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Determining a Waste Tyre Management System for Hong Kong

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Abstract

Twenty-five percent of waste tyres in Hong Kong are not recycled in spite of a vigorous recycling industry and landfills nearing capacity. The goal of this project was to identify possible solutions to the country's waste tyre management. To accomplish this goal, we interviewed influential members of the waste tyre community, conducted library research, and researched current waste tyre statistics. Through analysis of this data we developed a set of recommendations for Hong Kong to accomplish complete waste tyre recycling.

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Executive Summary

Municipal solid waste management in Hong Kong is a major challenge because its three municipal landfills will be filled to capacity within the next 5-9 years. Non-biodegradable materials such as waste tyres and plastic bags are a critical part of this problem. The Hong Kong government is implementing a plastic bag tax in order to reduce the flow of plastic bags into landfills. It is considering similar steps for waste tyres. The goal of our project is to identify the waste tyre management system that would be best for Hong Kong.

Our goal has been achieved via four main objectives. Our first objective was to determine the willingness of Hong Kong's community to pay a waste tyre tax. Through research of Hong Kong newspapers and a public survey conducted by the EPD, we found that a vast majority of the public was supportive of environmental taxes. Interviews with tyre retailers, producers, and recyclers confirmed that they too are open to a tyre levy. This support came with exceptions in all cases; most interviewees stated they did not want the funds going to general government revenues but instead directly to environmental improvement.

Second, we determined where funds were needed in Hong Kong's waste tyre management system. There are many competitive recycling businesses in Hong Kong that create rubber products, one major company being Jets Technics. These companies have solid markets and are making profits, which suggest that there is no need for government funds in support of technology or research. Often with waste tyre management systems, funds are used to support the transportation of tyres from tyre collection points and landfills to waste tyre recyclers. However, we have concluded that funding from a government tax would not be best used for the transportation of waste

tyres because recycling corporations in Hong Kong have already contracted transportation companies with company funding. Instead, funds would be needed most in the public education of proper recycling techniques and the management of a private board that will supervise collection points and overall tyre recycling.

By comparing Hong Kong's waste tyre management situation with those of other areas around the world, we were able to identify a set of steps that could solve the waste tyre problem. First, we have recommended a number of changes to Hong Kong's current waste tyre policy to improve the city's waste tyre management system. These changes include a strict landfill ban on tyres, refusal to collect tyres with household trash, the formation of separate tyre drop-piles outside of landfills as collection points, and increased public awareness. We trust these changes will be significant steps in stopping the waste tyre problem at its source.

In addition to the changes to Hong Kong's waste tyre management policy, a stewardship board for waste tyre management has proven to be a realistic solution for Hong Kong. The purpose of a stewardship board is to manage environmental levies as a separate entity of the government and break down communication barriers between the retailers, consumers, and recyclers of waste tyres to be in general control of a waste management system. This will direct funds away from the treasury and towards environmental improvement.

Under a stewardship board, we have recommended two plausible options for gaining funds. A landfill gate fee collected at tyre collection points is the first option. This fee would be used to finance the stewardship board directly without much government involvement. This type of fee has proven to be effective in Australia's waste tyre management system. Second, a tyre deposit fee would provide consumers with an

incentive to properly dispose of their waste tyres. Modeled after the current system for glass bottle deposits in Hong Kong, a significant sum would be added to the original price of the tyre, which would then be returned to the consumer when the end-of-life tyres are brought to proper tyre collection points.

Our final objective was to determine a legislative timetable for the implementation of a waste tyre management system. The Environmental Protection Department has established a “Policy Framework for the Management of Municipal Solid Waste” which includes the Plastic Bag Tax and will include the waste tyre legislation, was initially intended to date from 2005 to 2014. According to this Policy Framework, a waste tyre Producer Responsibility Scheme (PRS) should be completed by the end of 2008. When interviewed, EPD officers stated that they were still researching different possibilities for waste tyre management in Hong Kong. This led us to believe that changes may actually not come into effect until 2009 or 2010. However, the recently passed plastic bag tax suggests that a time of approximately two months is required to execute a legislative process. In the event that a tax is chosen by the government as the appropriate PRS for Hong Kong, it is predicted that a similar timetable will take effect. However, the continued debate of the EPD on the appropriate PRS will delay this process.

We have concluded that a waste tyre tax would not be the best option for Hong Kong for several reasons; a tax will not stop waste tyres from entering landfills, the funds collected from a tax are not necessary for any aspect of tyre recycling, and the allocation of funds through the government is not clear. Our strongest recommendation is that a landfill ban for tyres should accompany any waste tyre policy that is implemented. This will ensure that tyres are not being disposed of, but are instead collected in separate drop-

off points and more readily available for recycling. Also, the opinions of Hong Kong drivers, tyre retailers, green groups, and the EPD have suggested that any fee collected should go directly to the improvement of the environment. We strongly recommend that a stewardship board be implemented in order to centralize Hong Kong's waste tyre managements system. If a collection fee is instituted by a stewardship board, the board would be restricted to using the funds exclusively for environmental improvement. Hong Kong currently has a system very much like a stewardship board in place for its construction wastes that could serve as a model for a waste tyre board. With the implementation of these recommendations, we believe Hong Kong can achieve total recycling of its waste tyres.

1. Introduction

Managing waste tyres is a worldwide environmental challenge. Only a few countries such as the United States, Canada, and Australia are beginning to manage the overflow of waste tyres amongst other common wastes. In many developed countries the government has taken steps to control the disposal of waste tyres through various methods, such as implementing gate fees or waste taxes. The implementation of such waste tyre management programs create an environment where consumers and producers alike are encouraged to recycle. With help from these programs, either through funding or public awareness, communities have worked towards complete recycling of all waste tyres.

In Hong Kong, the waste tyre problem is increasing because the country's three strategic landfills are scheduled to reach capacity within the next five to nine years. This is due to increased population size which leads to increased amounts of waste. Waste tyres are one of many contributors to this immense problem. The markets for retreaded tyres, rubber mats, and rubberized asphalt have made the recovery of waste tyres a priority. While there are companies such as Jets Technics that recycle waste tyres, no system imposed by the Hong Kong government has been implemented to keep waste tyres out of landfills for recycling. The Environmental Protection Department (EPD) is currently in the beginning stages of its legislative process to create a waste tyre management plan. While one suggestion is a waste tyre tax, the EPD is still researching other options. Their research includes determining where any allocated funds would be put to use as well as the public acceptance of a waste tyre management system.

There are cases in many developed countries where the implementation of waste tyre management systems has been successful. In some cases, such as the United States,

tax dollars have established a significant source of funding for companies involved in waste tyre management by funding transportation and waste management programs. In other countries, such as Australia and Canada, different systems have proved successful. In Australia, the transportation of waste tyres to recyclers is paid for by landfill gate fees when end-of-life tyres are collected. In Canada, waste tyre management is controlled by an independent entity which is separate from the government. This system uses the fees paid for on tyres exclusively for environmental improvement, such as supporting recycling and transportation. These countries are only a few examples of those that have been successful in properly disposing of waste tyres and have stopped millions of tyres from entering landfills.

The Hong Kong community and tyre-related businesses have little information regarding the planning, implementation, and effects of a proposed waste tyre management system. If the government plans to implement a tax, the community needs to know who will be taxed and what the funds will be used for. Also, parties affected by a waste tyre program are interested in knowing how long it will take to put a management system in place. Without proper laws and education concerning the positive and negative impacts of waste tyre management, the Hong Kong community continues to resist correct disposal of tyres. Even with a recycling market available in Hong Kong, thousands of tyres have been exported for private profit or dumped in landfills. Better education regarding waste tyre management would benefit the Hong Kong community's perception of proper recycling methods.

The goal of this project was to determine a possible waste tyre management system for Hong Kong. We have investigated a hypothetical tax on waste tyres that may be implemented by the Environmental Protection Department, including some of the

major advantages and disadvantages of a levy. Through this we have determined the likelihood of the community to support a waste tyre tax. By evaluating Hong Kong's current waste tyre problem, we have decided where collected funds could be allocated to help the management and remediation of tyres entering the landfills. Next, by researching various waste tyre management methods around the world, we have determined possible waste tyre management solutions for Hong Kong. Lastly, by reviewing Hong Kong's legislative process and previous environmental legislation, we have determined a legislative time table for implementing a waste tyre management system. With this research, we have provided the necessary information and recommendations to begin the creation and implementation of a stronger waste tyre management system in Hong Kong. Our findings will also aid the city in making strides toward reducing waste tyres in landfills, as well as the amount of tyres discarded illegally. Eventually, these efforts will combine to create a system where all of Hong Kong's waste tyres are recycled.

2. Background

This chapter is an overview of the issues that Hong Kong faces due to improper waste tyre management. Hong Kong, due to its dense and growing population, faces a waste crisis: its landfills are estimated to be filled to capacity in less than ten years. The Hong Kong government recognizes this problem and has begun to enact legislation which will step up recycling efforts significantly. This legislation looks to enforce the "polluter pays" principle, and began with a plastic bag tax, which will be enacted within the next year. The next step in the legislation is to pass a tax on waste tyres, which is the primary interest of our sponsor and this project. This background chapter will review current waste tyre management systems both in Hong Kong and around the world, as well as the role of the project sponsor, Jets Technics in waste tyre management in Hong Kong.

2.1. Waste Tyres: Problems & Solutions

Every industrialized nation has faced waste management issues, and tyres are a particularly difficult problem to overcome. Knowledge of the problem is not enough; particular industries and legislation are necessary to facilitate tyre recycling. Once these foundations exist, however, recycling tyres is generally beneficial, as it creates a widely used source of fuel and reusable rubber and also provides jobs and income for those working in the industry (Jay Wrolstad, 2002).

2.1.1. General Information on Waste Tyres

Waste tyres are considered a problem because they are difficult to get rid of safely through normal means such as leaving them in a landfill to decay or incinerating them. A tyre by itself is generally fairly large, but a great deal of that is open space; this space is a problem for several reasons. First, gases such as methane can collect in the space, posing a dangerous fire hazard. This generally occurs when tyres are in landfill, as the other materials around the tyres decay while the tyres do not, and the space in the tyre collects the gases from the decaying material. Not only can these collected gases combust, the tyre itself is very difficult to extinguish when on fire and gives off toxic smoke and chemicals when it is burning. Second, stagnant water can collect in a tyre, providing a breeding ground for insects such as mosquitoes, which carry their own dangers in the form of contagious disease (United States EPA, 2007). The space can also provide a home for rodents. Tyres generally do not decay nearly as quickly as other waste in the landfill. This is due to the process of vulcanization, a method of treating rubber with extreme heat and adding sulfur to make it extremely durable; because of this, other material around the tyre will decompose and cause the tyre to rise to the surface of the landfill (United States EPA, 2007).

2.1.2. Where and Why Waste Tyres Have Become A Problem Around the World

Tyres have become a problem around the world because of the difficulty in getting rid of them; the often-used solution of throwing them into landfills has the aforementioned dangers, which cause more problems so that corrective measures must be taken. Recycling is a much more efficient solution than landfills for disposing of tyres and countries such as the United States have adopted it as the primary means of disposal.

