

**Recycling as a Sustainable Waste Management Strategy for Singapore: An Investigation to Find Ways to Promote Singaporean's Household Waste Recycling Behaviour**

**by**

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## Table of Content

Abstract	1
Introduction	2
Factors that Motivate Recycling Behaviour	2
Waste Management and Recycling in Singapore	4
Recycling in Singapore and in Sweden	5
Objective of Study	6
Part 1. Strategies for Promoting Environmentally Responsible Behaviours: A Comparison Between Singapore and Sweden	7
Governmental Intervention in Sweden	7
Governmental Intervention in Singapore	8
Comparison of Governmental Interventions between Singapore and Sweden	8
Environmental Education in Sweden	10
Environmental Education in Singapore	11
Comparison of Environmental Education between Singapore and Sweden	11
Part 2. Empirical Study of Singaporeans' Household Waste Recycling Behaviour	12
Theoretical Framework	12
i. Theory of Planned Behaviour	12
ii. The New Ecological Paradigm Scale	13
iii. Knowledge	14
Method	15
i. Participants	15
ii. Participants' Recycling Facilities in Singapore and in Sweden	16
iii. Material	17
iv. Procedure	18
v. Statistics	19
Results	19
- Singaporeans' Ecological Worldview and Environmental Knowledge	19
- Singaporeans' Opinions on Sweden's Environmental Protection Policies and Adaptation to Swedish Culture	20
- Intention to Recycle and Recycling Frequencies in Singapore and in Sweden	20
- Motives for Recycling in Singapore and in Sweden	22
- Specific Knowledge on Recycling	25
- Predicting Intention to Recycle and Recycling Frequency in Sweden	25
- Intention to Continue Recycling in Singapore	26
Discussion	27
Conclusion	32
References	32

## **List of Tables**

Table 1.	Recycling Rates in Singapore and Sweden	5
Table 2.	Location of Recycling Facility for the Different Recyclable Household Waste in Singapore	17
Table 3.	General Environmental Issues Knowledge Items and Participants' Responses	19
Table 4.	Items Measuring Opinions towards Sweden's Environmental Protection Policies	20
Table 5.	Items Measuring Adaptation to the Swedish Culture and Participants' Responses	20
Table 6.	Comparison of Intentions to Recycle in Singapore and in Sweden	20
Table 7.	Recycling Frequencies of the Different Recyclables	21
Table 8.	Result of Factor Analysis of Motives for Recycling	22
Table 9.	Indices of Motives for Recycling	23
Table 10.	Participants' Responses on the Five Indices	24
Table 11.	Newly Arrivals' Performance on Subjective Norm and Neighbourhood Indices	24
Table 12.	Group Comparison on Subjective Norm Index	25
Table 13.	Specific Knowledge on Recycling Index and Participants' Responses	25
Table 14.	Regression Analysis to Predict Intention to Recycle in Sweden	26
Table 15.	Regression Analysis to Predict Recycling Behaviour in Sweden	26

### **List of Figures**

Figure 1.	Theory of Planned Behaviour	13
Figure 2.	Recycling Behaviour of Singaporeans	21
Figure 3.	Interactions between Recycling and Recycling Facilities	29
Figure 4.	Consumption Reduction as Sustainable Approach towards Waste Management	31

### **List of Appendices**

Appendix 1.	Sample Questionnaire	36
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## **Abstract**

Recycling is often viewed as an important aspect of an efficient and effective solid waste management system, which the Singapore government cites as a key factor for Singapore to be more sustainable in her waste management system. This study investigates the different factors that interact and influence Singaporeans' household waste recycling behaviours. This study also analyses and compares how Singapore and Sweden utilise governmental, and education interventions to promote environmentally responsible behaviours among their citizens in the hope that lessons can be learnt about effective communication strategies through the comparison. Results show that increase in accessibility of recycling facilities in Sweden has increased the recycling behaviours of a group of Singaporeans temporarily living in Sweden. For Singapore who is currently trying to promote recycling to achieve sustainability in her waste management system, such result finding is good news. Nevertheless, this study argues that sustainability can only be achieved with waste minimisation.

## **Introduction**

The term “sustainable development” is fast becoming a popular phrase. From environmentalists to politicians, people are realising that sustainable development is a concept that has to be incorporated into concrete actions if we want a life for our children that is as good as, or even better than the one we are living in now. In order to achieve the goals of sustainable development, every fabric that makes up our society needs to be examined. One area that needs close scrutiny is the issue of waste. Waste management is an area of important consideration in the pursuit for sustainable development.

Waste, when not managed properly, can pose serious health hazard (Miller, 2000, p.596). Therefore, waste management is an important issue that needs effective solutions. Landfills and incineration are popular methods many countries adopt to handle their wastes. However, even with these methods, the management of solid waste is still a major challenge constantly faced by many countries. When constant material consumption is encouraged and seen as economic progress, the “buy and discard” mentality generated results in huge amounts of solid waste (Read, 1999). As landfills start filling up and incinerators reach full capacity, governments around the world start searching for a more effective and efficient solid waste management system.

Recycling is often viewed as an important aspect of an efficient and effective solid waste management system. The term recycling is defined as “the process through which materials previously used are collected, processed, remanufactured, and reused” (Schultz et al., 1995). Generally, there are two types of recycling for materials such as glass, metals, paper, and plastics. Primary or close-loop recycling is when wastes discarded by consumers are recycled to produce new products while secondary, or open-loop recycling is when waste materials are converted into different products. It is estimated that while secondary recycling can reduce virgin material by 25% at most, primary recycling can reduce the amount of virgin material in a product by 20-90%. Organic solid waste can be recycled through composting into soil fertiliser or conditioner as topsoil or landfill cover. (Miller, 2000, p.588) Thus, recycling of waste helps to reduce the amount of waste going into landfills and incinerators. Besides being an important solid waste reduction and management strategy, it is also a way to decrease resource throughput, as using recycled material means reducing the amount of new resources needed to manufacture a new product.

### **Factors that Motivate Recycling Behaviour**

A recycling program is only successful if people support and actively participate in it. Consequently, there are many studies that investigate the motivating factors behind people’s recycling behaviours. A review by Schultz et al. (1995) showed that past studies had focused on personal factors that influence recycling behaviours. The personal factors investigated by forty-one studies included attitude, knowledge, demographic variables, and personality variables. Generally, there were positive relationships between environmental concern and recycling behaviours (Schultz, & Oskamp, 1994 as cited in Schultz et al., 1995). Studies had also found possession of knowledge on recycling differentiate between recyclers and non-recyclers (Vining, & Ebreo, 1990 as cited in Schultz et al., 1995) while research findings done on the relationship between demographic variables like age and education level and recycling behaviours were generally unclear (Schultz et al., 1995), except for gender whereby men and women were equally likely to recycle (Vining, & Ebreo, 1990; Gamba, & Oskamp, 1994 as cited in Schultz et al., 1995). Studies conducted to find relationship between personality construct and recycling behaviour tended to agree that recyclers

seemed to have a higher sense of social responsibility (Simmons, & Widmar, 1990 as cited in Schultz et al., 1995).

Schultz et al. (1995) had also highlighted situational factors as a popular area of study for researchers to find motivating influences on people's recycling behaviours. A total of thirty-nine studies were included in the review. Studies had focused on finding antecedent and consequence interventions that increased recycling behaviours. Commitment pledges (Wang, & Katzev, 1990 as cited in Schultz et al., 1995), social pressure (Burn, 1991 as cited in Schultz et al., 1995), prompts (Austin et al., 1993 as cited in Schultz et al., 1995), goal settings (Folz, 1991 as cited in Schultz et al., 1995), and barriers removal (Gamba, & Oskamp, 1994 as cited in Schultz et al., 1995) were antecedent strategies that seemed to produce significant increase in recycling behaviours. However, more studies need to be done to find out the persisting effects of these strategies. Rewards and feedbacks were two consequence interventions that had been widely investigated and research findings suggested both strategies caused an increase in recycling behaviours (Needleman, & Geller, 1992; Katzev, & Mishima, 1992 as cited in Schultz et al., 1995). However, reward strategies may only produce short-lived changes in behaviour and behaviour usually returns to baseline levels when the reward is terminated (Schultz et al., 1995).

Recent research studies continue to explore the factors that differentiate recyclers from non-recyclers with the hope of using these factors to increase recycling behaviours. A study on the relationship between value orientation and recycling behaviour suggested that inconvenience was the key factor for predicting the recycling behaviour of people who were more individualistic or had a lower economic status. For people who had collectivistic value orientation whereby sharing, duties, and obligations were strongly valued, or for people who had more internal locus of control, beliefs about the importance of recycling were positively related to the tendency to recycle. (McCarty, & Shrum, 2001)

Thøgersen (1996) also suggested that people tended to classify environmental behaviour like recycling as a moral responsibility and obligation, especially in affluent industrial societies. Therefore, offering reward programs to encourage recycling behaviours may actually reduce the feeling of obligation, causing negative effects on the targeted behaviour. Instead of feeling morally obligated to recycle, people may start weighing the private costs and benefits of recycling. This may result in a decrease in recycling behaviours, as people realise they can afford to forgo the reward in view of the higher cost they incur when they recycle.

Researchers who are interested in recycling behaviour are also synthesizing previous findings into a theoretical framework. Wastepaper recycling had been studied using Ajzen's Theory of Planned Behaviour (Cheung et al., 1999). Fransson and Garling (1999) and Tucker et al. (1998) had also proposed new models to understand recycling and other environmentally responsible behaviours. Other research areas include assessing the efficiency of different recycling program such as kerbside recycling scheme (Perrin, & Barton, 2001). The wealth of research findings also included research studies from other countries and cultures like China where attitude towards recycling was compared between the rural and urban population (Chung, & Poon, 2000), Mexico where efficiency of formal and informal recycling schemes were assessed (Ojeda-Benitez et al., 2002) etc. This shows that the issue of recycling has gained considerable attention and importance worldwide.

Like many countries, Singapore faces solid waste problem. The government recognises the importance and urgency of dealing with Singapore's solid waste problem in an effective and sustainable way. In *The Singapore Green Plan 2012*, the report Singapore submitted to the World Summit on Sustainable Development at Johannesburg, recycling is cited as a key factor for Singapore to be more sustainable in her waste management system (Chua, 2002, p.3). The Singapore government has made the first step by identifying a problem and suggesting a possible solution. This study attempts to contribute to the solution by investigating the different factors that interact and influence recycling behaviour, specifically Singaporeans' household waste recycling behaviours.

### **Waste Management and Recycling in Singapore**

Singapore is a small city island state located at the southern tip of the Malayan peninsula. The main island, together with 57 smaller islands within her territory, is 137 kilometres north of the equator. Singapore has a population of 4,131,200 people. With only 682 square kilometre of land and a population density of 6,055 per square kilometre, Singapore faces severe land scarcity problem. (Statistics Singapore, 2002)

Prior to 1979, solid wastes collected in Singapore were disposed of by dumping in landfills. However, as Singapore developed and faced increasing land scarcity problem, incineration was preferred over landfills. Even though incineration as a waste management system costs six to seven times more to operate than dumping, it can reduce the volume of waste by 90% and weight by 80%. This is an advantage for land-scarce Singapore, who cannot afford more land for landfills. (Foo, 1997) Currently, Singapore has 4 incinerator plants at Ulu Pandan, Tuas, Senoko, and Tuas South to handle the solid waste generated (National Environment Agency, 2002b).

Nevertheless, the amount of solid waste generated in Singapore steadily increases over the years with increasing affluence and changing lifestyles. From 1,260 tonnes in 1970 to 7,600 tonnes in 2000, this is a six-fold increase in three decades of the solid waste disposed in Singapore (Cheng Sim Jeow, personal communication, September 13, 2002). The total amount of waste collected in the year 2001 was 2.8 million tonnes with domestic refuse accounting for 49% of the refuse originated and non-domestic refuse from industrial premises and institutions accounting for the other 51%. This statistic translates into 0.93 kilograms of domestic waste generated per Singaporean per day. (National Environment Agency, 2002b) The incinerator plants at Ulu Pandan, Tuas, and Senoko are reaching their designed capacities. Singapore has just opened a new landfill, Semakau Landfill, in 1999 at an estimated construction cost of S\$1.2 billion as other landfills have reached their full capacities. (Foo, 1997) If the amount of solid waste in Singapore is allowed to grow in the trend projected from the current amount of solid waste generated, it is estimated that Singapore will need a new incineration plant every five-seven years and a new landfill site every thirty years (Cheng Sim Jeow, personal communication, September 13, 2002). This is expensive and unsustainable, and a more permanent and sustainable waste management system is needed.

