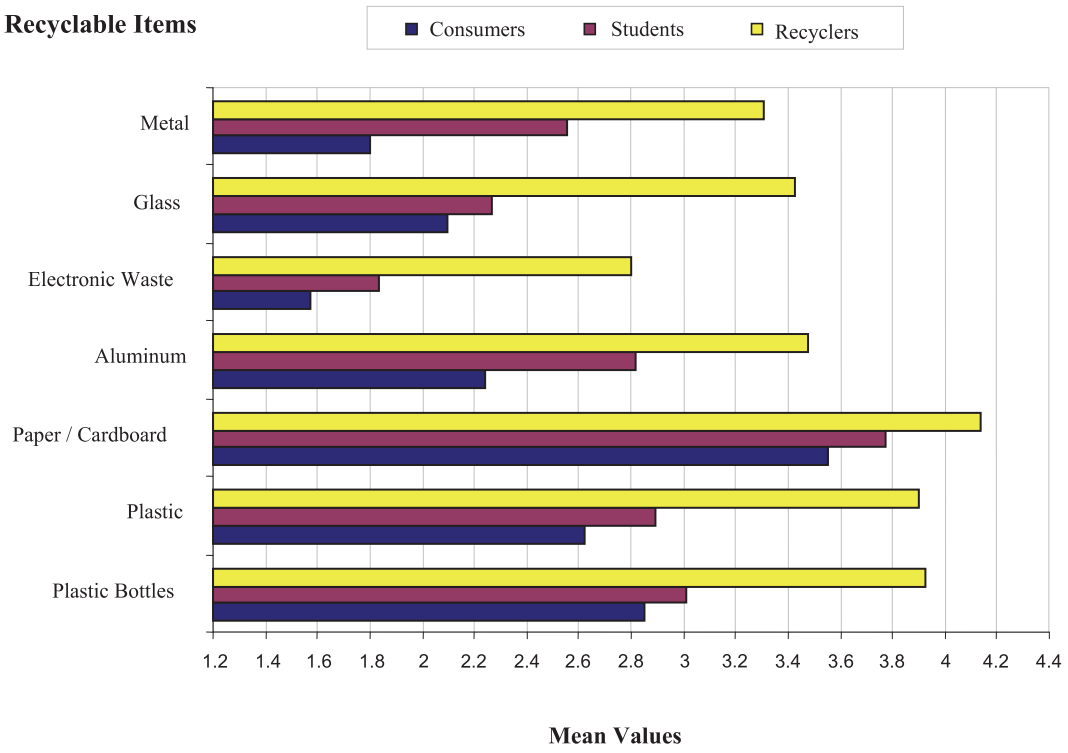

Figure 4: Reported Recycling Participation

Recyclers generally appear to recycle more often; consumers and students recycle at a comparable rate, while the average recycling intensity of students seems to be a tic more frequent. The recyclable items being preferably stated to be recycled often or very often/almost ever are similar for all groups. Recyclers prefer paper (79.7%), plastic (70.9 %) and plastic bottles (68.3%). 56.5% of the consumers preferably recycle paper, followed by plastic bottles (31.5%) and plastic (26.5%). Additionally to paper (66.5%), plastic bottles (39.1%) and plastic (34.5%), students tend to favour also aluminium (33.8 %). It should be noted that the study subjects' claimed participation frequency should be regarded over reported. In the author's opinion, due to his experience in the field, the survey does not reflect actual recycling frequency rates, but provides a gross insight into recyclable items being preferably collected.

4.9.2 Recycling Methods

The usage of recycling and collection centres is the recycling method predominantly stated.

13.3% of the recyclers reported to go there less than 1 time a month, 57.6% up to 4 times a month or 1 once a week and 29.1% stated to bring their recyclables to collection centres more often; whereas 94.5 per cent had to cover a distance of 10 km or less and 73.5% had a mileage of 5 km or less. In contrast to recycling and collection centres, 59.5 of the recyclers never use a bin, 29.7% up to one time a week and 10.7 more often. 62.7% never use mobile and/or kerbside collection programs, 31.5% up to 4 times a month or 1 once a week and 5.8% use this opportunity more often. In terms of contentment, the survey participants answered quite differentiated. 19% of the consumers, 4.9% of the students but 42.2% of the recyclers are presently not content with recycling activities and programs undertaken by governmental and non-governmental bodies. But contrary, 88% of the recyclers are pleased by Alam Flora's service provision.

4.9.3 Consumption Patterns

In order to get a gross insight into usage and consumption patterns related to beverage containers, consumers were asked to state how often specific beverage containers are usually used on average. The survey participants could choose from a scale from 1 to 5 with 1 meaning that a specific container is never and 5 that a container is used very often/almost ever. Figure 5 shows the survey results differentiated by the types of beverage containers being in usage.