The specifics of waste tyre recycling vary, depending on the final usage. It depends on whether the tyre will be recycled as a whole, decomposed into the base components, or shredded and made into new products.

2.1.3. What Can be Done

Whole tyres can be recycled as-is. They have uses in providing buffers against tidal erosion for bridges and nature reserves. The tyres, when set up and aligned correctly, distort the wave motion and can greatly reduce the effect of erosion (United States EPA, 2007). Whole tyres can also be used as a form of guardrail in various situations, such as highways and recreational vehicle sports. Finally, whole tyres can be recycled by the process of retreading. This process strips off the outer tread of the tyre and applies a new one, making the tyre usable again while not requiring the material that making an entirely new tyre would require.

In addition to recycling the entire tyre, it is also possible to decompose the tyre into its base components through a process called pyrolysis. Pyrolysis is the process of heating a tyre such that it decomposes into three basic components; gas, liquid, and a form of solid carbon. The problem with this process is that it is not currently cost-effective, as the products of the process must be refined further to be useful (United States EPA, 2007).

The third possibility, shredding the tyre, seems to be the most promising solution. The shredded tyre has a variety of potential uses. One use is as a noise buffer. Tyre shreds can be combined with other materials to make walls much more noise absorbent, which is important for such things as noise reduction structures near highways. The tyre shreds can be recycled into different kinds of rubber, such as the kind used as a

foundation for playgrounds. It is good for playgrounds because the rubber flooring absorbs most of the impact of a fall, helping to prevent injury (United States EPA, 2007). Another common use is to reduce the shred to a powder, and use that as an ingredient in concrete. This method of creating concrete has a variety of beneficial effects, such as reducing noise, lasting longer, and making concrete more cost-effective (United States EPA, 2007). The shreds also have a variety of other uses, such as mulching. Shredded tyres can also be reduced to finer particles, which are known as crumb rubber. Crumb rubber is almost completely free from contaminants such as wire and is much more useful to rubber recyclers but the process to produce crumb rubber is extremely expensive.

A fourth alternate use for tyres is as a fuel source. Tyres produce the same amount of energy per unit mass as oil and slightly more than coal (United States EPA, 2007). Because of this, tyres can be used as efficient fuel for industrial processes such as power plants while having less effect on the environment than coal would. Most of the time, the tyres must be shredded to fit the boiler or other device. However, using a whole tyre as fuel is certainly possible, and can be done with large enough machinery. The only problem with using an entire tyre as fuel lies in the wires that are used in making tyres. Shredding tyres removes the wiring as part of the process. Otherwise, the wires are left over as a byproduct of the fuel and can cause waste management problems of their own.

2.2. Waste Tyre Management Systems Around the World

As Hong Kong is exploring the idea of implementing a waste tyre tax, an overview of how other countries around the world have dealt with the problem successfully would be useful in determining the best method for Hong Kong. The countries that are discussed in this section are Canada, the United States and Australia. Canada has been extremely successful with its stewardship programs. The United States has also been successful with the implementation of waste tyre laws and fees. Australia uses a different system in comparison to Canada and the United States; they use what is called a landfill gate tax.

2.2.1. Canada

Like many other countries in the world, Canada has had to find alternatives to landfills for waste tyre disposal. In the late 1980's and early 1990's, Canada disposed of their tyres by simply burning them. However, after 13 million scrap tyres burned uncontrollably in Ontario, Canada, they had to find alternative ways to deal with the disposal of them (Farrell, 2000). Most provinces in Canada decided to levy a tax on new tyres in order to fund recycling programs. These programs are run privately under what are called stewardship programs, with each province having its own program. These stewardship boards are responsible for tax collection, as well as distributing incentives to the tyre tax recyclers. Rubber is the most popular by-product of recycled tyres. Therefore, most recycling processing firms concentrate on obtaining rubber from the tyres and turning them into crumbed rubber. Crumbed rubber is then used by different industries to make such products as rubber mats, mud flaps for trucks, automotive and industrial parts, sports fields/turfs, and rubberized pavements and roads. Because there are ten provinces

in Canada, each having slightly different stewardship programs, we are going to discuss three of them: British Columbia, New Brunswick and Manitoba.

New Brunswick is the eighth largest province or territory in Canada, with a population of approximately 800,000 people. It is also one of three Maritime Provinces in Canada. New Brunswick, much like the other provinces and territories in Canada, had a problematic waste tyre disposal problem and sought to fix it by implementing a waste tax levy and a stewardship board to ensure that the taxes from the levy are used to recycle waste tyres. The New Brunswick Department of Environment created the New Brunswick Stewardship board in October 1996 (Farrell, 2000). The board is comprised of five members; a government appointee, a member of a new car dealership, a member of the Atlantic Tyre Dealers Association, a tyre dealer and a member of a trucking company (NB Tire Stewardship Board, 2007). The board's primary goal is to divert scrap tyres from waste disposal facilities and ensure that they are recycled. The board achieves their primary goal by collecting levies from retailers and by providing financial assistance (for transporting the tyres and processing them) to waste tyre recyclers. Last year the board collected approximately 15 million tons of waste tyres and collected approximately \$3 million CAD (Canadian Dollars) from levies and fees (New Brunswick Tire Stewardship Board's Annual Report 2006, 2007). The breakdown of the levies and fees are as follows: tyres up to 17" in width require an additional fee of \$3CAD, and tyres up to 24.5" require a fee of \$9CAD (NB Tire Stewardship Board, 2007). The board receives the levies through remittances from tyre retailers once a month. Retailers are offered the option of having the Board pick up their waste tyres instead of paying a hauling fee or landfill tip. The board has also designed a 'tyre round up program', where residents can drop off their old tyres at designated locations around the province. After the waste tyres are collected,

they are then processed and used as raw material for products such as: livestock mattresses for dairy operations, synthetic roofing shingles, and re-treaded tyres (NB Tire Stewardship Board, 2007).

Manitoba is the fifth largest province in Canada with a population of approximately 1.2 million people and is located in western Canada. Like New Brunswick, Manitoba also created a Stewardship program to deal with their waste tyre problem. In 1992, the government of Manitoba, under the Waste Reduction and Prevention Act (WRAP Act), created a tyre levy on new tyres that were sold in Manitoba. Initially the department of Finance collected the levies, but the government established The Manitoba Tyre Stewardship Board on April 1, 1995, and they assumed the collection of the levy (Farrell, 2000). The board is composed of five members: two appointed by the Lieutenant Governor in Council, and the others being representatives of the Rubber Association of Canada, the Western Canadian Tyre Dealers Association and the Manitoba Motor League. The Stewardship board is directly responsible for licensing all tyre and motor vehicle dealers in order to collect the levies from them (The Manitoba Tire Stewardship Board, 2007). The money collected by the board is used to pay for the collection, transportation, storage, processing and disposal of scrap tyres. Unlike most other provinces, Manitoba has only levied a tax on the purchase of passenger vehicles and lightweight trucks. The levy comprised of a \$2.80 CAD fee on all tyres purchased and \$0.20 CAD Provincial sales tax (The Manitoba Tire Stewardship Board, 2007). In 2005, the Manitoba Tyre Stewardship board collected approximately \$3 million CAD from fees and levies in (Discussion Paper: The Stewardship Program, Energy Science and Technology, January 7, 2006). The board supports several contractors that recycle

tyres; these contractors recycle waste tyres and create products such as blasting mats, tyre-derived fuel and cattle mats for trailers.

British Columbia is located on the west coast of Canada and is the third largest province in terms of population, with an estimated 4.4 million people. In 1991 British Columbia became the first province to pass a comprehensive scrap tyre management law, under the mandate of this law, the Financial Incentives for Recycling Scrap Tyres (FIRST) program was introduced in June 1991 (Tire Stewardship Board B.C, 2007). FIRST is a government program that provides financial incentives for the transportation and recycling of scrap tyres. In order to fund the FIRST program, a tax was levied on all tyres that were newly bought. The Tyre Stewardship of British Columbia (TSBC) replaced the FIRST program on January 1, 2007, after 16 years of operation (Moore M., 2007). The TSBC is a non-profit organization, whose goal is to manage the scrap tyre recycling program on behalf of the tyre retailers in the province. The TSBC board is composed of seven members; it consists of three members of the Western Canada Tyre Dealers, one member of the Retail Council of Canada, two members of the Rubber Association of Canada and one member of the New Car Dealers Association (Tire Stewardship Board B.C, 2007). The TSBC funded its program with the tax that was used by the FIRST program. At this point, the tax is \$4.00 CAD for all passenger and light truck tyres. The funds obtained from the tax are used to finance transportation incentives, as well as providing financial support for the research and development of new methods to recycle waste tyres. (Tire Stewardship Board B.C, 2007)

2.2.2. *United States*

Over the last fifty years the United States has had to deal with the problem of finding alternative ways to dispose of their solid waste other than the use of a landfill. This has become a problem mainly due to large increases in solid waste production without any increases in landfill space. In order to save the limited landfill space, government agencies sought to ban or eliminate bulky waste materials such as scrap tyres. Keeping waste materials such as waste tyres out of landfills was an extremely difficult task because the government agencies encountered problems with transportation of tyres from the landfills, finding appropriate storage facilities, and finding alternative ways to dispose of them (including recycling). Most states solved this problem by implementing a tax or fee on new tyres. Forty-eight states have implemented a waste tyre management program and all of them are different. In this report, we are going to examine the programs in two states that we think are successful. These states are California and New Hampshire.

The state of California is located in the western pacific region of the United States of America and is the largest state in the U.S. in terms of population, with a population of approximately 33 million people. For years California has been attempting to solve the problem of diverting, or safely managing, over 40 million waste tyres that are produced in the state each year. They have also had to deal with the illegal stockpiling and dumping of waste tyres. It is estimated that 1.5 million tyres are stockpiled or dumped each year (California Integrated Waste Management Board, 1996). In 1989 the local Government of California passed the California Tyre Recycling Act of 1989, which authorized the creation of the Tyre Recycling Program and the California Tyre Recycling Management Fund. When this act was passed, the California Integrated Waste

Management Board was the organization designated to oversee and manage waste tyres. The California Integrated Waste Management Board is comprised of six members, four who are appointed by the Governor himself, one is appointed by the speaker of the Assembly, and the other is appointed by the Senate Committee on Rules (Board C. I., 2007). The board's goal is to find new uses for waste material, such as waste tyres, and to work in collaboration with local governments, industries, and the public in order to reach this goal. The Board is funded by the collection of the California Tyre Fee, which is \$ 1.75 USD (US Dollars) per tyre (Board C. I., 2007). The tyre retailer collects this fee and deposits it in the California Tyre Recycling Fee Management fund on a quarterly basis. The California Integrated Waste Management Board uses the money from the California Tyre Fee to: operate tyre recycling programs, administer a waste tyre hauler program, pay for cleanup costs related to the disposal of used whole tyres, conduct research directed at promoting and developing alternatives to landfill disposal of used whole tyres, operate state wide tyre shredding programs, and cover the regulation of the storage of tyres (Board C. I., 2007).