In 1991, the Ministry of Environment of Singapore set up a Waste Minimisation Unit to spearhead waste minimisation and recycling in Singapore. By February 1992, the unit was upgraded to departmental level with a new name called the Waste Minimisation Department (WMD) to emphasise Singapore's commitment to promote a more sustainable waste management strategy. The function of WMD was to develop, promote, and oversee the implementation of programmes on waste minimisation and recycling in all sectors of the community. In November 1990, a three-

month pilot project on the segregation and recovery of waste paper and plastics from household waste was launched in three housing estates of different income strata. The objective of the project was to gauge the response of the public towards recycling of household waste. (Foo, 1997)

A questionnaire survey revealed that 96% of the residents in the pilot project were supportive of the new recycling scheme and participated in it at least once. After the pilot project in 1990, recycling schemes were started in other public and private housing estates. While initial participation rates from residents in pilot recycling schemes were good, a long term study conducted for one of the housing estates 2 years after the initiation of a recycling project showed unsustainable participation rate after the initial excitement of the new scheme had died down. Only 9% of the respondents practised regular recycling while 11% recycled “some of the time”. 64% recycled once in a while during certain special events like Singapore’s annual Clean and Green campaign while 16% did not recycle at all. (Foo, 1997)

The study suggested several strategies for future recycling scheme to have sustained success in Singapore. One of the strategies was to improve the operational aspects of recycling schemes by improving convenience like placing recycling bins in more accessible and visible location. (Foo, 1997) However, it remains to be seen whether improving the convenience of recycling facilities will increase household waste recycling behaviours of Singaporeans. Time, money, and resources can be saved if a study can be conducted first to find out the feasibility of this strategy before it is fully implemented.

### **Recycling in Singapore and in Sweden**

Singapore highlighted recycling as one of the key areas for Singapore to reach sustainability in the report submitted to the World Summit on Sustainable Development at Johannesburg (Chua, 2002, p.3). It is interesting to see how much Singaporeans are recycling as compared to other countries. It allows Singapore to gauge how far behind or ahead she is in comparison. The following table compares the recycling rate of different recyclables in Singapore and Sweden.

Table 1: Recycling Rates in Singapore and Sweden (in %)

	<b>Singapore</b>	<b>Sweden</b>
<b>Paper / Cardboard</b>	36	40
<b>Plastic</b>	10	34
<b>Glass</b>	15	84

(Swedish Environmental Protection Agency, 2000b; Chua, 2002, p.4)

The recycling rates show that Sweden is recycling more than Singapore. Singapore’s lower recycling rate compared to Sweden’s suggests that Sweden is more effective in her efforts in promoting household waste recycling among her citizens. For Singapore who is trying to promote recycling, it will be interesting to see how similar and different Singapore is compared to Sweden in the way both countries go about promoting environmentally responsible behaviours. Such a comparison may help to shed some light as to whether Singapore is going in the right direction in the promotional efforts before too much time, efforts, and resources are wasted.

## Objective of Study

There are two objectives to this study. The first objective is to analyse and compare the strategies Singapore and Sweden utilise for promoting environmentally responsible behaviours among their citizens. Lessons can be learnt about effective communication strategies by comparing the similarities and differences in the strategies utilise by the two countries. There is a possibility that Singapore can improve her current communication strategy by looking at the different strategies Sweden has utilised.

There are numerous ways to encourage environmentally responsible behaviours. Gardner and Stern (1996) highlighted four interventions that were frequently used to encourage environmentally responsible behaviours. The four interventions are religious and moral controls, educational interventions, government laws and incentives, and small-group or community management arrangements (Gardner, & Stern, 1996, p.6). Gardner and Stern (1996) also argued that because there were different factors that could influence environmentally responsible behaviours, incorporating different interventions would have a better success rate than using only one intervention (p.159). This study recognises that Singapore and Sweden can use different programs with different interventions to promote environmental responsible behaviours among their citizens. The work of many non-governmental organisations is also important in the promotion of environmental responsible behaviours. Nevertheless, this study will only focus on how the two countries utilise governmental, and education interventions to increase prosocial and pro-environmental behaviours among their citizens.

As mentioned earlier, this study will also investigate the different factors that interact and influence Singaporeans' household waste recycling behaviours. The review of Singapore's pilot recycling scheme suggested that improving accessibility of recycling facilities would increase Singaporean's household waste behaviour. This study's second objective is to investigate whether Singaporeans' recycling behaviour differs or not when situational factor, specifically recycling facilities' accessibility, is changed. This study also explores the effects on Singaporeans' recycling behaviour when social factor changes. In addition, attempts are made to find the underlying motives that cause Singaporeans' to change their behaviour.

A focus on accessibility of recycling facilities' effect on recycling behaviour in this study does not discount other external factors from having similar influence on the behaviour. However, this study will only look at accessibility of recycling facilities, which is the scope delineated from the review on Singapore's pilot recycling scheme. Similarly, there are many social and personal factors that can affect a person's recycling behaviour. Nevertheless, this study will only analyse the social factors and motives that cause Singaporean's possible changes in recycling behaviour under the guidance of the Theory of Planned Behaviour (Ajzen, 1991) and the New Ecological Paradigm scale (Dunlap et al., 2000). Another factor that will be included in the analysis is the effects of possession of specific recycling knowledge on recycling behaviour.

## **Part 1. Strategies for Promoting Environmentally Responsible Behaviours: A Comparison Between Singapore and Sweden**

### **Governmental Intervention in Sweden**

Located in Northern Europe, Sweden has a long history that dates back to the Viking period. With a land area of 449,964 square kilometres and a population of 8,873,052 people, Sweden is sparsely populated compared to Singapore. (*World Factbook: Sweden*, 2002)

The Swedish government has stated sustainable development as an overall objective of all government policies (Swedish National Committee on Agenda 21 and Habitat, 2002, p.83). On 1 January 1999, the Swedish government adopted the Environmental Code. The Code consists of a consolidated body of stringent and comprehensive environmental legislation with the purpose to ensure a healthy and sound environment for the present and future generations. The Environmental Code is considered a more effective instrument than previous legislation for promoting progress towards sustainable development with its overall objectives, general rules of consideration, and new instruments such as environmental quality standards. (p.46)

In the same year, the Swedish Parliament also adopted 15 new objectives for environmental quality with the aim of fulfilling these objectives in order to hand over a society to the next generation in which major environmental problems had been solved (Swedish Environmental Protection Agency, n.d.). These 15 objectives and the Environmental Code show Sweden's commitment to the course of transforming Sweden into a sustainable society. Commitment by top political officials serves as a model for the citizens, creating synergy towards achieving sustainable development.

The promotion of Agenda 21 plans and activities, which is the result of the Rio Conference in 1992, also allows the Swedish government to bring all the objectives and strategies adopted to a local level, whereby everybody can participate in. The government places great importance to bottom-up Agenda 21 activities as they build local commitment among local authorities and the local population (Swedish National Committee, 2002, p.9).

A survey conducted four years after the Rio conference in 1996 showed that 40% of Swedes had heard of Agenda 21, 20% had learnt about it through written information, and 3% had personally taken part in an Agenda 21 project (Swedish National Committee on Agenda 21, 1997b). In 2001, a study conducted by Umeå University showed that almost 70% of Sweden's 289 local authorities had adopted a local action plan and over 65% of the local authorities had employed a full time or part time employee to specifically coordinate local Agenda 21 activities (Swedish National Committee, 2002, p.19).

The local press, information meetings, information materials for households, environmental fairs or exhibitions, and environmental teams or study circles are the channels used to achieve such widespread participation in Agenda 21 activities (Swedish National Committee, 1997b). Special information measures are also developed to specifically target students and teachers in schools and day nurseries, trade associations, and business enterprises. The municipalities help spread the messages of Agenda 21 by distributing information to their own employees. Many town councils and private employers are following the example set by the municipalities. Written information about municipal activities on the environment and Agenda 21 is disseminated through municipal

bulletins and “eco-pages” in the local telephone directory. (Swedish National Committee on Agenda 21, 1997a)

The enthusiasm for Agenda 21 at the local level in Sweden may be due to several reasons. One of them is the early involvement of the local authorities. The bottom-up perspective and public participation strategy adopted by the Swedish government suits Swedish local authorities, which traditionally have strong power and position (Swedish National Committee, 2002, p.18). Moreover, Swedish municipalities have a great deal of responsibilities in the field of environment and health protections, as well as activities like energy supply, water, sewerage, and public transport. This may make it easier for Swedish municipals to carry the torch when Agenda 21 arrives after the 1992 Rio conference (Swedish National Committee, 1997b). In addition, the government, the Swedish Association of Local Authorities and the Environmental Advisory Council have arranged a series of seminars all over Sweden to publicise Agenda 21 and to create interest in sustainable development issues (Swedish National Committee, 2002, p.19). Add to a strong tradition of nature conservation and protection of green areas in Sweden due to ancient customary law of the right of access to all land, including private land (p.18), it may make it easier for the Swedish government to promote environmental consciousness among her citizens.

### **Governmental Intervention in Singapore**

The Ministry of Environment is the main body in charge of formulating environmental policies in Singapore. Regulatory instruments are the traditional focus of Singapore’s environmental policies. Examples of these can be seen from the ministry’s policies in the control of air and water pollution, where violations of strict laws and regulations will result in stiff financial penalties. Due to Singapore’s land scarcity problem, strict planning and building controls are also in effect to prevent Singapore from land-use, environmental, and transportations problems. (Foo, 1996)

The use of regulatory instruments to enforce Singapore’s environmental policies has been administered smoothly over the years. Examples of Singapore’s success in the use of regulatory instruments can be seen from the congestion free roads (Goh, 2002) and the clean air and water Singaporeans get to enjoy (Foo, 1996). Several factors may have contributed to the success. One of the factors is the far-sightedness of Singapore’s political leaders and bureaucrats who organise and implement these instruments at a very early stage of Singapore’s development. Early implementation means putting a cap on problems before they reach large-scale proportions, which will be very difficult to overcome. The small size of Singapore and the one-level government may also make it easier for the Ministry of Environment to administer, co-ordinate, and manage its policies. The temperament of Singaporeans is another reason why Singapore government can constantly use regulatory instruments to implement its policies. Singaporeans are generally law-abiding citizens, who are co-operative and supportive of the government. The public generally believes in and respects the country’s laws and statutes, which help to reduce the problem of non-compliance. (Foo, 1996)

### **Comparison of Governmental Interventions between Singapore and Sweden**

The environmental agenda is highly placed in both countries’ governments’ priority list. For Singapore, the land scarcity problem and a lack of natural resource are just some of the issues that highlight the fragility of her existence. The survival of Singapore depends on being sustainable. It means that Singapore needs to be “striking the right balance with Nature, giving it the care and

respect due to ensure that it does not give up on us” (Chua, 2002, p.2). While the Singapore government adopts conservation and balance as the country’s attitude towards the environment (Chua, 2002, p.2), the Swedish government adopts a national strategy towards sustainable development (Swedish National Committee, 2002, p.83).

Even though both countries have adopted positive protective attitude towards the environment, the way to achieve sustainability and to encourage the public’s environmentally responsible behaviours is very different between Singapore and Sweden. The Singapore government prefers using the law and regulations to enforce her policies, adopting a top-down approach, whereas the Swedish government adopts a bottom-up approach through her objective-oriented style of management. The principle of the objective-oriented management approach is to specify operational objectives but give the implementers freedom as regards to ways and means to achieve the objectives within a specified timeframe. (Swedish National Committee, 2002, p.42) Together with the government’s strong endorsement of local initiative in Agenda 21 activities, it shows the Swedish government’s preference for bottom-up approach compared to Singapore’s top-down approach.

Sweden’s success in encouraging public support for environmental policies and goals may be due to the objective-oriented management approach the government undertake in its way of governance. The freedom given to implementers of policies allows creativity, which is crucial for finding innovative ways to meet the objectives in a shorter time. As Einstein says, “We can’t solve problems by using the same kind of thinking we used when we created them”. Meeting the goals of sustainable development require us to think out of the usual box. The freedom bestows on the implementers may be the essential creative avenue to generate new solutions to old problems.

The higher recycling rate in Sweden as compared to Singapore is a possible reflection of the different ways the two government undertake in implementing environmental policies and in this case, recycling initiative. The issue of recycling is an essential part of the Environmental Code adopted by the Swedish government. Section 1 of the Environmental Code states that “reuse and recycling, as well as other management of materials, raw materials and energy are encouraged with a view to establishing and maintaining natural cycles” (Swedish National Committee, 2002, p.47). Recycling of household waste also get a head start in Sweden due to local Agenda 21 activities. This is another example of the objective-oriented management approach that gives the implementers the freedom to find their own solutions. Many local Agenda 21 action plans start by looking at waste issues and introducing recycling, source separation, and composting to their municipals (p.19). In fact, waste, pre-separation and recycling is one of the most rapidly developed Agenda 21 projects in Sweden following the Rio conference (Swedish National Committee, 1997b).