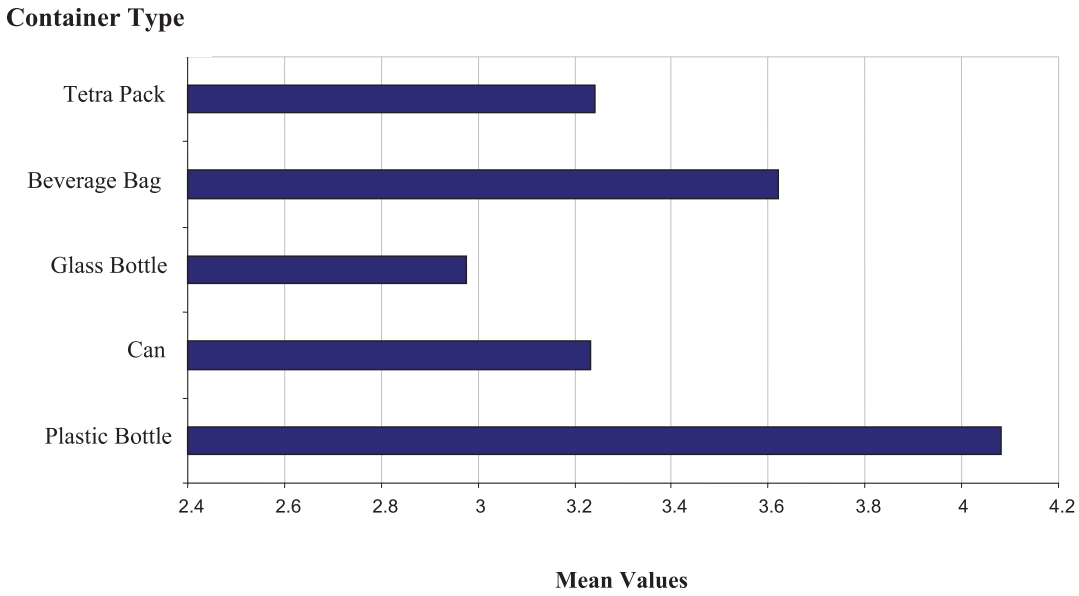

Figure 5: Reported Beverage Container Usage Frequency

78.8 of the consumers stated to consume beverages provided by plastic bottles often or very often/almost ever, while 6.0% use plastic bottles never or seldom. Beverage bags are often or very often/almost ever used by 61.1% of the participants. The participants were further asked to rank the two beverage containers being preferably consumed and used. 54% of the consumers preferred plastic bottles for drinking purposes, followed by tetra pack containers which accumulated 10.3% of the votes. Plastic bottle containers were also ranked the preferred alternative by 24.2% of the consumers. In many Malaysian households, water is traditionally being boiled for drinking purposes. To get an impression of how intense this habit is practised, the survey participants were further asked to state how often water is boiled for drinking purposes on a scale from 1 to 5; whereas 1 means that water is never and 5 means that water is

boiled very often/almost ever. Both the average boiling intensity and the frequency of boiling activities of consumers, students and recyclers is considered both high and similar. 88.7% of the students boil water often or very often/almost ever (4.4923 mean value), while 85.5% of the consumers (4.3900 mean value) and 83.6% of the recyclers (4.3544 mean value) practise the habit at a comparable rate. Hereby, plastic bottles are often used for storing purposes. To get a gross insight into the refill habit, the consumers were further asked to state how often plastic bottles were usually refilled for storing purposes on average. 24.9% of the consumers stated that they would never refill a plastic bottle, 61.7 % reported to refill between 1 and 5 times, 13.4% to refill more than 5 times and 71.2% between 1 and 10 times. The average refill intensity was 4.4031 with a standard deviation of 4.28938. The number of average refills is therefore regarded not being statistically significant. Furthermore, it is hardly possible to report the actual average number of potential refilling. Nevertheless, the survey indicates that plastic bottles are partially reused very often.

5. Conclusion

The Krones Bottle-to-Bottle Recycling Concept is potentially feasible and profitable. Working the recycling plant to capacity would generate appropriate revenue. The potential availability of PET input material is assumed to exceed the process capacity by 1865.4 per cent. The market price for processed PET material suitable for being reused in food packaging applications is assumed to find full-scale attention at the Malaysian sales market. Against the background of investigating whether the emerging Malaysian economy is in progress to let alleged PET recycling potentials slip, promising opportunities for entrepreneurial endeavours are predominantly foiled by deficiencies arising from the existing solid waste management structure. At this juncture, the anticipated availability of PET feedstream is appointed the major obstacle to PET recycling in Malaysia. The PET recovery intensity is regarded insufficient and vague, collection and trading of recyclable PET material appears to be unattractive to the informal sector. Governmental strategies to trigger recycling activities seem to be ineffective and misplaced. The institutional framework of the Malaysian solid waste management appears impractical for sustainable PET recovery operations. The resource recovery system appears still being caught at a developing stage. Short and medium term PET resource recovery potentials have to be interpreted negative. A project implementation under prevailing circumstances is assumed not be economically viable. The assumed capital profitability is far below market average and additionally expected to decrease further. Alternative entrepreneurial resource recovery concepts promising appropriate resource recovery intensity are capital-intensive and primarily depending on cooperative strategies involving well-established stakeholders. The initiation of PET recycling endeavours in Malaysia therefore highly depends on the benevolence of major stakeholders in charge.

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