New Hampshire is the 9th smallest state in the U.S. in respect to population, with approximately 1.2 million people. New Hampshire is located in the New England region of the United States. Being one of the smallest states land-wise in the U.S. (ranked 46th), the state government of New Hampshire is very concerned about providing space for waste management. One measure that the state has implemented is banning all waste tyres from municipal landfills (Scrap Tire Management, 2007). The state has also established a fund for collecting and disposing of used tyres, motor oil, and motor vehicle batteries. The money for this fund is raised by charging a fee on all motor vehicles that are registered with the town or city clerk. The New Hampshire Department of

Environmental Services, through the Waste Tyre Division, controls this fund. The fees are as follows: \$5.00 USD for heavy vehicles, including trailers, heavy trucks, buses and tractors whose gross weight exceeds 18,000 pounds, \$3.00 USD for automobiles, light vehicles including trucks and commercial vehicles including tractor trailers and \$2.00 for all terrain vehicles, agriculture and farm vehicles, historic vehicles and two wheeled vehicles including mopeds, motorcycles and non-motorized car and boat trailers (Scrap Tire Management, 2007). The money collected from the fees is used primarily to offset collection and disposal fees.

2.2.3. Australia

For several years the Government of Australia has been struggling with the disposal of the estimated 170,000 tonnes of waste tyres generated each year (Australia Commonwealth Department of the Environment, 2001). The majority of waste tyres in Australia are being disposed of in landfills or dumped illegally, which has caused serious environmental issues. The Australian Government Department of Environment and Water Resources has implemented regulations and policies to try and hinder the disposal of waste tyres in landfills. They have banned all scrap tyres from municipal landfills whether they are whole or shredded. Like many other countries, Australia is seeking a greener way to solve their problem by searching for methods to recycle the tyres. Tyres can be recycled in numerous ways and the most popular ones in Australia are crumbing and shredding. Another way that the government is trying to slow down or stop the disposal of waste tyres in landfills is by waste avoidance (Australian Government Department of the Environment, 2007). Waste avoidance is reducing the number of tyres that are disposed of by reducing the number of tyres that are produced. One way that this

can be done is by encouraging people to buy tyres with a longer tread life. Unlike most other countries that fund their waste tyre programs with taxes, Australia uses a landfill gate fee. The fees are collected by local governments and are used for the collection and storage of the waste tyres. The fees range from \$1.80 to \$3.00 AUD (Australian Dollars) per passenger vehicle tyres (Australian Government Department of the Environment, 2007).

2.3. The Waste Reduction Problem in Hong Kong

This section is an overview of the problems that Hong Kong is facing due to improper management of waste tyres. Because Hong Kong is densely populated and still growing, it is creating more waste than can currently be processed. Hong Kong citizens do not find recycling in general to be a convenient practice. Therefore, most do not attempt to make an effort to do so. Hong Kong's problems with recycling means and methods are becoming an increasingly large problem for the community and environment. If this problem continues without reconsideration of various waste management programs, Hong Kong will reach a point where it no longer has space for its waste materials. Because rubbish and recyclables have both been simply thrown away for so long, landfill space is becoming scarce.

2.3.1. Current Recycling Statistics in Hong Kong

Hong Kong's current recycling rates are not at a level of compatibility with the needs of the region. Statistics show that in 2006 only 14% of Hong Kong's population recycled, while most other citizens found it inconvenient to do so (Sustainable Solutions Limited, 2002). The Environmental Protection Department (EPD) states that approximately 2.84 million tonnes of municipal solid waste recyclables were recovered in 2006 and that this number has been steadily increasing over the years as Hong Kong's population has increased. This is 45% of the total amount of waste collected and was in addition to the 55% of non-recyclable waste that made up 3.39 million tons in 2006 (Hong Kong EPD, 2007). This poses a huge problem with the environment because Hong Kong is producing more waste than it can process. Hong Kong exports most of its recyclable waste to mainland China or other countries because it is unable to recycle efficiently and effectively. Only 4% of the recyclable materials that Hong Kong produces are recycled locally. In 2006, this meant that only 0.11 million tons of recyclable wastes were recycled locally as opposed to the 2.73 million tons that were exported. Although Hong Kong earns about HK\$5.3 billion each year (Hong Kong EPD, 2007) on exported recyclable material, localized recycling programs have the potential to generate more profit.

A large portion of Hong Kong's challenges with recycling and waste management is due to the overload of waste tyres being thrown away and not recycled. Hong Kong's government and the EPD are working with various recycling companies to prevent these tyres from being brought to the landfills as waste and recycled instead. The major companies that take charge of the transportation and recycling of many waste tyres in Hong Kong are listed below:

1. Luen Hop Environment Tyre
2. Luen Hop Rubbertyre
3. Man Lee Hang Tyre & Battery Co. Ltd.
4. Natural Environmental Service Co.
5. Standard Tires & Batteries
6. Wah On Tyres Retreading Co.
7. Jets Technics

(Hong Kong EPD, 2007)

The companies listed above are only a few of the larger companies that are responsible for the specific collection of the waste tyres in Hong Kong.

Hong Kong has only three strategic landfills and seven transfer stations. Waste tyres that are not recycled are simply brought to a landfill, cut in half, and added to the piles. The landfills that are most commonly used are the West New Territories (WENT) landfill, South New Territories (SENT) Landfill, and North East New Territories (NENT) Landfill. There are also thirteen closed landfills to date. Figure 1 shows the landfills and their locations below:

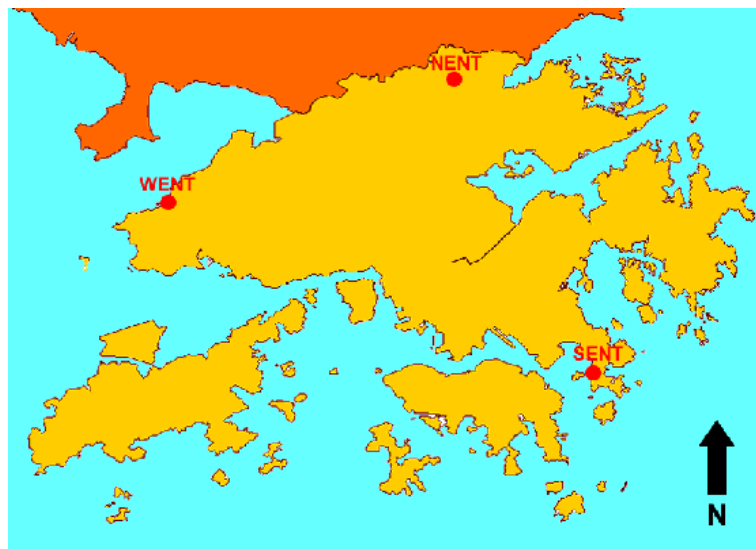


Figure 1: Strategic Landfill Locations in Hong Kong
Source: Hong Kong EPD, 2007

The types of wastes that go to these landfills are municipal solid waste (MSW), construction waste, chemical waste, and special wastes which include clinical waste, animal carcasses, livestock waste, radioactive waste, and grease trap waste. The seven major transfer stations currently in operation are used to contain bulk amounts of waste to be transported efficiently to the three landfills. These transfer stations and their locations are shown below in Figure 2:

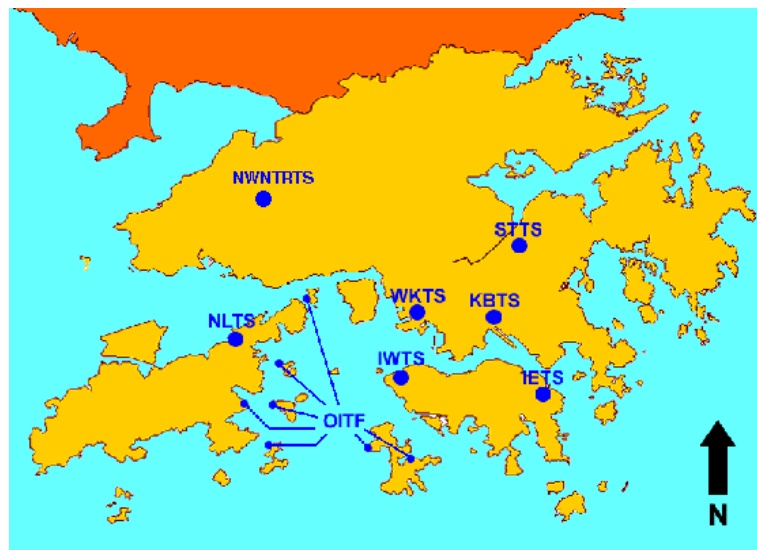


Figure 2: Refuse Transfer Station Locations in Hong Kong
Source: Hong Kong EPD, 2007

The refuse transfer stations listed are the Island East Transfer Station (IETS), the Island West Transfer Station (IWTS), Shatin Transfer Station (STTS), North Lantau Transfer Station (NLTS), Outlying Islands Transfer Station (OITF), West Kowloon Transfer Station (WKTS), and North West New Territories Refuse Transfer Station (NWNTRTS). The Kowloon Bay Transfer Station (KBTS) is currently closed. Hong Kong disposes of 5.5 million tonnes of waste per year, and all is sent to one of the three strategic landfills. This amount has also been increasing over the years and is quickly

approaching dangerous levels. The landfills that are currently in operation were designed to remain open until around the year 2020. However, due to the increase in waste production, these landfills are expected to be full between 2009 and 2014 (Hong Kong EPD, 2007). For this reason alone, it is very important that Hong Kong adopt effective recycling programs for every recyclable material.

2.3.2. Current Efforts to Improve Recycling

Hong Kong has recognized its problem with rapidly decreasing landfill space, and is actively searching for efficient ways to reduce waste. Recycling is a major challenge in Hong Kong as well, and the government has been focusing on this issue to improve its general waste management problems. The Legislative Council (LegCo) Panel on Environmental Affairs has proposed the implementation of Producer Responsibility Schemes (PRS). These "polluter pays" programs have given four main ideas to the Hong Kong Government (Hong Kong EPD, 2007).

The first program, a product take-back, is the most common program used; it ensures that companies take back and recycle their own products. This has been used successfully in other countries to deal with the waste tyre problem. The second program is the deposit-refund system, where the consumer pays a deposit upon purchase of a product and is given a refund of the deposit on return of the product (or the waste thereof). An Advanced Recycling Fee (ARF) is implemented, usually along with another program such as the product take-back scheme. This fee, upon purchase of the product, goes to a fund responsible for recycling. Sweden has already successfully implemented this type of scheme for its waste tyres, and the tax currently being considered by the Hong Kong government most resembles this program. The fourth program is a product

tax. This program's objective is to discourage use of the product to reduce waste caused by the product. (Hong Kong EPD, 2007).