Compared to Sweden’s bottom-up approach, the Singapore government uses its usual top-down approach by setting up the National Environment Agency (NEA) under the Ministry of Environment to help Singapore achieves long term recycling policies and goals targeted in *The Singapore Green Plan 2012* (Chua, 2002, p.4; The Straits Times, 2002, May 25). In April 2001, NEA, which has taken over the role of WMD, launched a National Recycling Programme to help Singapore achieve her recycling targets (Cheng Sim Jeow, personal communication, September 13, 2002).

When people engage in activities based on their own internal motives and initiative, they are more likely to persist in the behaviour. This is especially so when there is an absence of any

obvious external force or reward, as people will see the action as something they have chosen themselves. (Gardner, & Stern, 1996, p.86) For the Swedes, when they are allowed to set up their own household waste recycling plans, it is possible that they are more likely to engage in recycling behaviour as they see it as their own chosen action. For Singaporean, recycling programs are set up by the government and they may see themselves as passive consumers of a recycling scheme. There is no internalisation of the behaviour for Singaporeans. This may be the difference between a bottom-up and top-down approach and may also explain the difference in recycling rates between the two countries. Singapore may need to rethink her preference for using top-down approach when implementing environmental policies if long-term sustainable result is the goal. Singapore may need to reassess her preference for using regulatory instruments to implement environmental policies as it may only produce passive participants who do not internalise the targeted behaviour.

### **Environmental Education in Sweden**

People's attitudes and lifestyles are established at an early age. Gardner and Stern (1996) pointed out that environmental education in schools had important long-term effect on people's awareness and attitude towards environmental issues (p.92). To produce changes in basic environmental understanding, environmental education must start early. The teaching of sustainable development starts at pre-school level in Sweden to ensure people's continuous interests (Swedish National Committee, 2002, p.58). Early exposure helps to develop children's sense of responsibility for nature and help them to acquire experience and basic knowledge about the relations between human, nature, and society. Children attending nursery in Sweden spend a lot of time outdoors interacting with nature. Recycling of waste is also one of the activities the children undertake everyday at school. (Swedish National Committee, 1997a)

It is enacted in Sweden's School Education Act that the teaching of sustainable development is compulsory (Swedish National Committee, 2002, p.58). In fact, the first few sections of the Education Act, which take precedence over the curricula, state that "each individual active in school shall promote respect for our common environment" (Swedish National Committee, 1997a). Thus, sustainable development has a prominent place in the Swedish school syllabus, especially in the 9-year compulsory school and the upper secondary school as well as for local authority administered adult education. Sweden's new teacher training program is also training prospective teachers to be able to relay sustainable development issues to their students. (Swedish National Committee, 2002, p.59)

Schools in Sweden are certified for their involvement in environmental work. One of the certification systems is the Keep Sweden Clean Foundation (Green Flag) and the other is by the National Agency for Education (Environmental Schools) (Swedish National Committee, 2002, p.64). Both systems certify schools that involve pupils, teachers and other staff that work on achieving objectives in environmental areas. The National Agency for Education also requires certified schools to include environmental, work environment, and health issues in their curricula and syllabuses. A total of 538 day-care centres and schools in Sweden have received the Green Flag while 27 schools are certified as Environmental Schools by the National Agency of Education. (p.65) It is reported that children, aged under 15, are one of the groups in Sweden that are highly involved in environmental work through activities in schools, day nurseries etc (Swedish National Committee, 1997b).

## **Environmental Education in Singapore**

In Singapore, developing environmental sensibilities and awareness is one of the themes taught in the formal school curriculum. Environmental issues are incorporated in subjects like science, social studies, geography, and the languages. At elementary and high school level, the focus of environmental education is on generating awareness and interest. At the pre-university level, students are given opportunities to discuss and debate environmental issues in the language classes. (Haslinda Zamani, personal communication, August 28, 2002)

To demonstrate care and concern for the environment, schools take part in activities like adopting a park, or cleaning the beach. Touring water treatment plants, sewerage, and solid waste disposal facilities are also activities undertaken by schools to educate students about resource usage. For schools that encourage their students to develop “green” projects or initiatives, they are given a chance to submit and showcase their projects in competitions like the Young Innovators’ Fair or the Green Leaf Merit Award. The environmental campaign, Clean and Green Week, organised by the NEA annually to educate the public on various environmental issues, is also an activity schools in Singapore are involved in. The 2001 Clean and Green Week had more than 148,000 students from 15 educational institutions involved in 570 environmental activities. (Haslinda Zamani, personal communication, August 28, 2002) Some schools also set up environmental clubs for students who are interested to join as extra-curriculum activity (Chua, 2002, p.35).

Like Sweden, Singapore recognises that efforts at instilling environmental consciousness need to start early in order to have long-term effects on children. Pre-schoolers were an important target group at the 2001 Clean and Green Week, which was seen by the launch of the *Captain Green Book Series* and *Songs for Pre-schoolers* to teach pre-schoolers about the fun of recycling (National Environment Agency, 2002c). Singapore recognises that it is important for children to know from young the importance of conserving and protecting the environment so that as adults, they will adopt environmentally responsible attitude and behaviours. As scripted in Singapore’s guiding principle for the national education curriculum design, “when our young know and appreciate the features, constraints, values and aspirations of Singapore, they can play an active part in the community and the nation, to mould the kind of society that Singapore desires and needs to sustain her stability and growth” (Ministry of Education, 2002).

### **Comparison of Environmental Education between Singapore and Sweden**

Comparison of the two countries’ strategy of using environmental education to promote environmental consciousness among their citizens shows more similarities than differences. Both countries integrate environmental education into the curriculum of formal education. Children are also encouraged to be more involved in environmental work by different activities organised by schools. Nevertheless, while both Sweden and Singapore have invested in using formal education to raise environmental consciousness in their people, Sweden’s environmental education seems more comprehensive and well integrated. This difference may be due to Singapore’s education system being slower in integrating environmental issues into the education system.

The Swedish society has had the time to grow and to focus on issues other than national survival. For Singapore, having just gained independence in 1965, the last three decades have been spent trying to ensure the survival of the nation. The focus and drive for Singapore’s survival is evidenced from the evolution of Singapore’s education system. The 1960s saw an education system

that is survival-driven. The key strategy is to lay the foundation and build a socially cohesive citizenry and a skilled workforce. By the 1980s, with Singapore on track in growth and progress as a nation, the education system shifts its focus to one that is efficiency-driven so as to reduce educational wastage and to raise overall education standards. (Ministry of Education, 2002)

Today, the education system realise that globalisation has made the survival of Singapore intricately linked with global issues. Environmental issue is one that weaves the fate of all nations in the world together and it needs to be included in Singapore's education curriculum. (Ministry of Education, 2002) The Singapore education system may be quick to include environmental education into its formal curriculum. This is to ensure that young Singaporeans are keep updated so that when it is time for them to contribute to the society, they possess the correct attitude and skill. However, it may still be slower compared to Sweden. Therefore, it is expected that result from Singapore' environmental education will only show later (Lee, 2000, p.13).

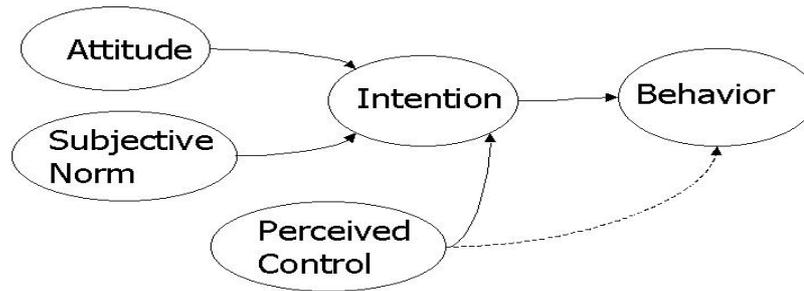
## **Part 2. Empirical Study of Singaporeans' Household Waste Recycling Behaviour**

### **Theoretical Framework**

Explaining why humans engage in certain behaviours in all its complexity is a difficult task. From looking at physiological processes that initiate behaviours to looking at social institutions that influence behaviours, the study of human behaviours can be approached from many different levels. Ajzen's Theory of Planned Behaviour is chosen to inspire the choice of different factors investigated as possible causes of household waste recycling behaviour (Ajzen, 1991). The New Ecological Paradigm scale is used to measure Singaporeans' worldview on the environment and to understand the social structures Singaporeans are being exposed to and influenced by (Dunlap et al., 2000). The possession of knowledge and its influence on recycling behaviour will also be discussed.

#### **i. Theory of Planned Behaviour**

In the Theory of Planned Behaviour, the occurrence of a behaviour is determined by behavioural intention, which is defined as the motivational factors that influence the behaviour. In another words, behavioural intentions are indications of how hard people are willing to try and how much effort they are planning to exert in order to perform the behaviour. Behavioural intention is in turn determined by three conceptually distinct concepts: attitudes towards the behaviour, subjective norm, and perceived behavioural control. Attitude toward the behaviour refers to the degree a person has a favourable or unfavourable evaluation or appraisal of the behaviour. Subjective norm is defined as the perceived social pressure to perform or not to perform the behaviour, and perceived behavioural control is defined as the perceived ease or difficulty of performing the behaviour. It is also assumed to reflect past experiences as well as anticipated hindrance and barriers. Thus, the more favourable the attitude and subjective norm towards the behaviour, the greater the perceived behavioural control, the stronger a person's intention will be to perform the behaviour, the more likely the behaviour under consideration will occur. Figure 1 depicts a schematic explanation of the Theory of Planned Behaviour. (Ajzen, 1991)



**Figure 1: Theory of Planned Behaviour (Ajzen, 1991)**

The Theory of Planned Behaviour has been used extensively to examine a wide variety of behaviours with considerable success. The behaviours under examination included condom use, premarital sex, attending health checks, class attendance, various leisure activities, participation in regular exercise, violating driving regulations, and dishonest behaviours such as cheating on an examinations and shoplifting. The general findings supported the theory, that the three concepts, attitude towards the behaviour, subjective norm, and perceived behavioural control, had predictive power in predicting behavioural intention and actual behaviour. (Cheung et al., 1999)

This study utilises Ajzen’s theory to see if the three concepts and behavioural intention predict Singaporeans’ household waste recycling behaviour. As behavioural intention, perceived behavioural control, attitude towards the behaviour, and subjective norm all reveals a different aspect of behaviour, each of these concepts can serve as a point of attack in the attempts to change the behaviour under consideration. Therefore, knowing how Singaporeans’ responses are to these concepts can help Singapore focus in her attempts to increase Singaporeans’ recycling habits.

## **ii. The New Ecological Paradigm Scale**

In 1978, Dunlap and Van Liere developed a 12-item Likert scale called the New Environmental Paradigm (NEP) scale. The scale was developed to measure the public’s awareness of environmental issues, which had increased due to the emergence of environmental problems both locally and globally. The scale taps into a person’s beliefs about the nature of Earth and human’s relationship with Earth. Dunlap and Van Liere used the term “paradigm” to suggest that the NEP scale measured a coherent cognitive structure or worldview. (Stern et al, 1995) A high score on the scale reflects a pro-ecological orientation and suggests a leaning towards pro-environmental beliefs and attitudes on a wide range of issues. The scale has been broadly used. It has been used to examine environmental orientations of ethnic minorities in the United States as well as residents of countries such as Canada, Sweden, the Baltic states, Turkey, and Japan and college students in several Latin America countries and Spain (Dunlap et al., 2000).

In 2000, a revised NEP scale, called the New Ecological Paradigm scale, was published. The new scale continues to measure the endorsement of an ecological worldview. To provide more comprehensive coverage, the number of items in the new scale was increased to 15 items. The new scale was also corrected from a lack of balance in item direction, and outmoded and sexist terminology from the original scale. Tests done on the New Ecological Paradigm scale showed it possessed predictive and construct validity. Its internal consistency had also improved slightly from the original scale from alpha of .81 to .83. (Dunlap et al., 2000) To the best of this study’s knowledge, neither the NEP scale nor the revised version has ever been administered on Singaporeans.

While attitude-behaviour theories, like the Theory of Planned Behaviour, is useful for predicting specific behaviours, they do not explain the social and various institutional contexts that shape the relevant attitudes and behaviour (Guagnano et al., 1995 as cited in Stern et al., 1995). The New Ecological Paradigm scale is used as a tool to link and to explain the social structure and socialization processes that influence specific attitude and behaviour (Stern et al., 1995). This study attempts to use the New Ecological Paradigm scale on Singaporeans to understand the social structure Singaporeans are exposed to and its influence on Singaporeans' household waste recycling behaviours.

### **iii. Knowledge**

Research findings suggest a link between knowledge and behaviour. Oskamp et al. (1991) suggested that knowledge about the specifics of recycling was more closely related to recycling behaviour than knowledge about global environmental issues (as cited in Schultz et al., 1995). Schultz et al. (1995) found similar findings in three other studies. Gardner and Stern (1996) argued that a lack of information could be a serious barrier to action (p.80). Therefore, even if a person has pro-environmental attitude or belief, a lack in information may result in the person being unable to act effectively on his/her attitude and belief.

In 2002, it was reported that up to 70% of the waste Singaporeans put out for recycling could not be recycled. It was reported that the waste was either not suitable for recycling or they were damaged beyond recovery. (Kaur, 2002, October 21) The report reflects Singaporeans' ignorance of what can or cannot be recycled. It suggests that Singaporeans lack specific knowledge on recycling.

Thus, it is suggested that the ability to recycle is determined by the ability to acquire the skill to recycle through possession of specific recycling knowledge. Therefore, possession of knowledge on how to recycle may be important for recycling behaviour to be exhibited. Possession of general knowledge on environmental issues may not predict specific environmentally responsible behaviour like recycling because the knowledge conveyed may not be enough for acquiring the skill to recycle.

Based on the theoretical framework outlined above and in relations to Singaporeans, this study hypothesises that:

1. Moving from Singapore to Sweden increases the physical accessibility of household waste recycling facilities as compared to accessibility of recycling facilities in Singapore.
2. This change is expected to strengthen attitude, perceived behavioural control, and social pressure towards recycling, and thereby, increases the intentions to recycle household wastes.
3. An increase in intention to recycle increases actual recycling behaviour.
4. Moving from Singapore to Sweden increases Singaporeans' knowledge regarding recycling of household wastes.

5. Recycling of household wastes increases when possession of specific knowledge regarding recycling increases.
6. Moving from Singapore to Sweden will strengthen Singaporean's pro-environmental beliefs and attitude.

## **Method**

### **i. Participants**

The procurement of submarines by the Singapore Navy from the Swedish navy had resulted in a group of Singapore naval servicemen and their families to relocate temporarily to Karlskrona, Sweden. Some of them arrived at the end of July 2002, whereas the others had been in Sweden for some time. For the purpose of this study, this group of Singaporeans was recruited as participants and they were divided into two groups according to their length of stay in Sweden. The two groups are described below.

The first group of participants (hereafter called newly arrivals) consisted of 26 Singaporeans (10 female, 16 male) that were newly arrivals to Sweden. Age of the participants ranged from 24 to 36 years old with a mean age of 26 years 4 months. In terms of education qualification, 27% of the participants completed high school education, 8% completed junior college or equivalent education, 58% completed tertiary level education, and 8% had postgraduate qualifications.

For the newly arrivals, this was the first time they would be living in Sweden with 4% of them living by themselves, 15% living together with colleagues, 50% staying with their husbands or wives, and 31% staying with their spouses and children. All of the participants had moved from high-rise public housing in Singapore to apartments in Karlskrona.

The newly arrivals were re-surveyed 6 weeks later to assess their recycling behaviour in Sweden. A total of 23 participants completed this part of the study, with 2 female participants and 1 male participant dropping out of the study. The response rate was 88%.

The second group (hereafter called longer stayers) consisted of 57 Singaporeans, of which 42 completed the study, generating a response rate of 74%. The group included 14 females and 27 males (one participant did not provide any demographic information). The mean age of this group was 27 years 7 months with an age range of 23 to 41 years old. In terms of education qualification, 24% of the participants completed high school education, and 63% finished tertiary level education. There were 12% with postgraduate qualification.

The length of stay for the longer stayers ranged from 4 months to 54 months. Even though it seemed that the length of stay for the longer stayers had a wide range, only 1 participant had stayed 4 months and 1 for 54 months with most participants having stayed 24 months, generating a mean stay of 22.5 months. All participants except for one lived in Sweden for the first time. In Sweden, all participants were living in apartments with 5% living by themselves, 32% living with colleagues, 51% living with their husbands or wives, and 12% living with their spouses and children. A total of 40 participants were living in high-rise public housing in Singapore with 1 participant living in a private apartment. Except for length of stay, there was no significant difference in demographics between the two groups.

## ii. Participants' Recycling Facilities in Singapore and in Sweden

In Singapore, waste recycling centres are set up by the Ministry of Environment in hotels, hospitals, schools, offices, factories, clubhouses, and residential buildings. These are "in-house" waste recycling centres catering only for a targeted group of users. By 1995, 1,255 "in house" recycling centres were set up. With the sponsorships of private organisations, the ministry also set up public recycling centres across the islands. These public recycling centres are located near residential areas to encourage recycling among nearby residents who do not have access to other kinds of recycling facilities. These centres contain bins for the recycling of "dry" recyclable waste like paper, plastics, and cans. (Foo, 1997) Today, there are 165 public recycling facilities spread throughout the country (National Environment Agency, 2002a). Pick-up service is also available to some residents living in high-rise public housing after the launch of a National Recycling Programme in April 2001 (Cheng Sim Jeow, personal communication, September 13, 2002).

Among the newly arrivals, 19% had recycling bins for different recyclable located within walking distances to their Singapore residences, 35% had pick-up services while 35% had no access to recycling facilities at all. There were 4% who did not know whether they had any recycling facilities at their Singapore residence, and 8% stated that they had recycling services very similar to pick-up services except that special recycling bags were made available to them.

For the longer stayers, 10% had recycling bins for different recyclable located within walking distances to their Singapore residences, 8% had pick-up services while 58% had no access to recycling facilities at all. There were 5% who indicated that either recycling facilities were available but were too far to walk from their residences or that economic incentives were included in their residences' recycling program. The remaining 20% did not know if their residences were involved in any recycling program or not. Analysis shows that more participants in the newly arrivals group have access to recycling facilities in Singapore compared to the longer stayers group ( $p=.001$ ).

In Sweden, different recycling schemes are available for the recycling of different household wastes. Taking Karlskrona as an example, the municipality where all the participants of this study live in, recycling facilities are available for paper, glass, metal, rigid and soft plastics, and carton. Karlskrona municipality is also in the process of introducing the system of sorting combustible waste material and compostable waste matter to its residents. (Anna Palminger, personal communication, September 17, 2002) Most residential apartment blocks have a waste sorting and recycling room available for use that is within walking distance. Each sorting room will have different bins for different recyclables. (Karl-Johan Svärd, personal communication, May 25, 2002) For both groups of participants, this is the type of household waste recycling facility they have accessed to at their residential apartments in Karlskrona.

In addition, there are 58 public recycling centres spread throughout the municipal for the convenience of residents who do not have access to recycling facilities in their own residential estate. When buying canned and bottled drinks, residents have to pay a deposit for the metal can, glass or plastic bottle, which add as an incentive for residents to recycle the drinks package in exchange for money back. (Anna Palminger, personal communication, September 17, 2002)

A comparison of the number of public recycling facilities may make Singapore look better equipped than residents living in Karlskrona, Sweden. However, the numbers are misleading. First of all, most residents in Karlskrona already have a conveniently located waste sorting and recycling room within their own housing estate. The 58 public recycling centres are additional facilities to make recycling easier for Karlskrona residents.

Most importantly, the 165 public recycling facilities in Singapore is a cumulative number of public recycling facilities catering for either wastepaper, drink cans, plastic bottles, or glass bottles. The count of one recycling facility does not necessary include facilities for all the different recyclables like in Karlskrona. For example, the count of 12 waste paper recycling facilities and 12 drink cans recycling facilities at petrol stations amounts to 24 public recycling facilities, thus inflating the number of public recycling facilities actually available in Singapore (refer Table 2).

Table 2: Location of Recycling Facility for the Different Recyclable Household Waste in Singapore

	Location of Recycling Facility						
	*Orchard Road	Public Housing Estate	Ministry of Environment Building	Petrol Station	Singapore Zoo	Food Centre	Misc. Public Areas
<b>Waste Paper</b>	18	28	1	12			
<b>Drink Cans</b>	18	4	1	12	1	38	
<b>Plastic Bottles</b>	18	4	1				
<b>Glass Bottles</b>					1		8

\*Orchard Road is Singapore’s prime shopping street. (National Environment Agency, 2002a)

The public recycling facilities in Singapore are not comprehensive and only collect certain household wastes and not others. This makes it very inconvenient for a person in Singapore who wants to recycle all the different recyclable household waste. The person has to travel to different recycling facilities around the country to drop off different household waste. Thus, compared to Sweden, Singapore needs to improve in making recycling facilities not only more convenient for her residents, but also more comprehensive in the type of recyclable wastes each recycling facility collects.

### iii. Material

Data was collected by means of a questionnaire. The following describes the measures used.

1. Household wastes recycling behaviours in Singapore and Sweden were measured by asking participants how often they personally recycle glass bottles, paper products, cartons, plastics, metals, and compost. Their recycling frequencies were indicated on a 5-point Likert scale. Only waste that were most likely to be generated daily was included in the study.
2. The questionnaire consisted of 4 scales that were related to the different concepts in the Theory of Planned Behaviour. There were 5 items that were relating to the perceived behavioural control concepts, 6 items to the subjective norm concept, 6 items to the attitude towards household waste recycling behaviour concept, and 1 item to measure behavioural intention.

Participants were asked to indicate their level of agreement with the items from these scales by choosing from a 5-point Likert scale.

3. General knowledge for various environmental issues and specific knowledge on recycling of household waste were measured by 9 true/false/don't know items and 7 true/false/don't know items respectively.
4. Ecological orientation was measured using the New Ecological Paradigm scale. Participants were asked to indicate their level of agreement for the 15 items in the scale by choosing from a 5-point Likert scale.
5. There were 4 items that concerned Singaporeans' opinions towards Sweden's environmental protection policies. Participants were asked to indicate their level of agreement with the statements on a 5-point Likert scale.
6. Two items assessed the ease of fitting into the Swedish culture. A 5-point Likert scale was used to elicit participants' level of agreement with the statements.
7. Three items, using a 5-point Likert scale, were formulated to assess participants' future recycling habits.

Two open-ended questions were included in the questionnaire to find out how participants had learnt about Sweden's household waste recycling program and the type of household waste recycling program they would like Singapore to adopt. Demographic information like gender, age, education level, length of stay in Sweden, living arrangement in Sweden, type of housing accommodation in Singapore, and recycling facilities available in neighbourhood in Singapore were also solicited.

All Likert scales, except for the ones measuring recycling frequencies, used in the questionnaire had "strongly agree" assigned to the value 5, "mildly agree" to 4, "unsure" to 3, "mildly disagree" to 2, and "strongly disagree" assigned to the value 1. For the Likert scales measuring recycling frequencies, the number 5 was assigned to "always", 4 to "often", 3 to "sometimes", 2 to "seldom", and 1 to "never". A sample of the questionnaire can be found in Appendix 1.

#### **iv. Procedure**

The questionnaire was pilot tested by 5 individuals to check for possible comprehension and language mistakes before being distributed to the participants. Questionnaires were distributed to the male participants at their workplace. For those who were married, they were asked to bring home a questionnaire to their wives to be completed and returned later.

For the newly arrivals, they were asked to fill up two questionnaires, one distributed within a week of their arrival in Sweden and the second one 6 week after. The first questionnaire was to gather information regarding their recycling behaviours in Singapore and the second questionnaire was to gather information regarding their recycling behaviour in Sweden.

All participants were assured anonymity. They were also assured of a chance to win a lucky draw, a way to increase participation rate, when they had completed the questionnaires.

## v. Statistics

The collected data were treated by means of analysis of frequency, reliability analysis (Cronbach's alpha), Chi-square analysis, factor analysis (orthogonal solution), MANOVA, and multiple regression analysis. All analyses were made by SPSS version 10 (SPSS Inc., 2000). The Level of significance was set to  $p \leq .05$ .

## Results

### Singaporeans' Ecological Worldview and Environmental Knowledge

The 15 items of the New Ecological Paradigm scale were added into an index as suggested by Dunlap et al. (2000). However, this index yielded a reliability of Cronbach's alpha = .50, which was much lower than when the scale was administered to a group of Washington State residents group during the development of the scale and had an alpha of .83 (Dunlap et al., 2000). The mean of the New Environmental Paradigm for the Singaporeans was  $m=3.50$  ( $SD=0.36$ ). There were no significant differences between the new arrivals and the longer stayers.