The Hong Kong government has also implemented a land allocation policy to local recycling industries. In 2006, 36 lots totaling 7.4 hectares of land were given to individual recycling industries to contribute to Hong Kong's local recycling efforts. These plots of land are short-term tenancy arrangements, but it is expected that if this program remains a success, the government will allow them to stay. The recycling companies that have been given land are recyclers of paper, metals, plastics, textile, wood and rubber tyres (Hong Kong EPD, 2007). Figure 3 shows the values of exported recyclables out of Hong Kong.

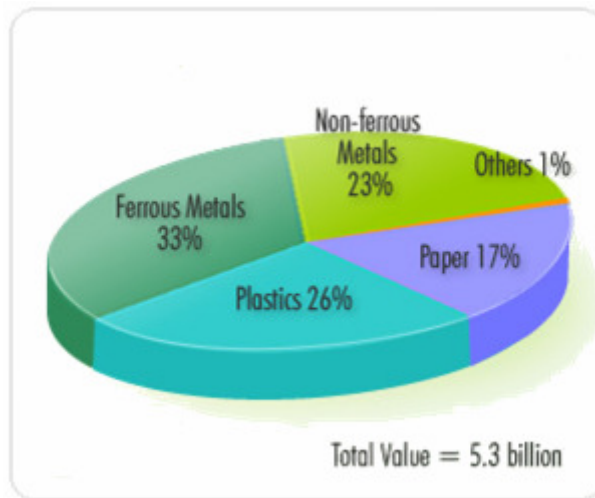


Figure 3: Exported Recyclable Materials in 2006
Source: Hong Kong EPD, 2007.

In Figure 3, waste tyres fall under the “Others” category. This shows that in total, a good portion of Hong Kong's recyclable waste is exported for recycling or simply thrown away, but are not recycled locally. Through the allocation land policy, more local recycling industries can contribute to the recycling of waste tyres in Hong Kong.

2.3.3. *Introduction to Green tax*

In the effort to reduce the amount of the municipal solid waste in Hong Kong the government has considered a green tax as an alternative solution. The idea of the green tax has been borrowed from the environmental tax model of the Organization for Economic Co-operation and Development (OECD). OECD was established in Paris on December 14th 1960, its thirty members include the United States, United Kingdom, Germany, France, Japan, and others. (OECD, 2002) The organization's main purpose is to help its members achieve the highest sustainable economic growth and employment while also raising the standard of living for their citizens (Barde, 1999). In many of the OECD countries, the government is trying to reduce the taxes on personal income and profit and increase taxes on consumption and social security contributions. This interest leads the OECD to introduce the concept of Green Tax reform in the early 1990s (Barde, 1999).

From the OECD's standpoint, the green tax is a cost-effective approach for implementing domestic environmental policies. From the fiscal policy perspective, the green tax opens an opportunity for introducing new environmental taxes that are "aimed to integrate environmental consideration into the design of the tax systems." (Barde, 1999) The green tax is an economic instrument in environmental policy, it can offer a way to achieve environmental policy at a lower cost (OECD 1997) and at the same time raise a significant amount of tax revenue for the government. The OECD Council Recommendation on the Use of Economic Instruments in Environmental Policy recommended the member countries to "make a greater and more consistent use of economic instruments as a complement or a substitute to other policy instruments such as regulations, taking into account national socio-economic conditions" (OECD, 1997). The

green tax system can use current tax systems that are likely to have a direct or indirect negative effect on the environment. The existing taxes then can be restructured in an “environmentally-friendlier manner”. In a report from EUROSTAT, the following term was used to define the green tax:

“A tax falls into the environmental category if the tax base is a physical unit (or a proxy for it) of something that has a proven specific negative impact on the environment, when used or released.” (OECD, 1997)

According to the OECD, this definition concentrates on giving the tax a function, rather than only a reason for introduction. In application, the green tax can be used as taxes which are unrequited, charges which are requited, emission charges or taxes which are direct payment based on quantity or quality of the pollutants discharged, and product taxes (OECD, 1997).

The numbers from research done by OECD showed that in 1995, the environmentally related taxes accounted for about 3.8% to 11.2% of each member countries tax revenue (average of 7%), and varies between 1% and 4.5% of the GDP (Barde, 1999).

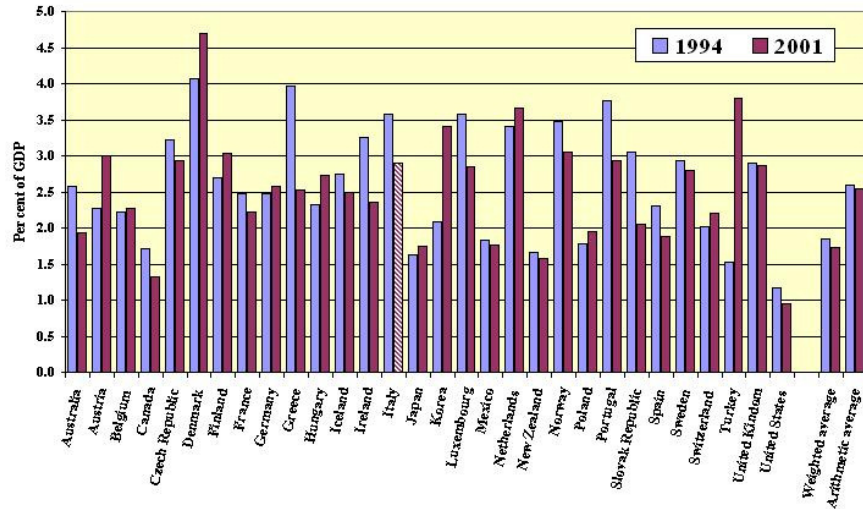


Figure 4: Revenue from Environmentally Related Taxes in Percent GDP

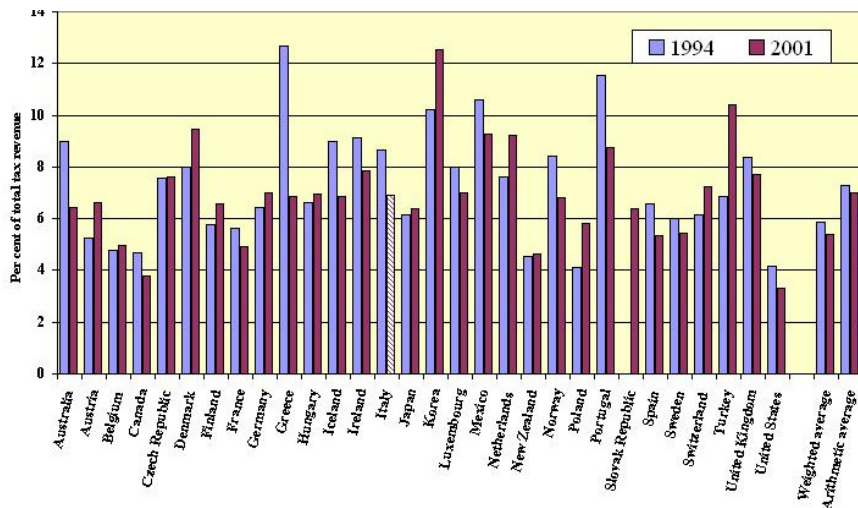


Figure 5: Revenues from Environmentally Related Taxes in Percent of Total Tax Revenue

Source: OECD Environmentally Related Taxes Database 2004

These numbers show that a significant amount of money has been generated by environmental taxes each year. This also raises the public’s concern about the use of the environmental tax revenue. Some OECD countries used the tax revenue to “strengthen the budget balance, finance increased spending or reduce other taxes”. The green tax revenue is also used to shift the tax burden off the labor to the pollution generated with the hope that “this would encourage work effort and thereby contribute to increased

employment, while improving the environment”. Other uses for the revenue include projects such as repairing and recycling waste material or any other specific environmental issues (Cebreiro-Gomez, et al., 2006).

However, there are some frequently raised concerns about the introduction of new environmental taxes. The first lies in the stability of the tax revenue. The expectation of the environmental tax is not to raise a large amount of tax revenue but to induce “a reduction in the tax base related environmentally-harmful products or activities”. Therefore, when the problem is reduced or solved, is it necessary to keep the tax in existence? The second is the “adverse distributional effect”, because green tax percentages are not based on income, these taxes may hurt groups with lower income. And last is about “competitiveness and economic growth”, but so far the green tax has not showed any negative effect on the competitiveness of the OECD countries’ economies (Barde, 1999). From a fiscal point of view, the green tax is also not a good tax. A good tax in definition is “one that can produce maximum revenue with efficiency stability and simplicity”. This is not the case for the green tax, for the green tax to have an incentive effect on the environmental, the tax need to be high. Therefore, the more the tax work, the more pollution products and factors will diminish and less revenue will be collected. For the products tax, the green tax can also make a product to disappear from the current market. (Barde, 1999)

2.3.4. *Hong Kong’s Plastic Bag Tax*

One example of a tax that has already begun implementation in Hong Kong is a levy on recyclable plastic shopping bags. Hong Kong’s landfills receive over 8 billion of these bags each year (Hong Kong EPD, 2007), which has become an immense problem

that is possible to control. The levy on plastic shopping bags is a program that retailers which supply these bags to their customers voluntarily induce. The tax is a 50 cent HKD (Hong Kong Dollars) tax on every new bag. This causes shoppers to have more of an incentive to either bring their own reusable shopping bags or not use a bag at all. Some of the major chain retailers in Hong Kong that are under this scheme are:

- Wellcome
- PARKnSHOP
- China Resources Vanguard
- Watsons
- Mannings
- Pricerite
- DCH Food Marts
- A-1 Bakery
- Circle K

In addition to the levy itself, some of these stores are doing more than simply allowing the tax to be placed on their plastic shopping bags. Some of these extensions include incentives or rebates to those customers who do not use new plastic bags, putting up signs to advertise their participation in the scheme, and asking each and every customer if they really need a plastic shopping bag. This levy scheme is predicted to reduce plastic shopping bag use to about 50% from current rates in the first year and potentially reach a 90% decrease in years to come. The levy itself is estimated to bring in about \$200 million to be used by the Environment and Conservation Fund. This money in this fund will then be used to further awareness and efforts toward recycling and better waste management for the welfare of Hong Kong in the long run (Hong Kong EPD, 2007). This levy is important to the research of Hong Kong's recycling industry because

it shows that levies on recyclable wastes are feasible and worth-while. This scheme is also important to the management of waste tyres because it is thus far the intended method for the betterment of their recycling.

Through research on newspaper articles and the examination of a public consultation report conducted by the EPD, information on general responses to the plastic bag tax was collected. The data showed mixed reviews to the taxes. The government, green groups, and a majority of the general public supported a levy on plastic bags, while plastic bag manufacturers, retailers, and a minority of the public opposed the tax.