The items measuring general knowledge showed that Singaporeans were very aware of global environmental problems. Nevertheless, there were some environmental issues Singaporeans were less aware of like the negative effect of ozone depletion on human health and the effect greenhouse gases had on global warming. The analysis showed no significant difference in performances on the items measuring general knowledge on environmental issues between the two groups. Table 3 shows the responses participants gave to the items on general knowledge.

Table 3: General Environmental Issues Knowledge Items and Participants' Responses (in %)

Items	Correct (%)	Wrong (%)	Don't know (%)
Accumulation of greenhouse gases can cause global warming.	68	2	31
The depletion of the ozone layer has positive effect on human health.	52	40	9
Extensive cutting of trees is bad for the environment as it can cause soil erosion.	84	9	7
The majority of Earth's abundant water supply is fresh water.	69	7	24
The world's oil reserve is decreasing.	87	2	12
Driving a car contributes to air pollution.	96	3	2
The removal of vegetation decreases the risk of flooding.	62	15	24
The world's non-renewable energy resources are depleting.	66	4	30
Wind is a form of renewable energy resource.	66	10	24

## Singaporeans' Opinions on Sweden's Environmental Protection Policies and Adaptation to Swedish Culture

Table 4 shows the 4 items measuring opinions on Sweden's environmental protection policies. The four items were combined into an index after frequency analysis showed high inter-item consistency and reliability analysis yielded a .68 Cronbach's alpha level.

Table 4: Items Measuring Opinions towards Sweden's Environmental Protection Policies

<b>Sweden's environmental protection policies index</b>
• I think it is good to have Sweden's household waste recycling program.
• In general, the Swedes are unaware of environmental issues.
• Sweden is commendable for its efforts towards preserving the environment.
• Singapore has nothing to learn from Sweden about the preservation of the environment.

While frequency analysis showed good distribution for items measuring adaptation to the Swedish culture, reliability assessment showed low alpha level. It was decided that a single item would be chosen to measure the concept rather than using an index that had low inter-item consistency. Table 5 shows the item chosen for analysis and Singaporeans' responses to the item.

Table 5: Item measuring Adaptation to the Swedish Culture and Participants' Responses (in %)

<b>Item</b>	<b>Strongly Agree (%)</b>	<b>Mildly Agree (%)</b>	<b>Unsure (%)</b>	<b>Mildly Disagree (%)</b>	<b>Strongly Disagree (%)</b>
Adopting the Swedish lifestyle and culture is easy.	23	52	6	19	-

Both the newly arrivals and the longer stayers gave high praises to Sweden's efforts in protecting the environment with no significant difference in sentiment between the two groups (mean = 4.17 and mean = 4.40 for the newly arrivals and the longer stayers respectively). Both groups also expressed experiencing little problem adapting to the Swedish culture with no significant difference between the two groups (mean = 3.87 and mean = 3.76 for the newly arrivals and the longer stayers respectively).

### Intention to Recycle and Recycling Frequencies in Singapore and in Sweden

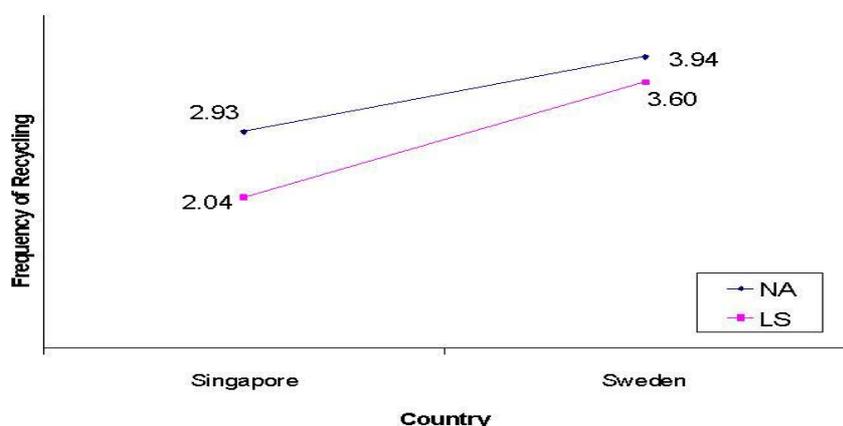
Both groups of Singaporeans had high intentions to recycle their household wastes in Singapore. The intentions became stronger when they moved to Sweden ( $F(1,64)=14.23, p=.000$ ). There was also a significant interaction between the two groups and their intentions to recycle. Compared to the newly arrivals, the longer stayers had a higher increase in their intentions to recycle when they relocated from Singapore to Sweden ( $F(1,64)=7.68, p=.007$ ).

Table 6: Comparison of Intentions to Recycle in Singapore and in Sweden

	<b>Mean of Intention to Recycle in Singapore</b>	<b>Mean of Intention to Recycle in Sweden</b>
<b>Newly Arrivals</b>	4.22	4.35
<b>Group with longer stay in Sweden</b>	3.59	4.44

The 6 items that assessed frequency of household waste recycling in Singapore and the 6 items that assessed recycling frequency in Sweden were added into an index respectively. Indices for recycling frequency in Singapore and recycling frequency in Sweden showed high inter-item consistency (Cronbach's alpha = .87 and .83 respectively).

When comparing the two indices, it was found that Singaporeans' household wastes recycling frequency increased significantly when they were relocated from Singapore to Sweden, regardless of how long one had stayed in Sweden ( $F(1,64)=71.11, p=.000$ ). Nevertheless, the longer stayers increased their recycling frequencies more than the newly arrivals ( $F(1,64)=15.83, p=.000$ ). There was no significant interaction between group and recycling behaviour. Figure 2 illustrates the result.



**Figure 2: Recycling Behaviour of Singaporeans (NA = Newly Arrivals; LS = Longer Stayers)**

Analyses were also made for both groups' recycling frequencies for each recyclable waste assessed in the questionnaire. Results suggested significant increases in recycling frequencies for all 6 different types of recyclable waste (refer Table 7). There were significant differences between the groups in recycling frequencies for all the different recyclable waste except for glass. The analyses also showed significant group and recycling frequency interactions for all the recyclable wastes except for metal and compost.

**Table 7: Recycling Frequencies of the Different Recyclables (NA = Newly Arrivals; LS = Longer Stayers)**

Type of Recyclable	Group	Mean for Recycling Frequency in Singapore	Mean for Recycling Frequency in Sweden	*Group	*Type of Recyclable	*Group x Type of Recyclable
<b>Glass Bottles</b>	NA	2.52	3.78	n.s.	F=103.51 p=.000	F=7.23 p=.009
	LS	2.07	4.24			
<b>Paper Products</b>	NA	3.70	4.09	F=14.69 p=.000	F=19.77 p=.000	F=5.90 p=.018
	LS	2.38	3.71			
<b>Cartons</b>	NA	3.43	4.17	F=12.07 p=.001	F=34.93 p=.000	F=5.03 p=.028
	LS	2.26	3.90			

<b>Plastics</b>	NA	3.52	4.35	F=14.68	F=57.60	F=8.95
	LS	2.15	4.05	p=.000	p=.000	p=.004
<b>Metals</b>	NA	2.48	3.74	F=12.04	F=37.10	n.s.
	LS	1.68	2.86	p=.001	p=.000	
<b>Compost</b>	NA	1.96	3.52	F=4.69	F=43.65	n.s.
	LS	1.68	2.83	p=.034	p=.000	

\*N=65, df=1

### Motives for Recycling in Singapore and in Sweden

Singaporeans' motives for recycling were investigated by 17 items relating to the concepts of Theory of Planned Behaviour. Four of these items had skewed distributions, and they were therefore excluded from further analysis. The four items were "I believe recycling is good for the environment", "If recycling facilities are available, I think the Swedes/Singaporeans will recycle their household waste faithfully", "I believe most Singaporeans in Sweden do not care about recycling", and "I have easy access to information about recycling of household waste".

Factor analysis on the remaining items yielded five indices, which explained 70% of the variances. Three of the five factors could be interpreted in terms of the Theory of Planned Behaviour. They were Subjective Norm that measured Singaporeans' perceived social pressure to recycle their household wastes, Perceived Control that measured Singaporeans' perception of their ability to recycle, and Attitude towards Recycling. The two additional factors were Neighbourhood that expressed Singaporeans' perception of their neighbours and their neighbourhood in relation to recycling activities, and Responsibility that assessed Singaporeans' beliefs about who should be in charge of the recycling process.

Table 8: Result of Factor Analysis of Motives for Recycling (Orthogonal Solution, Loadings <.40 not given)

Items	Factor				
	1	2	3	4	5
My family will think badly of me if I am not recycling my household waste.	.82				
My friends will have bad impressions of me if I am not recycling my household waste.	.86				
Singaporeans are too busy to recycle their household waste.		.82			
It is difficult <u>to sort</u> the different recyclable waste in the table.		.54			
It is difficult <u>to store</u> the different recyclable waste in the house.		.49			
I do not have time for recycling.		.75			
I think all my neighbours recycle their household waste faithfully.			.83		
Recycling facilities are easily accessible for use.			.93		
I believe there must be economic incentives for me when I recycle.				.67	
I think the relevant authorities should be responsible for the sorting and recycling of household waste.				.85	

I think recycling household waste is an efficient waste reduction strategy.				.49	
I enjoy doing my part for the environment by recycling.					.81
I find recycling fun.					.63
Proportion of total variance %	17.3	15.1	13.5	13.1	11.5

For each one of the five factors, items with high loadings were added into indices and reliability analyses were calculated. In the reliability analysis one item was excluded from the Responsibility index in order to increase Cronbach's alpha. Table 9 shows the items in each of the indices that were used for final analysis. Table 10 shows the participants' responses on each item of each of the indices.

Table 9: Indices of Motives for Recycling

	<u>N</u>	<u>M</u>	<u>SD</u>	<u>Cronbach's alpha</u>
<b><u>Subjective norm index</u></b>	68	4.93	1.97	.85
• My family will think badly of me if I am not recycling my household waste.	68	2.51	1.06	
• My friends will have bad impressions of me if I am not recycling my household waste.	68	2.41	1.05	
<b><u>*Perceived control index</u></b>	68	11.82	3.37	.69
• Singaporeans are too busy to recycle their household waste.	68	2.76	1.21	
• It is difficult <u>to sort</u> the different recyclable waste in the table.	68	2.91	1.32	
• It is difficult <u>to store</u> the different recyclable waste in the house.	68	2.38	1.16	
• I do not have time for recycling.	68	3.76	0.96	
<b><u>Neighbourhood index</u></b>	68	6.88	2.32	.77
• I think all my neighbours recycle their household waste faithfully.	68	3.32	1.09	
• Recycling facilities are easily accessible for use.	68	3.56	1.48	
<b><u>*Responsibility index</u></b>	68	5.24	2.21	.63
• I believe there must be economic incentives for me when I recycle.	68	2.75	1.27	
• I think the relevant authorities should be responsible for the sorting and recycling of household waste.	68	2.49	1.31	
<b><u>Attitude towards recycling index</u></b>	68	8.07	1.30	.65
• I enjoy doing my part for the environment by recycling.	68	4.25	0.68	
• I find recycling fun.	68	3.82	0.83	

\*Items are turned during analysis to create index measuring high perceived control and high self-responsibility.

Table 10: Participants' Responses (in %) on the Five Indices

	<b>Strongly Agree (%)</b>	<b>Mildly Agree (%)</b>	<b>Unsure (%)</b>	<b>Mildly Disagree (%)</b>	<b>Strongly Disagree (%)</b>
<b><u>Subjective norm index</u></b>					
My family will think badly of me if I am not recycling my household waste.	2	21	24	37	18
My friends will have bad impressions of me if I am not recycling my household waste.	3	12	31	32	22
<b><u>Perceived control index</u></b>					
Singaporeans are too busy to recycle their household waste.	6	29	2	32	16
It is difficult to sort the different recyclable waste in the table.	9	38	6	29	18
It is difficult to store the different recyclable waste in the house.	2	27	4	44	24
I do not have time for recycling.	21	52	12	16	-
<b><u>Neighbourhood index</u></b>					
I think all my neighbours recycle their household waste faithfully.	13	32	35	12	7
Recycling facilities are easily accessible for use.	37	28	3	19	13
<b><u>Responsibility index</u></b>					
I believe there must be economic incentives for me when I recycle.	17.6	30.9	22.1	17.6	11.8
I think the relevant authorities should be responsible for the sorting and recycling of household waste.	27.9	32.4	10.3	22.1	7.4
<b><u>Attitude towards recycling index</u></b>					
I enjoy doing my part for the environment by recycling.	37	53	9	2	-
I find recycling fun.	19	52	22	7	-

A comparison on the newly arrivals' responses on the five indices measuring various motives to recycle suggested that after the newly arrivals stayed in Sweden for 6 weeks, their responses on the Subjective norm index and the Neighbourhood index significantly increased (refer Table 11). There was no change for the other three indices.