The Environmental Protection Department conducted a public survey and held meetings with the Legislative Council, various green groups, plastic bag manufacturers, retailers, and the Advisory Council on the Environment. The results of the Public Consultation Report showed that approximately 90% of the surveyed sample population agreed that there was room to reduce the use of plastic shopping bags. The survey also found that 84% of the respondents supported the implementation of a “polluter pays” (*Legislative Council Brief, 2007*) scheme and 66% supported the implementation of a tax. The majority of the Legislative Panel on Environmental Affairs agreed that a tax is the best possible Producer Responsibility Scheme (PRS) for plastic bags. The Advisory Council on the Environment also supported the tax. They saw it as the first step of many for “polluter pays” policies on the six proposed types of recyclable products. Green groups had a positive response to the implementation of an environmental levy, although they had varying opinions on how the tax should be used. The Plastic Bag Manufacturers’ Association opposed the tax because they thought that “plastic bags were more environmentally friendly than other single-use carriers, such as paper bags”

(*Legislative Council Brief*, 2007). The Hong Kong Retail Management Association also opposed the tax, stating that the tax will target large supermarkets, convenience stores, and personal health and beauty stores that contribute only a minute percentage of the plastic bag overload in landfills.

Although the information in newspapers and journals reflected mixed views, the majority of the articles reviewed for this project contained positive reviews for the Plastic Bag Tax. All of the following quotes were obtained from influential news sources in the Hong Kong area. In an editorial titled “Hooray for the Plastic Bag Tax” in the June 5, 2007 edition of the *China Daily Hong Kong Edition*, a member of the public wrote, “even those of us who are passive environmentalists should applaud this move because plastic bags, in many different sizes and colors, have become such a huge nuisance”. In an article titled, “Survey respondents back green groups in call for plastic-bag tax”, written in the May 2, 2007 edition of *The Standard*, Carol Chung states that “According to a Caritas Community Centre survey, more than 60 percent of the 407 people interviewed in Kennedy Town - a middle-class area - agreed that such a tax should be enforced”. The article also included the opinion of Hong Kong’s People’s Council for Sustainable Development vice chairman Plato Yip Kwong-To. He said, “the issue is no longer about the need for a plastic-bag tax, but how effective the tax would be, calling on the government to consider a tax that will be high enough to act as a deterrent”. A third editorial, found in the May 27, 2007 edition of the *South China Morning Post*, was titled “Bag levy step in the right direction”. The writer stated, “I am writing to express my view on the proposal to tax the use of plastic bags. The consultation on proposals to tax the use

of plastic bags launched by the Environmental Protection Department is a step in the right direction in improving our deteriorating environment”.

Although a majority of the reviewed newspaper article authors were in support of the plastic bag tax, there were several authors who still opposed it. In an article titled, “Legislator hits out at ‘punitive’ plastic bag tax”, in the May 28, 2007 edition of *The Standard*, Author Carol Cheung interviewed Vincent Fang Gang, a lawmaker representing the wholesale and retail sectors of Hong Kong. In this interview, Mr. Fang Gang said, “the industry fully supports the proposed tax to protect the environment, but criticized it is as a ‘short- sighted’ approach”. Mr. Fang Gang also went on to say, “the government should have a comprehensive recycling plan to deal with and transport garbage to collection points, and support the recycling industry. If we do the recycling well, garbage can be a treasure”. He suggested that “environmental protection should start at school, but we're aware of our limited resources and the government is not strong enough in educating the public”. In an interview found in the September 4, 2009 article of the *South China Morning Post* by Fanny Fung, a government official stated, “We would not like to give the public a wrong impression that they are contributing to environmental protection by paying 50 cents for a plastic bag. Otherwise, some may want to buy 10 bags if they think they are contributing HK\$5 to environmental protection”. In that same article, Ms. Wing-tsz stated her opinion that “the government should use all the tax[es] collected on bags for environmental protection”. In an editorial in the September 8, 2007 edition of the *South China Morning Post* titled “Should supermarkets charge for plastic bags?” a member of the public writes “There was an uproar over the newly enforced compulsory charge for plastic bags at ParknShop. Some shoppers supported the

move when it was first announced, but others complained about the inconvenience it caused”.

2.3.5. *Current Models for Waste Collection Systems*

Construction waste is any substance, matter, or thing that is generated as the result of construction work. It is a mixture of surplus materials arising from site clearance, excavation, construction, refurbishment, renovation, demolition and road works. Construction waste makes up about 27% of Hong Kong municipal solid waste and fills 14% of Hong Kong’s public landfills. The construction waste management strategy is summarized as an inverted cone which is to avoid, minimize, reuse, recycle and finally dispose of waste with the desirability decreasing in this order.

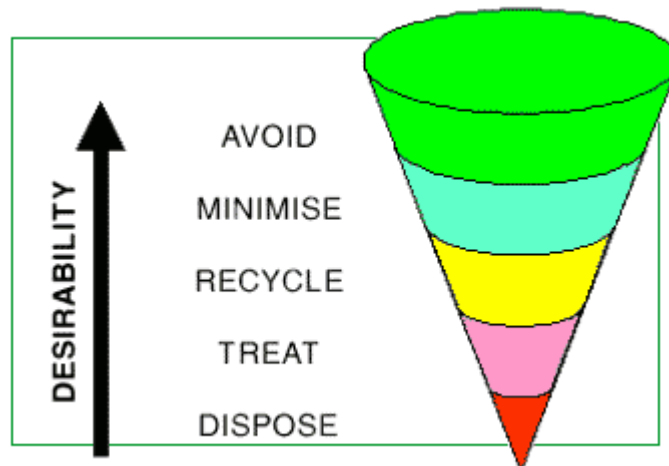


Figure 6: Construction Waste Management Strategy (EPD Construction Waste, 2005)

The charging scheme came into operation on December 1st 2005. It requires contractors with projects valuing over a \$1 million to open a bank account with the Environmental Protection Department within 21 days after they have won a building contract. With projects valuing less than \$1 million, any person, such as the owner of the

premises where the construction is taking place, can open a bank account. Contractors are charged every time they use construction waste recycling facilities or dispose the waste in a landfill. Disposal of construction waste into landfills costs five times more than disposal of “inert waste”, which includes rock, rubble, boulder, earth, soil, sand, concrete, asphalt, brick, tile, or masonry. This encourages contractors to separate construction waste from inert waste before dumping into landfill. These fees cover disposal costs such as transportation and landfill operation. All the transaction information is public on the EPD website. This way, the businesses involved can track where their money is going. Through the Charging Scheme, construction waste producers are encouraged to reduce, sort, and recycle construction waste so that their disposal costs can be minimized and our valuable landfill space can be preserved. (EPD Construction Waste, 2005)

Another waste collection model is the container recycling program, which includes deposit fees. Deposits on beverage containers are not a new idea. The deposit-refund system was created by the beverage industry as a means of guaranteeing the return of their glass bottles to be washed, refilled and resold. While this program is in its early stages in Hong Kong, many countries around the world have adopted container recycling legislation, including the United States, Canada, Switzerland, Australia, Germany, and Sweden (Container-Recycling Institute, 2006). In Massachusetts, U.S.A., the Beverage Container Recovery Law was passed in 1983. This plan includes a fee of \$.05 USD be added to beer, soft drink, and carbonated water containers. When the empty container is returned to the retailer or bottling company, the consumer receives the exact amount of the fee for each container (Massachusetts Department of Environmental Protection, 2007). With this program, consumers gain an economic incentive to return empty containers. When a deposit is “unclaimed” or “unredeemed” profits were originally

collected by the distributors or bottlers in most states. Though, in Massachusetts, the courts have ruled that because these unclaimed deposits are "abandoned" by the public, they rightfully belong to the state, and they are now used to fund environmental programs in those states. This working model for container recycling, including other successful "bottle-bills" around the world, are valuable models for Hong Kong's glass bottle redemption program as well as any other future waste management systems in Hong Kong.

2.3.6. Hopes for the Future of Recycling in Hong Kong

Hong Kong has issued a helpline service to aid the public with their recycling needs (Hong Kong EPD, 2007). This service has been in operation since 1991. It offers tips and educational information on recycling programs and how the public can organize its waste reduction. In 2006 there were 4,396 enquiries, which have earned the service a positive mark (Hong Kong EPD, 2007). The aims of this service are to bring more public awareness to the Hong Kong community about recycling and general waste management.

The Environmental Protection Department (EPD) is planning many methods and programs to improve the waste management systems in Hong Kong. They are always searching for more land on which to put landfills as the current landfills are filling up at faster rates than originally expected. Also, the closed landfills are being prepared for golf courses, driving ranges, parks, etc. so that the land may be given back to the community. A Policy Framework is being organized by the EPD and Hong Kong's government that aims to reduce the total amount of municipal solid waste (MSW) by 1% each year, reclaim more of the recyclable waste available to 50%, and therefore reduce the amount of MSW that is going to the landfills and causing most of the problem by 25% by the

year 2014 (Hong Kong EPD, 2007). By increasing awareness for this cause, these goals will be more achievable.

Another huge goal that has been set by the EPD is EcoPark. EcoPark is a large area of land set up for the networking of various recycling and waste disposal industries to become more efficient with waste management in Hong Kong. This plan is outlined in the Policy Framework and aims to combine the powers of different recycling industries over a 20 hectare plot of land right in Hong Kong (Hong Kong EPD, 2007). The Policy Framework sets a timeline for the completion of EcoPark for the year 2009.

Along with these basic contributions, Hong Kong is implementing plans to further their recycling and waste management programs. Table 1 on the following page shows all of these plans and their expected completion dates.

Table 1: Current and Future Waste Management and Recycling Plans for Hong Kong

Specific Measures	Targets
Territory-wide Source Separation of Domestic waste	<p>To increase the domestic waste recovery rate from 14% in 2004 to 20% in 2007 and 26% in 2012.</p> <p>To increase the number of housing estates under the program to 180, 700, 1,140 and 1,360 by the end of 2005, 2007, 2009 and 2010 respectively, so as to enlist 80% of the local population by 2010.</p> <p>To increase the number of public rental housing (PRH) estates taking part, from 30 in 2005 to all PRH estates by 2012.</p>
<p>Producer Responsibility Schemes (PRS)</p> <p>PRS for specific products:</p> <ul style="list-style-type: none"> o Electrical & electronic equipment o Vehicle tyres o Plastic bags o Packaging materials o Beverage containers o Rechargeable batteries 	<p>To produce Product Eco-responsibility Bill to Hong Kong's Legislative Council (LegCo) in 2006</p> <p>To make Regulations in 2007</p> <p>To make Regulations in 2008</p> <p>To make Regulations in 2009</p>
MSW Charging	To introduce relevant legislation to LegCo in 2007
Land Policy	To provide short-term tenancy sites with longer duration for the recycling industry on a case-by-case basis
EcoPark	To commission Phase 1 by late 2006 and Phase 2 by 2009
Green Procurement	Government departments to adopt a green procurement policy as far as practicable
Funding for recycling technology projects	On-going
Integrated Waste Management Facilities (IWMF)	To commission the IWMF in mid 2010s subject to the implementation of the "polluter-pays" principle
Landfill Extensions	To commission these extensions in early to mid 2010s

Source: Hong Kong EPD, 2007.