Table 11: Newly Arrivals' Performance on Subjective Norm and Neighbourhood Indices

<b>Index</b>	<b>N</b>	<b>Mean</b>	<b>Mean (after 6 wks)</b>	<b>F</b>	<b>p</b>
Subjective norm	23	2.65	3.11	8.47	.008
Neighbourhood	23	2.43	4.11	46.79	.001

Comparing the longer stayer group's responses and the newly arrivals' responses after 6 weeks of experience in Sweden, the only index from the five indices that showed significant difference between the two groups was the Subjective norm index, with the newly arrivals expressing more social pressure to recycle (refer Table 12).

Table 12: Group Comparison on Subjective Norm Index

<b>Index</b>	<b>N</b>	<b>Mean (Newly Arrivals)</b>	<b>Mean (Longer Stayers)</b>	<b>F</b>	<b>p</b>
Subjective norm	65	3.11	2.38	8.80	.004

### Specific Knowledge on Recycling

In order to select specific knowledge items that discriminated between Singaporeans with high or low knowledge, the wrong answers and don't know answers were added together. Criteria for an acceptable distribution was set at minimum 5% responses on correct or wrong/don't know answers on each item. At this stage, 1 item was discarded due to poor distribution.

A temporary index was created with the rest of the items. Pearson Chi-square analysis was performed on this index with the group divided at approximately 50% (50% of the lowest scores and 50% of the highest scores). Analysis resulted in one more item being discarded, since it did not significantly discriminate between the high knowledge and low knowledge group. The following table shows the items included in the final index.

Table 13: Specific Knowledge on Recycling Index and Participants' Responses (in %)

<b>Items</b>	<b>Correct (%)</b>	<b>Wrong (%)</b>	<b>Don't know (%)</b>
The paper labels on glass bottles need to be removed first before they can be recycled.	49	12	40
All plastics can be recycled.	27	44	29
Cartons can be recycled in the same bin as newspaper.	31	43	27
All metals can be recycled.	18	50	32
Food waste can be recycled into valuable garden soil	68	7	25

There was no significant difference in the newly arrivals' performance on specific knowledge on recycling when they just arrived and six weeks later. Both the newly arrivals and the longer stayers showed no significant differences in their performances on the specific knowledge items.

### Predicting Intention to Recycle and Recycling Frequency in Sweden

In order to find out to what extent Singaporeans' possible motives to recycle and specific knowledge on recycling could predict their intentions to recycle in Sweden and their recycling behaviour in Sweden, regression analysis was carried out. In the first analysis with intention as dependent variable, the five motives and specific knowledge were introduced as independent variables. In this analysis, the Subjective norm index and Attitude towards recycling index significantly predicted the intention to recycle in Sweden (refer Table 14).

Table 14: Regression Analysis to Predict Intention to Recycle in Sweden

	$\beta$	$\Delta R^2$
Subjective norm index	-.37**	
Perceived control index	-.06	
Neighbourhood index	-.23	
Responsibility index	-.10	
Attitude towards recycling index	.52***	
Specific knowledge on recycling index	.17	
		.32*** ( $R^2=.32^{***}$ )

\*\*\*p=.001 \*\*p=.01 \*p=.05

In a second analysis, the indices of recycling frequency constituted the dependent variable. Intention was introduced in a first step and the five motives and specific knowledge in a second step. Perceived control index was the only variable able to predict the recycling behaviour in Sweden (refer Table 15).

Table 15: Regression Analysis to Predict Recycling Behaviour in Sweden

	$\beta$	$\Delta R^2$
<b>Step 1</b>		
Intention to Recycle in Sweden	.20	
		.04
<b>Step 2</b>		
Subjective norm index	.10	
Perceived control index	.30*	
Neighbourhood index	.24	
Responsibility index	-.11	
Attitude towards recycling index	-.01	
Specific knowledge on recycling index	.02	
		.22* ( $R^2=.26^*$ )

\*\*\*p=.001 \*\*p=.01 \*p=.05

### Intention to Continue Recycling in Singapore

A single item was chosen to measure future intention to continue acquired recycling behaviours back in Singapore. This was due to low inter-item consistency in a temporarily created 2-item index. The item “I will continue my recycling habits I adopted in Sweden if similar recycling facilities are available in Singapore” was chosen to measure future recycling intention.

Both the newly arrivals (mean=4.09) and the longer stayers (mean=4.43) affirmed their intention to continue their Swedish recycling habits when they return to Singapore. There was no significant difference in intention between the two groups. Incentive program, like the deposit return with the recycling of drink cans and bottles, is frequently cited by both groups as the program they like to see Singapore adopt in the future.

## Discussion

Analysis of Singaporean's accessibility to household waste recycling facilities suggests better accessibility in Sweden than in Singapore (refer Participants' Recycling Facilities in Singapore and in Sweden section). Therefore, it is justified to accept Hypothesis 1, that the move from Singapore to Sweden will increase the physical accessibility of recycling facilities. Results of this study also showed that Singaporeans' recycling behaviours had increased with the move from Singapore to Sweden. The increased in recycling frequency may be explained by the increased in accessibility of household waste recycling facilities in Sweden as compared to Singapore. If the increased accessibility of facilities increases Singaporeans' recycling rate, Singapore needs to seriously evaluate convenience as an important factor for increasing her citizens' recycling behaviour. This finding is supported further by comparing the newly arrivals' and the longer stayers' recycling rate and accessibility to recycling facilities in Singapore. Demographic information showed that the newly arrivals had more access to recycling facilities in Singapore compared to the longer stayers. Their higher rate of recycling in Singapore suggests that more access to recycling facilities is the result of the difference in recycling rate.

Increasing accessibility of recycling facilities may be one way for Singapore to promote recycling behaviour as it removes the external barrier that stops Singaporeans from recycling. Nevertheless, internal barriers can also stop people from engaging in environmentally responsible recycling (Gardner, & Stern, 1996, p.73). In order to be successful in promoting recycling, Singapore needs to know what are the personal motives that will increase recycling among Singaporeans.

Results from the study showed that perceived social pressure to recycle household waste increased when Singaporeans moved to Sweden. It also increased Singaporeans' intention to recycle their waste in Sweden. While attitude towards recycling had not increased with the move to Sweden, it helped to predict Singaporeans' increased intention to recycle in Sweden. Thus, for Hypothesis 2, it can only be accepted for social pressure, which is the only personal motive that has increased with the move from Singapore to Sweden.

The result suggests that the Swedish society's emphasis on waste recycling increase social pressure for Singaporeans to recycle their household waste. The ability of attitude to predict Singaporeans' increased intention to recycle in Sweden with no significant increased in attitude suggests that positive attitude towards household waste recycling is already well formed among Singaporeans before coming to Sweden. Singapore's efforts in promoting household waste recycling may have resulted in the formation of positive attitude towards recycling among Singaporeans. However, to increase intention to recycle, Singapore needs to focus on making household waste recycling a socially required behaviour and an integrated part of the Singapore society.

According to the statistical analysis, perceived behavioural control was the factor that determined recycling behaviour. Hypothesis 3 has to be rejected as it is perceived behavioural control and not intention to recycle that increases actual recycling behaviour. An in-depth look at Singaporeans' perceived behavioural control over household waste recycling is required since perceived behavioural control is an important predictor of actual recycling behaviour.

Singaporeans seem to think they have no time for recycling. For example, the item “I do not have time for recycling” in the Perceived control index generated a mean response of 3.76, which meant most Singaporeans agreed with the statement (refer Table 9). This suggests that either Singaporeans find recycling to be a time-consuming activity or that Singaporeans lead a hectic life that leaves very little time for other activity. Both suggestions are possible explanations. Recycling in Singapore can be a time-consuming activity as recycling facilities are not as accessible.

However, perceived behavioural control showed no significant improvement when Singaporeans moved to Sweden where recycling facilities were more accessible. This can be explained by the second suggestion. Singaporean workers work in a fast-paced environment where staying competitive is the guiding principle. This is unavoidable for a country with no natural resources and only human resources to depend on (Chua, 2002, p.iii). Being competitive is the only way for Singapore to progress from a small developing country with a per capita GNP of US\$800 in 1965 to that of US\$22,451 in 1995 and maintaining the standard at US\$ 20,950 in 2001 (Foo, 1997; Statistics Singapore, 2002). Moreover, Singapore does not believe in being a welfare state and each Singaporean is responsible for his/her own welfare and his/her family’s welfare (Lee, 2000, p.126). Therefore, most Singaporeans spent a lot of time at work (44-hour workweek) and it explains why Singaporeans do not have time for other activity (Attorney-General’s Chambers, 2002).

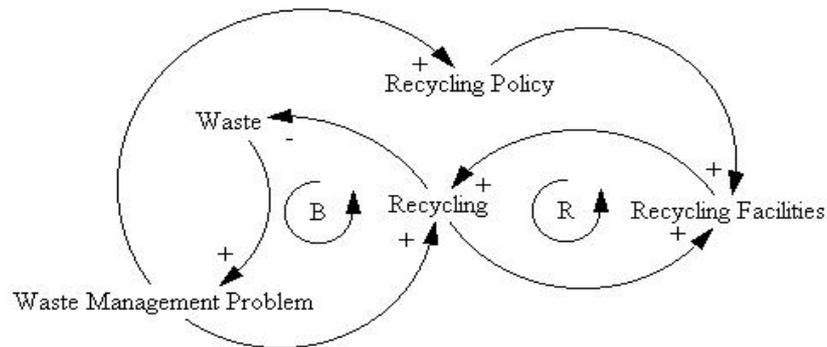
For Singaporeans who had moved to Sweden, the majority of them was still working for the Singapore Navy and was therefore not exempted from the work climate and work pressure of Singapore. This suggests why the perception of time is still the same even when they are in Sweden. It is not possible to change a whole society’s attitude towards work and time so that more time can be allocated for other activities, including recycling. The thing Singapore can do to help her people is by making recycling easier through increasing accessibility of recycling facilities.

Results on assessing Singaporeans’ specific knowledge on recycling showed no significant difference when they moved to Sweden. Specific knowledge on recycling did not predict recycling behaviour. Hypothesis 4 and Hypothesis 5 are therefore rejected, as knowledge on recycling shows no increment. Assessment on Singaporeans’ environmental beliefs and attitude also showed Singaporeans were generally pro-environmental but with no significant difference between the newly arrivals and the longer stayers (refer Results section). This suggests that the move from Singapore to Sweden has not strengthened Singaporeans’ pro-environmental beliefs and attitude, which means Hypothesis 6, is also rejected.

Learning about recycling in Sweden requires Singaporeans to possess knowledge of the Swedish language as a prerequisite. This may be a barrier that explains why Singaporeans are unable to benefit from Sweden’s educational efforts in promoting household waste recycling. Even though specific knowledge on recycling does not predict Singaporeans’ recycling behaviour, this study argues that Singapore still needs to improve her educational efforts towards teaching specific recycling knowledge. The education efforts have resulted in Singaporeans being well versed in general knowledge of environmental issues, as suggested from the results obtained on the General knowledge items (refer Table 3). Compared to the results obtained from the Specific knowledge on recycling index (refer Table 13), it suggests a disparity in educational efforts, with Singaporeans’ showing poor possession of recycling knowledge.

According to Gardner and Stern (1996), the way and type of information is conveyed can influence environmentally responsible behaviour (p.83). Research has shown that knowledge about

the specifics of recycling is more closely related to recycling behaviour than general environmental knowledge (Oskamp et al., 1991 as cited in Schultz et al., 1995). Most importantly, recycling programs in Singapore are reporting problem due to Singaporeans' ignorance of what can or cannot be recycled (Kaur, 2002, October 21). Therefore, Singapore needs to pay attention to how environmental education is being carried out in schools or to the public when promoting recycling behaviours. Singapore may need to devote more efforts towards educating Singaporeans about proper household waste recycling etiquette in order to see progress in recycling rate.



**Figure 3: Interaction between Recycling and Recycling Facilities**

Nevertheless, the good news is that Singaporeans' pro-environmental leanings suggest a willingness to engage in environmentally responsible behaviours. The study also finds that Singaporeans have the intention to continue their recycling habits they have adopted in Sweden when they return to Singapore if they have the right recycling condition. Therefore, these findings should give confidence to Singapore that her recycling rate should increase with a correct solution. Result from the review on Singapore's pilot recycling scheme (Foo, 1997) and results from this study both suggested increasing accessibility of recycling facilities as important factor to increase Singaporeans' recycling behaviour. It is important to realise that the activity of recycling and recycling facility actually re-enforces each other. As depicted in Figure 3, more recycling happens when more recycling facilities are available. On the other hand, when the government builds more recycling facilities, it will also encourage more recycling. Both Singaporeans and the government have to chip in their efforts in order for recycling to increase and for Singapore to achieve her recycling goals.

The promotion of environmentally responsible behaviours requires the consideration of multidimensional factors that can influence the process. At the simplest level, individual efforts are needed. However, many factors can influence individual efforts. This study also presented educational intervention and governmental interventions as two of many different factors that could influence the individual. They provide the social structure and socialization process that build an individual's worldview and value system, which in turn influence individual's specific attitude and behaviour. (Stern et al., 1995) In her efforts to increase Singaporeans' household waste recycling behaviours, Singapore has to carefully consider all possible influencing factors in order to be successful.

This study offers some recommendations for further research with the aim of finding more solutions to help Singapore in her efforts to promote household waste recycling behaviours among

her citizens. In the open-ended question asked in the questionnaire regarding the type of recycling program participants of the study would like Singapore to adopt, incentive program, like the deposit refund with the return of drink cans and bottles, was frequently cited as a program they liked to see Singapore adopt in the future. Majority of them also agreed with the statement in the Responsibility index that economic incentive would serve as an encouragement for recycling of household wastes (refer Table 10). While the idea of using incentives to attract people to recycle may be worth considering, it is also important to keep in mind the argument that offering incentives can decrease recycling behaviour (Thogersen, 1996). Nevertheless, it will be interesting to further investigate the feasibility and effectiveness of an incentive-based recycling program in Singapore.

Another interesting aspect of the result yielded from the Responsibility index was the high percentage of Singaporeans who believed recycling as an activity that was the responsibility of waste collection companies or other relevant authorities but not themselves (refer Table 10). This mentality reflects the result of the top-down approach the Singapore government frequently adopted in the way of governance. Not only does it create passive citizens that depend on the government to solve every problem, it also rationalises the displacement of responsibility for problem solving on the government. Thus, when Singapore identifies the problem of waste management, Singaporeans expect the government to solve the problem, including recycling household waste for them.

The Singapore government is beginning to realise that increasing recycling through the usual methods of legislation and enforcement will only produce short-term results. Instead, service facilitation and public education will be emphasised for promoting recycling. (Cheng Sim Jeow, personal communication, September 13, 2002) The shift in the government's approach suggests a continuous re-evaluation on the government's part towards the sensitivity and the effectiveness of its policies. Nevertheless, it does not eliminate the need for more studies to understand Singaporeans' attitude towards recycling and the sense of responsibility towards waste reductions.

A self-evaluation of this study suggests some areas that can be improved for future research. One area is the way information is collected for recycling behaviour. Frequency of behaviour is solicited from the participants of the study. A better way to collect the information may be to ask for volume or weight of recycled waste over a specific period of time. Nevertheless, researchers argue that asking for volume or weight of recyclable is not problem-free. First of all, the volume and weight of recyclable waste varies with family size. It also varies with consumption patterns and penalises those who pre-recycle, as in those who buy wisely to reduce waste. (Werner et al., 1995) Future researchers also need to be aware of participants' desire to appear better in their self-reported behaviour in a study as transparent as a study of recycling behaviour, a socially desired behaviour.

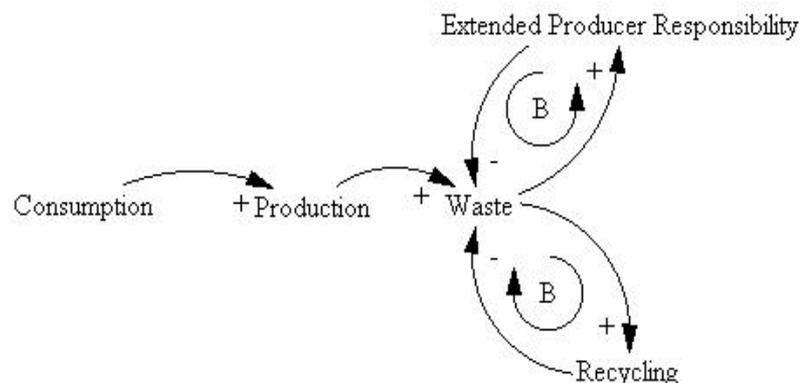
Recycling is a solution to managing escalating amount of waste generated by society. However, a solution is not needed if the problem does not exist in the first place. Recycling helps to ease the pressure of waste management but it does not eradicate the problem, which is waste generation. To increase sustainability, it is not enough to just find a sustainable waste management strategy. The amount of waste generated needs to be minimised.

It is difficult to buy anything that does not come with some sort of packaging. Packaging is necessary for hygiene reasons for some products like food products. Packaging is also needed to protect products. Nevertheless, it does not excuse packaging from being one of the culprits that inflates the amount of waste generated (Hormuth, 1999). Extended producer responsibility is about producers being responsible for their products' environment impact throughout the life cycle of the

products. This includes responsibility not only for the product but the packaging as well. (Swedish Environmental Protection Agency, 2000a) For the scope of this study, only producers' responsibility for packaging will be discussed. Making producers be responsible for their packaging is a possible way to decrease the generation of waste.

Extended producer responsibility has been introduced in Sweden since 1994 (Swedish EPA, 2000a). It stipulates that all producers must provide appropriate packaging collection system. Five material-handling firms are set up to ensure the Swedish companies are able to meet the producer responsibility requirement. The five firms are MetallKretsen AB for recycling metal packaging (except for refundable cans), Plastkretsen AB for recycling corrugated board, RWA Returwell AB for glass, and Svensk Kartongatervinning AB for recycling paper and paperboard. (Kronstrom, 1998) Since producers have to pay the five firms for the handling of their packaging, there is an added incentive on the producers' part to reduce the amount of packaging needed for their products. This creates a bonus not only for the producers, but for waste management as well when generation of waste from packaging decreases.

In Singapore, waste management and recycling industry is catered towards collection and reuse of recyclable waste. An industrial site is recently set aside for developing industries that can develop products from recyclable waste. For example, a factory is already in place for making bricks from recyclable waste. (Chua, 2002, p.5) While these are important strategies for Singapore to reduce the amount of waste that goes into landfills or incinerators, it does not help decrease the amount of waste generated. Singapore needs to consider introducing extended producer responsibility to get to the root of the waste management problem.



**Figure 4: Consumption Reduction as Sustainable Approach towards Waste Management**

Nevertheless, just like recycling, a closer look at extended producer responsibility shows that it is still not eradicating the root of the waste management problem. Figure 4 shows that, like recycling, extended producer responsibility only helps to reduce waste but not the generation of waste. The real solution is found at the beginning of the life cycle of a production, the production stage. True waste minimisation happens when production decreases, which results in less materials that get thrown away as trash. To decrease production, consumption needs to decrease.

Today's economic model is based on consumerism. A country's progress is measured by the country's gross domestic product (GDP), which is the market value of all goods and services produced by the country's economy. (Miller, 2000, p.755) To boast production, consumption has to

increase. Similarly, when consumption increase, production increase. People are told to buy more if they want economic progress for the country. The throw-away mentality develops as a result. People needs to realise that not only is consumerism depleting Earth's natural resources, it is also pushing the Earth's ability to cope as our waste sink. Countries can adopt different waste management strategies but only when consumerism decreases can true waste minimisation and true sustainable waste management be achieved.

### Conclusion

An increase in the accessibility of recycling facilities in Sweden has increased the recycling behaviours of a group of Singaporeans living in Sweden. This group of Singaporeans also intends to continue their recycling habits adopted in Sweden if similar recycling facilities are available in Singapore. For Singapore who is currently trying to promote recycling to achieve sustainability in her waste management system, such result finding is good news. Nevertheless, the solution is never as simple. Singapore needs to re-evaluate education efforts towards teaching proper recycling behaviours among Singaporeans. Further investigation is also needed to study the interactions between the government's style of governance and her people, and the effects these interactions have on Singaporeans' attitude and behaviour towards common problems faced by the whole of Singapore. Waste minimisation is also needed to achieve real sustainability in waste management.

### References

- Ajzen, I. (1991). The Theory of Planned Behaviour. *Organizational Behaviour and Human Decision Processes*. 50: 179-211.
- Attorney-General's Chambers. (2002). Employment Act. In *Singapore Statutes Online*. Retrieved November 6, 2002 from <http://statutes.agc.gov.sg>
- Cheung, S.F., Chan, D. K-S., & Wong, Z. S-Y. (1999, September). Reexamining the Theory of Planned Behaviour in Understanding Wastepaper Recycling. *Environment and Behaviour*. 31 (5): 587-612.
- Chua, L.H. (2002). *The Singapore Green Plan 2012*. Singapore: Ministry of Environment.
- Chung, S.S., & Poon, C.S. (2000). A Comparison of Waste Reduction Practices and the New Environmental Paradigm in Four Southern Chinese Areas. *Environmental Management*. 26 (2): 195-206.
- Dunlap, R.E., Van Liere, K.D., Mertig, A.G., & Jones, R.E. (2000). Measuring Endorsement of the New Ecological Paradigm: A Revised NEP Scale. *Journal of Social Issues*. 56 (3): 425-442.
- Foo, T.S. (1997). Recycling of Domestic Waste: Early Experiences in Singapore. *Habitat International*. 21 (3): 277-289.
- Foo, T.S. (1996). Urban Environmental Policy – The Use of Regulatory and Economic Instruments in Singapore. *Habitat International*. 20 (1): 5-22.

- Fransson, N., & Garling, T. (1999). Environmental Concern: Conceptual Definitions, Measurement Methods, and Research Findings. *Journal of Environmental Psychology*. 19: 369-382.
- Gardner, G.T., & Stern, P.C. (1996). *Environmental Problems and Human Behaviour*. London: Allyn & Bacon.
- Goh, M. (2002). Congestion Management and Electronic Road Pricing in Singapore. *Journal of Transport Geography*. 10: 29-38.
- Hormuth, S.E. (1999). Social Meaning and Social Context of Environmentally-Relevant Behaviour: Shopping, Wrapping, and Disposing. *Journal of Environmental Psychology*. 19: 277-286.
- Kaur, S. (2002, October 21). Up to 70% of Waste Meant for Recycling Can't Be Used. In *The Straits Times Interactive*. Retrieved October 21, 2002 from <http://straitstimes.asia1.com.sg/storyprintfriendly/0,1887,150139,00.html?>
- Kronstrom, C. (1998, September). Sweden: Solid Waste Recycling. In *Industry Sector Analysis*. Retrieved October 30, 2002 from <http://www.tradeport.org/ts/countries/sweden/isa/isar0015.html>
- Lee, K.Y. (2000). *From Third World to First – The Singapore Story: 1965-2000*. Singapore: Times Media Private Limited and The Straits Times Press.
- McCarty, J.A., & Shrum, L.J. (2001). The Influence of Individualism, Collectivism, and Locus of Control on Environmental Beliefs and Behaviour. *Journal of Public Policy and Marketing*. Spring
- Miller, G.T. (2000). *Living in the Environment: Principles, Connections, and Solutions (11th ed.)*. Belmont, California, USA: Brooks/Cole, Thomas Learning.
- Ministry of Education. (2002). *School Education in Singapore*. Retrieved August 12, 2002 from [http://www1.moe.edu.sg/JCReview/SchEd\\_inSpore.htm](http://www1.moe.edu.sg/JCReview/SchEd_inSpore.htm)
- National Environment Agency. (2002a). *Public Recycling Collection Centres/Points*. Retrieved November 11, 2002 from <http://app10.internet.gov.sg/scripts/nea/cms/htdocs/article.asp?pid=1462>
- National Environment Agency. (2002b). *Solid Waste Management*. Retrieved September 23, 2002 from [http://app10.internet.gov.sg/scripts/nea/cms/htdocs/category\\_sub.asp?cid=75](http://app10.internet.gov.sg/scripts/nea/cms/htdocs/category_sub.asp?cid=75)
- National Environment Agency. (2002c). *Waste Minimisation and Recycling Programme: Campaigns and Programmes*. Retrieved September 24, 2002 from <http://app10.internet.gov.sg/scripts/nea/cms/htdocs/article.asp?pid=337>
- Ojeda-Benitez, S., Armijo-de-Vega, C., & Ramirez-Barreto, M.E. (2002). Formal and Informal Recovery of Recyclables in Mexicali, Mexico: Handling Alternatives. *Resources, Conservation and Recycling*. 34: 273-288.