2.4. Waste Tyre Management in Hong Kong

This section will focus on how the waste management in Hong Kong directly affects waste tyres. In recent years, Hong Kong has become one of the largest financial centers in the world. During this change there have been many improvements to the quality of life in their society. This turn has led to a significant increase of traffic in Hong Kong. Large numbers of vehicles operate every day in Hong Kong such as large trucks, which are used to transport goods and construction material, and small cars. In 2005, the Hong Kong Environmental Protection Department estimated that Hong Kong produced about 50 tonnes of waste tyres a day and about 18 thousand tons annually (Windsor, B. L. 2007). However, research done by the Worcester Polytechnic Institute in 2007 showed that waste tyres are only a small percentage of the total waste in Hong Kong. In 2006, the Waste Reduction Group reported that the majority of recyclables (96%) are paper, plastics, and ferrous metals. The remaining 4% are electrical and electronic equipment, glass, wood, rubber tyres and textiles (Waste Reduction Group, 2007). Despite being only a small percentage of the waste, waste tyres take up a disproportionate amount of space in the landfills.

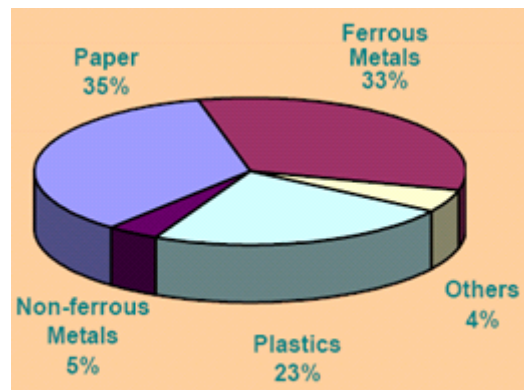


Figure 7: Composition of Municipal Solid Waste Recovered (Waste Reduction Group, 2007)

Each year, Hong Kong spends more than HK\$900 million collecting and transporting waste. Most of the waste ends up in landfills, which cost Hong Kong more than HK\$500 million to operate each year. The waste in the landfills is a serious threat to the community's health. To solve this problem, the Hong Kong government has aimed to create a "circular economy" where "waste generated as a result of economic activities is returned to the consumption loop." Dennis Chan Yin-ming, executive director of tyre and plastic recycler, Jets Technics, states: "Disposed plastic bags and tyres are raw materials for the recycling business and of high economic value after processing." (The Standard, Monday, August 28, 2006) However, the circle seems to be broken because Hong Kong still does not have an efficient centralized recycling system. Sustainable Solutions and Jets Technics are two companies who are facing these problems. Sustainable Solutions is the only provider of recycling bins in Hong Kong, and Jets Technics uses waste materials for their products, such as rubber mats for playgrounds. The Hong Kong government pays the contractors to collect the waste in Hong Kong but there are no connections between the collectors and the recyclers. Philip Stride, founder of Sustainable Solutions states: "But does it (reusable waste) get recycled? Well, I don't know... Contractors are already getting paid just to collect it. But if companies collect it for free, they have to make money from recycling them into usable products." (The Standard, Monday, August 28, 2006) These recyclers will gladly take waste such as plastic bags and tyres from the government for free, but they are spending their money to search and seize these materials which causes their operational cost to increase. Therefore, their products become uncompetitive. The new EcoPark, which was opened in 2007, was opened to provide some relief to companies such as Jets Technics. The EcoPark provides cheap rent for such facilities that reuse waste materials. However, only three bidders can win a

contract with the EcoPark, Jets Technics is one of them. This contract states that Jets Technics is required to collect 8,000 tons of waste tyres a year from Hong Kong before they can import waste materials from other countries (Chi-fai, May 8, 2007). This causes an economic dilemma for Jets Technics and other waste converting companies because waste material imported from Dubai or Ireland is much cheaper than material collected from the Hong Kong community. These recycling companies desire a centralized recycling system with mass collection points to collect materials for little to no cost to reduce their loss of profits. While lowering the companies' operational costs, the system would simultaneously benefit Hong Kong's waste disposal problem. (The Standard, Monday, August 28, 2006)

2.5. Summary

Due to the burden that waste tyres are to the environment and landfills, waste tyres must be relocated to specialized storage, disposal, or recycling facilities. The need for these specialized facilities is high across the globe but a country's economy may not be able to sustain them. Because the facilities run larger more specialized machinery than public landfills these facilities can easily become costly. Thus, in most cases, the government helps the company pay for the disposal of tyres by applying a tax that the consumer pays. Previous research has proved that a waste tyre tax may be an effective way to pay for the recycling of waste tyres. Current legislation in Hong Kong also calls for a waste tyre tax within the next few years. In this project we will be identifying the possible social, political, economic, technological, and environmental effects the tax may have on Hong Kong. By understanding the impacts of the tax we will know whether the

levy will be favorable and beneficial to the waste tyre problem in Hong Kong, or if other action may be required.

3. Methodology

Hong Kong's community currently has limited knowledge of the effects of a waste tyre tax or any other recycling schemes for waste tyres. This project has investigated the political, legislative, environmental, social, and technological impacts that a recycling scheme may have. Through research and interviews with members of the Hong Kong waste tyre community, our project has determined that it is not feasible to impose a waste tyre tax as the most effective solution to the management of waste tyres. These methods have also explored options that have proven to be a better solution for managing waste tyres than a levy.

3.1. The Willingness of the Hong Kong Community to Pay a Waste Tyre Tax

In order to determine the social acceptance of a waste tyre tax, we explored the general opinions of the private parties involved, as well as researched Hong Kong's previous reactions to "green taxation".

3.1.1. Opinions of Bus and Taxi Associations

The data found in this portion of the project is the opinions of taxi and bus company representatives and drivers. The specific bus company being targeted was Citybus Services and the taxi association was Urban Taxi Drivers Association. The interview protocol aimed to determine company officials' knowledge and possible concerns of the waste tyre problem in Hong Kong, as well as annual data on tyre repair and replacement, methods of disposal or recycling, and opinions of a waste tyre tax, including their willingness to pay one. Citybus officials responded to our questions via

fax and we obtained our information from Urban Taxi Drivers Association chairmen via phone interview. The interview responses can be seen in Appendices I and J respectively.

3.1.2. Opinions of Tyre Retailers and Recyclers

The opinions of tyre retailers and recyclers are very important to our project because they play a major role in the processes of waste tyre management. We first conducted an interview with Jets Technics Chairman Mr. John So, Sr. to determine his opinions of a possible waste tyre tax from a recycling business standpoint. We also gained opinions of Bridgestone Aircraft Tyres (Asia) Ltd. officials through a written response to our questions via email. Jets Technics and Bridgestone's interview responses can be seen in Appendices F and G respectively.

3.1.3. Previous Reactions to Green Taxes

Along with information gathered through interviews with the bus and taxi associations and tyre retailers and recyclers, our team used primary references of the public reaction to the plastic bag tax from Hong Kong newspaper editorials and a public survey given by the Environmental Protection Department. Information was also obtained via an interview with officials from the Waste Policy Division of the Environmental Protection Department. This interview can be seen in Appendix H.

3.2. Proper Allocation of Waste Tyre Management Funds

Data for this objective was collected from many different organizations connected to tyre use in Hong Kong. First, we interviewed Environmental Protection Department officers to determine where they intended environmental tyre recycling funds to be

allocated. Likewise, interviews with Bridgestone Aircraft Tires (Asia) Ltd. officials and the Jets Technics chairman revealed similar results. Through interviews with these organizations we found where funds are most needed in the tyre recycling process, whether it is collection, transportation to facilities, or public awareness. We also determined whether funds are justly needed as a waste tyre management solution or if additional methods should be explored.

3.3. Potential Alternatives to a Tax on Waste Tyres

In order to choose the best possible waste tyre management solution for Hong Kong, we compared the waste tyre management systems that are used around the world with the country's current situation.

3.3.1. Waste Tyre Management in Other Countries

To find alternatives to a waste tyre tax that would lessen the amounts of waste tyres going to Hong Kong's landfills, we obtained information on the methods of tyre recycling and financing in several countries around the world. This information can be seen in our Background Chapter. We then compared the data with methods in Hong Kong, as well as other methods being used in Hong Kong for recyclable materials other than waste tyres. Prior to arriving in Hong Kong, we researched the methods of tyre recycling and financing in Canada, Australia, and the United States because their methods all varied between themselves and Hong Kong. We combined this research with our research done in Hong Kong to find the most plausible solution for this particular community.

3.3.2. Exploring Methods of Improvement

In addition to our background research, our research in Hong Kong consisted of an interview with the Environmental Protection Department, Jets Technics, Urban Taxi Drivers Association, and Friends of the Earth. The interview with the Environmental Protection Department officers revealed information on the research concerning the appropriate recycling scheme for Hong Kong. Interviews with Jets Technics, the Urban Taxi Drivers' Association, and Friends of the Earth also provided information and opinions on how the system could be improved through possible alternatives to a waste tyre tax.

3.4. A Legislative Time Table for a Waste Tyre Management System

It is important to know how long it will take for the tax to be implemented in Hong Kong so that involved parties and the community will know when a change can be expected. To estimate this, we first researched the legislative time tables of previous taxes, such as the plastic bag tax. This research was completed through the Environmental Protection Department website, including pages on the "Policy Framework for the Management of Municipal Solid Waste (2005-2014)". Additionally, an interview with EPD Waste Policy Department officers was conducted because they will be responsible for maintaining the waste tyre tax after implementation. We used a protocol which included questions pertaining to the length of passing environmental taxes. Additional research was conducted within library resources in Hong Kong and added to the existing sections in our Background Chapter.

In addition to the Environmental Protection Department, we conducted extensive research on the plastic bag tax in Hong Kong. This information revealed the approximate

time the plastic bag tax bill took to pass through the Legislative Council (LegCo) for comparison with a possible waste tyre tax.

4. Data

The data in this chapter was collected over a two month time period. Interviews were conducted with Jets Technics, the Environmental Protection Department (EPD), bus and taxi organizations, tyre retailers, and green groups within Hong Kong. In the event that companies and organizations could not meet with us for a formal interview, a copy of the interview questions was sent to them and answers were obtained in written form. Outside of interviews, research was done at several Hong Kong libraries to find information on the legislation of tax laws and statistics concerning the drivers and amounts of tyres in Hong Kong.

4.1. The Willingness of the Hong Kong Community to Pay a Waste Tyre Tax

The following data was collected through interviews of different parties that would be affected by a change to waste tyre management. In all cases, the parties were asked about their opinions on a waste tyre tax. As stated by Environmental Protection Officers representing the Environmental Protection Department (EPD) they will need to “seek support from the community” (Alfred K. M. NG) and related businesses that will be affected before implementing a waste tyre management system.

4.1.1. Green Groups

Groups and organizations in Hong Kong have educated opinions on the impacts of a tyre tax. The green group Friends of the Earth is one important organization concerned with the environmental effects of waste tyres going to the landfills. Mr. Hahn Chu, a representative of the Friends of the Earth, stated that his organization is in favor of a tax on tyres. He believes this system would “provide the money for [the] government

to facilitate the collection and recycling of used tyres and will improve the current situation” (Mr. Hahn Chu).