- Perrin, D., & Barton, J. (2001). Issues Associated with Transforming Household Attitudes and Opinions into Materials Recovery: A Review of Two Kerbside Recycling Schemes. *Resources, Conservation and Recycling*. 33: 61-74.
- Read, A.D. (1999). "A Weekly Doorstep Recycling Collection, I Had No Idea We Could!" Overcoming the Local Barriers to Participation. *Resources, Conservation and Recycling*. 26: 217-249.
- Schultz, P.W., Oskamp, S., & Mainieri, T. (1995). Who Recycles and When? A Review of Personal and Situational Factors. *Journal of Environmental Psychology*. 15: 105-121.
- SPSS Inc. (2000). SPSS for Windows. Chicago: SPSS Inc.
- Statistics Singapore. (2002, November). *Key Stats: Latest Indicators*. Retrieved November 6, 2002 from <http://www.singstat.gov.sg/keystats/annual/indicators.html>
- Stern, P.C., Dietz, T., & Guagnano, G.A. (1995, November). The New Ecological Paradigm in Social-Psychological Context. *Environment and Behaviour*. 27 (6): 723-743.
- Swedish Environmental Protection Agency. (2000a). *Focus on the Whole Life-Cycle in Forthcoming Product Policy*. Retrieved November 6, 2002 from <http://www.internat.environ.se/documents/press/2000/p000217b.htm>
- Swedish Environmental Protection Agency. (2000b). *Recycling in Sweden Still Increasing*. Retrieved September 20, 2002 from <http://www.internat.environ.se/documents/press/2000/p000606.htm>
- Swedish Environmental Protection Agency. (n.d.). *Fifteen: Sweden's Objectives for Environmental Quality – The Responsibility of Our Generation*. Stockholm, Sweden: Swedish Environmental Protection Agency.
- Swedish National Committee on Agenda 21 and Habitat. (2002). *From Vision to Action: Sweden's National Report to the World Summit on Sustainable Development in Johannesburg 2002*. Sweden: Ministry of Environment.
- Swedish National Committee on Agenda 21. (1997a). *Means of Implementation: Information*. Retrieved September 26, 2002 from [http://www.agenda21forum.org/rappporter/slutbetankande\\_eng/part\\_ii\\_4.htm](http://www.agenda21forum.org/rappporter/slutbetankande_eng/part_ii_4.htm)
- Swedish National Committee on Agenda 21. (1997b). *Strengthening the Role of Important Groups in Society: Local Agenda 21 – Organisation and Implementation*. Retrieved September 26, 2002 from [http://www.agenda21forum.org/rappporter/slutbetankande\\_eng/part\\_II\\_3.htm](http://www.agenda21forum.org/rappporter/slutbetankande_eng/part_II_3.htm)
- The Straits Times. (2002, May 25). New Stat Board to Take Over Some of ENV's Roles. In *The Straits Times Interactive*. Retrieved May 25, 2002 from <http://straitstimes.asia1.com.sg/storyprintfriendly/0,1887,121803,00.html?>
- Thogersen, J. (1996, July). Recycling and Morality. *Environment and Behaviour*.

Tucker, P., Murney, G., & Lamont, J. (1998). Predicting Recycling Scheme Performance: A Process Simulation Approach. *Journal of Environmental Management*. 53: 31-48.

Werner, C.M., Turner, J., Shipman, K., Twitchell, F.S., Dickson, B.R., Brusckke, G.V., & von Bismarck, W.B. (1995). Commitment, Behaviour, and Attitude Change: An Analysis of Voluntary Recycling. *Journal of Environmental Psychology*. 15: 197-208.

*World Factbook: Sweden*. (2000). Retrieved October 30, 2002 from <http://education.yahoo.com/reference/factbook/sw/index.html>

Appendix 1. Sample Questionnaire

**Please tick the box that reflects your own PERSONAL recycling habits in SINGAPORE.**

	Strongly Agree	Mildly Agree	Unsure	Mildly Disagree	Strongly Disagree
I intend to recycle my household waste.	<input type="checkbox"/>				

**Please indicate how often you personally recycle any of these household wastes in SINGAPORE.**

	Always	Often	Sometimes	Seldom	Never
Glass Bottles	<input type="checkbox"/>				
Paper Products	<input type="checkbox"/>				
Cartons	<input type="checkbox"/>				
Plastics	<input type="checkbox"/>				
Metals	<input type="checkbox"/>				
Compost	<input type="checkbox"/>				

**Please tick the box that reflects your own personal recycling habits in SWEDEN.**

	Strongly Agree	Mildly Agree	Unsure	Mildly Disagree	Strongly Disagree
I intend to recycle my household waste.	<input type="checkbox"/>				

**Please indicate how often you personally recycle any of these household wastes in SWEDEN.**

	Always	Often	Sometimes	Seldom	Never
Glass Bottles	<input type="checkbox"/>				
Paper Products	<input type="checkbox"/>				
Cartons	<input type="checkbox"/>				
Plastics	<input type="checkbox"/>				
Metals	<input type="checkbox"/>				
Compost	<input type="checkbox"/>				

**Please tick the box that reflects most accurately your opinion towards recycling.**

	<b>Strongly Agree</b>	<b>Mildly Agree</b>	<b>Unsure</b>	<b>Mildly Disagree</b>	<b>Strongly Disagree</b>
I believe recycling is good for the environment.	<input type="checkbox"/>				
I think all my neighbours recycle their household waste faithfully.	<input type="checkbox"/>				
I enjoy doing my part for the environment by recycling.	<input type="checkbox"/>				
If recycling facilities are available, I think the Swedes will recycle their household wastes faithfully.	<input type="checkbox"/>				
I find recycling fun.	<input type="checkbox"/>				
My family will think badly of me if I am not recycling my household waste.	<input type="checkbox"/>				
I believe there must be economic incentives for me when I recycle.	<input type="checkbox"/>				
My friends will have bad impressions of me if I am not recycling my household waste.	<input type="checkbox"/>				
I think the relevant authorities should be responsible for the sorting and recycling of household waste.	<input type="checkbox"/>				
I believe most Singaporeans in Sweden do not care about recycling.	<input type="checkbox"/>				
I think recycling household waste is an efficient waste reduction strategy.	<input type="checkbox"/>				
Singaporeans are too busy to recycle their household waste.	<input type="checkbox"/>				

**The following are statements concerning the act of recycling in Sweden. Please tick the box that reflects most accurately your opinion towards the statement.**

	Strongly Agree	Mildly Agree	Unsure	Mildly Disagree	Strongly Disagree
Recycling facilities are easily accessible for use.	<input type="checkbox"/>				
It is difficult <u>to sort</u> the different recyclable waste in the house.	<input type="checkbox"/>				
It is difficult <u>to store</u> the different recyclable waste in the house.	<input type="checkbox"/>				
I do not have time for recycling.	<input type="checkbox"/>				
I have easy access to information about recycling of household waste.	<input type="checkbox"/>				

**The following are statements regarding recycling and the environment. Please indicate whether you think the statement is true or false.**

	True	False	Don't Know
The paper labels on glass bottles need to be removed first before they can be recycled.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Accumulation of greenhouse gases can cause global warming.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
All plastics can be recycled.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
The depletion of the ozone layer has positive effect on human health.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Cartons can be recycled in the same bin as newspaper.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Extensive cutting of trees is bad for the environment as it can cause soil erosion.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Batteries can be recycled.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
The majority of Earth's abundant water supply is fresh water.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
All metals can be recycled.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

**Please continue.**

	True	False	Don't Know
The world's oil reserve is decreasing.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Food waste can be recycled into valuable garden soil.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Driving a car contributes to air pollution.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Paper that has been stained with food can still be recycled.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
The removal of vegetation decreases the risk of flooding.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
The world's non-renewable energy resources are depleting.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Wind is a form of renewable energy resource.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

**Listed below are statements about the relationship between humans and the environment. For each one, please indicate whether you STRONGLY AGREE, MILDLY AGREE, UNSURE, MILDLY DISAGREE or STRONGLY DISAGREE with it.**

	Strongly Agree	Mildly Agree	Unsure	Mildly Disagree	Strongly Disagree
We are approaching the limit of the number of people the earth can support.	<input type="checkbox"/>				
Humans have the right to modify the natural environment to suit their needs.	<input type="checkbox"/>				
When humans interfere with nature it often produces disastrous consequences.	<input type="checkbox"/>				
Human ingenuity will insure that we do NOT make the earth unliveable.	<input type="checkbox"/>				
Humans are severely abusing the environment.	<input type="checkbox"/>				
The earth has plenty of natural resources if we just learn how to develop them.	<input type="checkbox"/>				

Please continue.

	Strongly Agree	Mildly Agree	Unsure	Mildly Disagree	Strongly Disagree
Plants and animals have as much right as humans to exist.	<input type="checkbox"/>				
The balance of nature is strong enough to cope with the impacts of modern industrial nations.	<input type="checkbox"/>				
Despite our special abilities humans are still subject to the laws of nature.	<input type="checkbox"/>				
<hr/>					
The so-called “ecological crisis” facing humankind has been greatly exaggerated.	<input type="checkbox"/>				
The earth is like a spaceship with very limited room and resources.	<input type="checkbox"/>				
Humans were meant to rule over the rest of nature.	<input type="checkbox"/>				
<hr/>					
The balance of nature is very delicate and easily upset.	<input type="checkbox"/>				
Humans will eventually learn enough about how nature works to be able to control it.	<input type="checkbox"/>				
If things continue on their present course, we will soon experience a major ecological catastrophe.	<input type="checkbox"/>				

**The following are statements about Sweden and its policies to preserve the environment. Please put a tick in the box that corresponds most accurately your opinion towards the statements.**

	Strongly Agree	Mildly Agree	Unsure	Mildly Disagree	Strongly Disagree
I think it is good to have Sweden’s household waste recycling program.	<input type="checkbox"/>				
In general, the Swedes are unaware of environmental issues.	<input type="checkbox"/>				

Please continue.

	<b>Strongly Agree</b>	<b>Mildly Agree</b>	<b>Unsure</b>	<b>Mildly Disagree</b>	<b>Strongly Disagree</b>
Sweden is commendable for its efforts towards preserving the environment.	<input type="checkbox"/>				
Singapore has nothing to learn from Sweden about the preservation of the environment.	<input type="checkbox"/>				

**Please indicate your opinion towards living in Sweden.**

	<b>Strongly Agree</b>	<b>Mildly Agree</b>	<u>Unsure</u>	<b>Mildly Disagree</b>	<b>Strongly Disagree</b>
Adopting the Swedish lifestyle and culture is easy.	<input type="checkbox"/>				
The language barrier makes adapting to the Swedish society difficult.	<input type="checkbox"/>				

**What do you think about your future recycling efforts in Singapore? Please choose the answer that reflects most closely your opinion towards the statement.**

	<b>Strongly Agree</b>	<b>Mildly Agree</b>	<u>Unsure</u>	<b>Mildly Disagree</b>	<b>Strongly Disagree</b>
When I return to Singapore, I will probably discontinue the recycling habits I adopted in Sweden.	<input type="checkbox"/>				
I will impart the knowledge I gain in Sweden about recycling of household waste to my family in Singapore.	<input type="checkbox"/>				
I will continue my recycling habits I adopted in Sweden if similar recycling facilities are available in Singapore.	<input type="checkbox"/>				

**How did you find out about Sweden's household waste recycling program?**

\_\_\_\_\_

**What type of household waste recycling program will you like Singapore to adopt in the future?**

\_\_\_\_\_

**Demographic Information**

**Gender:**  Female  
 Male

**Age:** \_\_\_\_\_ years

**Highest Level Attained for Education:**

- Primary School
- Secondary School
- Junior College
- Polytechnic / Undergraduate
- Postgraduate

**How long have you been in Sweden?** \_\_\_\_\_ months

**Please indicate living arrangement in Sweden:**

- Living by myself
- Living with colleague/s
- Living with wife/husband
- Living with wife/husband and child/ren

**Is this the first time you are living in Sweden? (Please exclude other stays that are less than a year in duration)**

- Yes
- No

**Please indicate the type of housing you were living in Singapore prior to arriving in Sweden:**

- HDB flats/executive condominium
- Private condominium
- Private houses

**Please indicate the kind of recycling facilities available in your neighbourhood in Singapore:**

- Recycling bins for different recyclables within walking distance
- Pick-up service for different recyclables
- No recycling facilities at all
- Don't know
- Others

**If pick Others above, please describe the type of recycling facilities below.**

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**Your comments to the questionnaire.**

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*Thank you for your time.*