4.1.2. Recycling Organizations

Mr. John So, Sr., Chairman of one of Hong Kong’s leading tyre recyclers, Jets Technics, has also expressed concerns with the city’s recycling management. The chairman believes that citizens will not change their disposal methods because of a tax. As a member of the waste tyre community, Mr. John So, Sr. made it clear that Jets Technics is not looking for any financial aid from the government. The company does not need the money for transportation of tyres to its recycling plants. Instead, contractors are paid to collect its waste tyres and the costs of transportation are approximately \$120 HKD per tonne of tyres (*Jets Technics Interview*, 2008). Mr. John So also stated that the costs of recycling local tyres are the same for recycling foreign waste tyres, and that the transportation of the waste tyres only takes up a small portion of the total recycling costs. Overall, in the opinion of Mr. John So, Sr., the tax will only cause recycling companies to be less competitive in the recycling industry. He would not like this to happen to his company.

4.1.3. Hong Kong Tyre Users

Another important representative of the waste tyre community in Hong Kong is the city’s drivers. Their opinions of a tax or other recycling schemes are important to the success of the waste tyre management system implemented in the future. Our data shows that public transportation accounts for over a third of the total tonnage of waste tyres in Hong Kong. Below is the total tonnage of waste tyres by each contributing group of drivers in Hong Kong. This data was compiled using 2006 statistics from the Hong Kong

Departments of Transport, tyre life data collected by Windsor (2007) and interviews with taxi and bus companies, 2006 municipal solid waste statistics from the Hong Kong Environmental Protection Department, and tyre weight statistics from Bridgestone Tires.

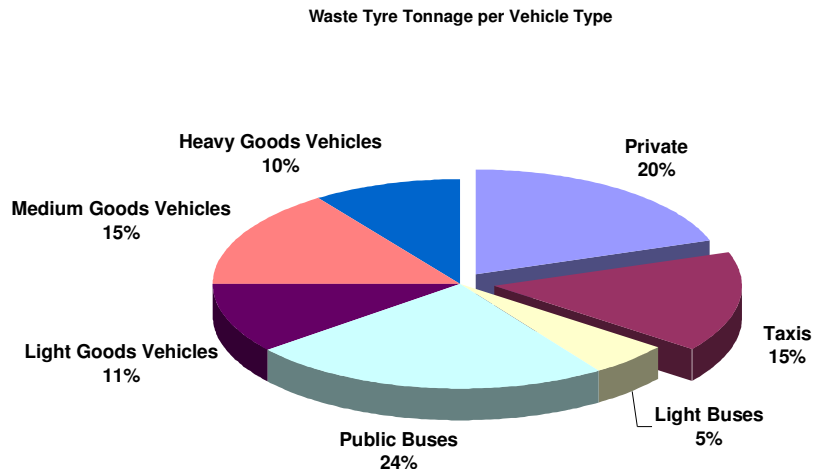


Figure 8: Approximate Annual Tonnage of Waste Tyres Produced per Vehicle Type in Hong Kong (Appendix D)

This figure shows the effect the private sector has on waste tyre amounts. Unlike public buses, taxis and privately owned vehicles both dispose of their tyres at local auto repair shops or tyre retailers. When asked about the disposal of tyres at these businesses the Urban Taxi Company's guess was the tyres then go to a landfill. Even if Mr. Kwok was mistaken, this suggests tyre retailers or auto repair shops fail to raise public knowledge about tyre recycling in Hong Kong.

Bus companies, such as Citybus and the Kowloon Motor Bus Company (KMB) are advocates of a recycling scheme, but express no opinions for or against a possible tax. According to Mandy Pang of the Public Affairs Department of Citybus and the KMB website, both companies regularly retread their bus tyres. Likewise, both corporations are already in the practice of sending waste tyres to recycling companies as opposed to

throwing them in the landfills. Hong Kong bus companies are concerned with environmental waste management and recycling, but do not express needs for government funding.

As another representative of the driving community in Hong Kong, taxi companies contribute approximately 15% of the city's total tonnage of waste tyres. An interview with Mr. Kwok, Chairman of the Urban Taxi Driver Association showed a standpoint from taxi drivers in Hong Kong. When asked what is done with the waste tyres from the taxis in his association, Mr. Kwok could only estimate that the company responsible for collecting them brings them to the landfills. However, he does not agree with this method of tyre disposal and instead stated his support for recycling through crumbing for use as rubberized asphalt. Mr. Kwok supports a tax on waste tyres for environmental improvement. He stated that the Urban Taxi Driver Association would be willing to pay a tax of \$20 HKD per waste tyre.

4.1.4. Tyre Retailers

In addition to the drivers in Hong Kong, tyre retailers play an important role in the tyre community. Bridgestone Tires is a major tyre manufacturer in Hong Kong. Mr. William Chang, Assistant Manager of Customer Service of Bridgestone Aircraft Tire Co. believes that the implementation of a tax on waste tyres would be too costly for the Hong Kong government and would be difficult to include the manufacturers and car owners to their satisfaction. The tax would clearly raise the prices of Bridgestone's retail tyres, "which will make our products less competitive in market" (William Chang, 2008). However, company officials also believe that an environmental tax on waste tyres will gain a positive image for Hong Kong and bring positive effects on tyre retail businesses.

4.2. Proper Allocation of Waste Tyre Management Funds

The allocation of the money is important to the success of any system implemented for waste tyre management in Hong Kong. The government's previous environmental management system, the Plastic Bag Tax, has not been clear to the public as to what the tax money is being used for. Companies such as Jets Technics have taken notice of this fact and they do not wish for collected waste tyre funds to be dealt with in a similar manner. Mr. John So, Sr. of Jets Technics stated that he feels a tax is simply a way to get around the real tyre recycling issues in Hong Kong. As the chairman of a successful recycling company, he does not believe that any aspect of recycling needs government funding and there is no proper way to allocate tax funds.

Environmental Protection Officers, Alfred K. M. NG and Mac C. T. NG stated that they are uncertain where the collected waste tyre funds would be placed. However, it is their belief that any funds collected from a tax would go the treasury. They would prefer that the money go to environmental funding through the EPD itself. This will allow the money to be directly used for environmental research and further development of waste management systems in Hong Kong. To support the EPD standpoint, the Urban Taxi Drivers Association Chairman, Mr. Kwok stated very strong opinions against any collected fees going to the government treasury. He is also in favor of collected money being directly allocated to funding for environmental programs.

4.3. Potential Alternatives to a Tax on Waste Tyres

In addition to our research completed on other waste tyre management systems in Canada, Australia, and the United States, the Hong Kong Environmental Protection Department (EPD) officers are performing similar research. The interviewed Environmental Protection Officers stated that the EPD is facing some obstacles with the implementation of a waste tyre management system. First, they recognize that it is necessary “to study the pros and cons of different solutions” (Mac C. T. NG) in order to ensure that the recycling of waste tyres will be performed optimally in Hong Kong. This will require that the EPD members determine what needs to be done to centralize the mechanism and support around the idea.

The EPD has proposed an ordinance for a Product Eco-responsibility Bill (PER Bill). This Bill outlines and proposes recycling options known as Producer Responsibility Schemes (PRS) for recyclable wastes in Hong Kong. The EPD groups have “proposed to introduce PRS’s for six types of products” (EPD Legislative Council Brief, 2007). Two of these products include plastic shopping bags and vehicle tyres.

“The purpose of the Bill is to minimize the environmental impact of certain types of products by introducing PRS’s or other measures that may require manufacturers, importers, wholesalers, retailers, consumers or any other parties to share the responsibility for the reduction in the use, and the recovery, recycling and proper disposal of the products” (EPD Legislative Council Brief, 2007).

When asked about a PRS for waste tyres, the EPD representatives were unable to propose an option. Although a tax is currently being considered, they are “still thinking” (Alfred K. M. NG) on the PRS that would best suit Hong Kong for waste tyres.

There are many waste tyre management options available to Hong Kong besides a levy on waste tyres. Jets Technics’ chairman Mr. John So, Sr. suggests that the government “provide a good platform for recycling” (Mr. John So, Sr.) instead of simply applying a tax. He feels that it is most important for the government to make an effort to stop the flow of waste tyres into the landfills. To do this, his main suggestion is a landfill ban. This would include a complete ban on waste tyres entering landfills so the extra space in the landfills may be used for other municipal solid waste. Once this is done, the recycling industry will have easier access to local tyres. The Hong Kong citizens will need a place to put their waste tyres, and recycling facilities will be a viable option (*Jets Technics Interview*, 2008).

Other groups associated with tyre use in Hong Kong are advocates of environmental recycling schemes. For example, Mr. William Chang of Bridgestone Airport Tire Co., (Asia) Ltd. is in favor of a recycling PRS for tyres. When interviewed he stated that company officials would “prefer to pay surcharge on waste disposal instead of paying [a] tax” (William Chang, 2008). Bridgestone’s position is that the government should set “standard charges for the disposal of waste in landfill[s]” which would shift the fees from the retailer to whoever disposes of the tyres.

Green Groups also play a vital role in the tyre community. Friends of the Earth is a green group in Hong Kong that aims for the improvement of “air quality, energy efficiency, [and] waste management” (Mr. Hahn Chu). As with most green groups, Friends of the Earth’s company goal is for the “government to establish appropriate

policies for the environment” (Mr. Hahn Chu). Mr. Chu, a representative of the company, stated that he is aware of the current waste tyre management issues in Hong Kong. He also understands that the government’s methods are “not very successful at the moment” (Mr. Hahn Chu). In his opinion, Mr. Chu stated that “Producer Responsibility legislation is the key to the success of taking used tyres out from the waste stream”. The PRS that his organization is in favor of is a tax on tyres. This is because it would “provide the money for [the] government to facilitate the collection and recycling of used tyres and will improve the current situation” (Mr. Hahn Chu). Aside from a tax on tyres, Mr. Chu also believes that “a landfill ban for tyres can be considered”, but in his opinion this may be a difficult plan for the government to implement. Overall, the Friends of the Earth directors believe that “used tyres should not be disposed in our landfills and they should be recycled to produce another material for reuse” (Mr. Hahn Chu).

4.4. A Legislative Time Table for a Waste Tyre Management System

There is currently only a broad estimate for a timetable in which a PRS for waste tyres will be implemented. Under the Project Framework outlined by the Environmental Protection Department, the Product Eco-responsibility Bill is to be implemented by the year 2015. This Bill includes the Green Tax. This tax is an umbrella PRS that will include all environmental taxes on recyclable wastes in Hong Kong. More specifically, the waste tyre management system is expected to be completed in the year 2008. The Legislative Council (LegCo) will need to pass the proposed PRS Bill individually and research will be conducted to determine its acceptance in Hong Kong. The EPD stated that legislation for waste tyre management cannot be introduced until the Plastic Bag Tax has been fully implemented. Because the Plastic Bag Tax is still being implemented the EPD will not

make its original 2008 deadline. When asked if they had any estimation for when a waste tyre plan would be implemented, the EPD could not give us an answer.

5. Analysis

This chapter is an analysis of the data collected from interviews combined with previous research cited in the background section. The analyzed data suggests how the views of Hong Kong's waste tyre community compare with options for waste tyre management. This will lead us to making useful conclusions and recommendations for the future of waste tyre management.

5.1. The Willingness of the Hong Kong Community to Pay a Waste Tyre Tax

The government is attempting to find solutions for Hong Kong's recycling problems. Although taxes are not always popular because of additional expenses for those who pay, a tax for a good reason, such as an environmental tax, can be popular. The Friends of the Earth representative we contacted, Mr. Hahn Chu, was in favor of a waste tyre tax to better the waste tyre management in Hong Kong. As an overview, the tax as a waste tyre management option would be feasible due to rather negligible changes to retail and recycling costs of tyres. In Mr. Chu's views,

“The impact on private car owners will not be big, but would be bigger on commercial vehicles owned by individuals and small companies [because] it will raise their operation cost[s]... For tyre retailers, they would probably transfer part of the cost to users. Recyclers would be happy to help retailers collect the used tyres with a fee” (Mr. Hahn Chu).

In this system “producers [would] have to pay for the cost of recovery, and users [would] have to bear part of the cost under the polluter pays principle” (Mr. Hahn Chu). Mr. Chu understands that this will bring financial change, but the change is feasible for those involved.

Other opinions of a possible waste tyre tax have not been as positive. Bridgestone Aircraft Tire Co., (Asia) Ltd., does not agree with a potential tax on tyre sales. This opinion is partly because of the added expense, but also due to the belief that a tax on waste tyres sales will not be as effective as one on disposal. It was suggested instead that company officials would “prefer to pay surcharge on waste disposal instead of paying [a] tax” (William Chang, 2008). John So, Sr. of Jets Technics made a separate point. When asked about a possible waste tyre tax, he was adamant that there was no subsidy or funding that his company required from it.

Although Hong Kong citizens who create waste tyres may not wish to pay a tax for fear of increased prices, a tax could still be supported. Responses from Bridgestone Tires and Friends of the Earth suggested retailers should be able to afford a tax on tyres. The willingness of other groups to support a tax, including bus companies and the EPD remain neutral due to continued consideration of other options. Initial impressions seem positive for private drivers to pay a tax. The expenses of maintaining and driving a car in Hong Kong, primarily the fuel and parking expenses are great. Therefore, the cost of a tax on tyres would be negligible next to the costs of owning and driving a car. The Chairman of Urban Taxi Drivers Association, Mr. Kwok, one representative of Hong Kong drivers, stated that his association would be willing to pay a tax on tyres if the money is placed into an environmental fund.

5.2. Proper Allocation of Waste Tyre Management Funds

Bridgestone Tire officials stated a tax would be a viable option if passed under strict environmental guidelines. However, a concern raised by Mr. John So, Sr. of Jets Technics and by Environmental Protection Officers of the EPD was that the waste tyre tax will be passed to primarily help fund the government and not the overall environmental issue caused by waste tyres. Their concerns are raised by the way funds collected by the Plastic Bag Tax were distributed. The Urban Taxi Association voiced similar concerns about the use of funds. Overall, these interviews all suggest that for collected fees to be beneficial, the funds collected must go straight to environmental programs.

5.3. Potential Alternatives to a Tax on Waste Tyres

Several alternatives to a waste tyre tax exist, and each has been proven successful in other areas of the world. These alternatives are described in further detail in the background chapter. The feasibility of these alternatives for Hong Kong is being studied by the Environmental Protection Department. Due to the country's exceptionally compact geography, not every environmental scheme used in other areas of the world may be available for Hong Kong.

A landfill ban alternative has proven to have a substantial amount of local support. This idea is strongly supported by Jets Technics, the Environmental Protection Department, the Urban Taxi Association and Friends of the Earth groups. A ban on tyre disposal at local landfills will ensure that all legally discarded tyres are made more available to recycling contractors. A landfill gate fee would ensure funds for transportation from tyre collection points and landfills. This landfill gate fee would

follow a “polluter-pays” scheme as suggested by Bridgestone Tires. Research on other recycling systems around the world has also made deposit fees a plausible option for Hong Kong. These fees would create an economic incentive for consumers to bring their tyres back to waste tyre collection stations. Also important with changes to waste tyre management policy in Hong Kong is public knowledge of recycling. Because both Bridgestone and the Urban Taxi Association suggested they believe their waste tyres go to landfills, we suggest public education of waste tyre recycling by the EPD or the Hong Kong government.

5.4. A Legislative Timetable for a Waste Tyre Management System

The “Policy Framework for the Management of Municipal Solid Waste”, which includes the Plastic Bag Tax and will include the waste tyre legislation, was initially intended to date from 2005 to 2014. As a part of this framework, the Product Eco-Responsibility (PER) Bill has proposed the legislation for each producer responsibility scheme (PRS), including one for a waste tyre management system. As stated in the Bill, the waste tyre PRS is to be administered in 2008. However, during our interview the EPD stated they were still evaluating options and the waste tyre PRS will not make its proposed deadline. The legislative timetable for the waste tyre PRS can be compared to that of the Plastic Bag Tax as far as government implementation is concerned. The Plastic Bag Tax, which began at the start of the program, has taken three years to be written, reviewed, and implemented. After the appropriate PRS for plastic bags was determined and the Bill was composed, it took the Hong Kong Legislative Council (LegCo) two months to discuss it further. The amount of time beyond legislative discussion remains uncertain and is expected to vary amongst different PRS bills. Because an appropriate

waste tyre management system is still under debate, it is difficult to estimate the amount of time it will take to be implemented.

6. Conclusions & Recommendations

A waste tyre tax is not the best possible approach to waste tyre management in Hong Kong. We have, however, identified several elements that could be instituted for waste tyre management. Our main recommendation includes significant changes to Hong Kong's current waste tyre policy, including a landfill ban. Following these changes, we recommend a stewardship board to manage the funding and operation of Hong Kong's waste tyre management. We also suggest that a landfill gate fee and a deposit fee are options the stewardship board may consider to fund and encourage tyre recycling. We believe these recommendations will help drive Hong Kong towards a future where all waste tyres are recycled.

6.1. The Waste Tyre Tax

A waste tyre tax in Hong Kong would not reduce the number of tyres entering landfills. While Hong Kong citizens and businesses would be negligibly affected by a levy on waste tyres, the funds collected are unnecessary for any aspect of tyre recycling. Waste tyre tax funds are not needed for supporting the costs of transportation of waste tyres from collection points to landfills, recycling technology, or to make recycling economically viable. Through interviews with executives of tyre recycling firms, we discovered that the tyre recycling technology is mature enough to support multiple successful and competitive recycling firms. Companies such as Jets Technics and their competitors are profitable, and while they are more than willing to accept more Hong Kong tyres, the business does not rely on it. Also, the cost of transporting tyres to recyclers from waste stockpiles is insignificant.

Without well-defined waste management programs awaiting funds from a levy on waste tyres, the Hong Kong community will likely not favor a waste tyre tax. After the passage of the Plastic Bag Tax, the Environmental Protection Department has documented many members of its community being concerned with the government's use of collected funds. (EPD Legislative Council Brief, 2007). The parties we interviewed each voiced the same concern: how would the funds from a tyre tax be spent?

6.2. Possible Waste Tyre Policy Changes

After reviewing the waste tyre management problem in Hong Kong, our team has come to the conclusion that substantial improvements can be made if the following changes to the current waste tyre policy are implemented:

- Focus on transporting tyres to local recyclers, not exporting
- Ban tyres from landfills
- Create waste tyre collection points outside of landfills with manual removal from dump trucks
- Have the Food & Hygiene Department's refuse to collect waste tyres with household trash
- Spread knowledge of the penalties of illegal dumping

These changes can be made with cooperation between Hong Kong's Environmental Protection Department and the Food & Hygiene Department, which is responsible for the

collection of household trash and ensuring that the streets are free of debris. By refusing to collect and bring tyres into landfills, the problem will be significantly reduced.

6.3. Stewardship Board

We strongly recommend that a stewardship board is implemented as Hong Kong's waste tyre management system. A stewardship board is a separate entity of the government that would manage the costs and transportation of waste tyre collection. This option was discussed earlier as Canada's tyre recycling management program. The single goal of this board would be to maximize the recycling of waste tyres produced in Hong Kong. The tyres would no longer be viewed as waste, but as valuable resources to the companies who use them as raw materials. This entity's independence would ensure that the money raised from collection fees goes directly towards their intended purpose, protecting the environment by recycling tires. The system would also centralize waste tyre management for retailers, collectors, and recyclers.

This independent board can be modeled after the existing system that the Environmental Protection Department uses for construction waste, as there would be many similarities in the collection and allocation of recycling funds.

6.4. Landfill Gate Fees

A landfill gate fee is an option we suggest a stewardship board implements for funding waste tyre management. A gate fee at tyre collection points or landfills would raise funds for the collection and transportation of tyres to recycling contractors. These fees would be set to cover operating and administrative costs only, without producing excess revenue. Under the supervision of a stewardship board, these funds would be

allocated directly to transportation and the management of waste tyre collection points outside of landfills. One complication with this recommendation is the possibility that the community will turn to illegally dumping tyres, as illegal tyre dumping has not been uncommon within Hong Kong (Windsor 2007). However, the fines for dumping tyres are high and if the public is more aware of these punishments, illegal dumping would be greatly discouraged.

6.5. Deposit Fees

One method a waste tyre stewardship board could raise the community's incentive to recycle is by instating a deposit fee. This system involves a fee that adds to the total price when new tyres are purchased. Like the container deposit fees in other countries, the fee would be returned to the consumer upon return of the tyre to an approved collection point. The approval of these collection points should be done by the EPD or the stewardship board and would be dependent on whether or not they transport their tyres to Hong Kong recycling companies. This will prompt the community to return tyres to these collection points rather than allow them to be exported or sent to landfills. This method would require the stewardship board to manage the deposited money. The initial deposit fee would need to be a large percentage of the initial price of the tyre in order to encourage consumers to return them for recycling. This large fee may be unpopular with the public, but the success of such programs involving plastic bottles and aluminum cans in other countries have proven this to be a plausible option.

6.6. Summary of Recommendations

Our interviews with influential members of Hong Kong's waste tyre community have proved that complete waste tyre recycling is a real possibility. Therefore, we strongly recommend that the government of Hong Kong and the Environmental Protection Department focus on stopping the exportation of waste tyres. Exporting tyres is a setback to environmental efforts in Hong Kong because it does not support recycling. By keeping tyres local and implementing other policy changes, such as a landfill ban, the community will be pressured to solve the waste tyre problem by recycling. We suggest that a landfill ban and other policy changes to the current waste tyre management would begin stopping the problem at its source. Also, a privately funded stewardship board would break down the communication barriers between consumers, retailers, recyclers, and tyre transportation contractors. With the implementation of these changes, and the efforts of the Hong Kong community, we believe that a fully sustainable waste tyre management system is achievable in the near future.

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Association of Municipalities of Ontario. (1991). *AMO's policy position on scrap tire management and the Ontario tire tax*. Toronto: Association of Municipalities of Ontario.

This book provides a brief understanding of the waste tyre management system at Ontario, Canada which was useful in comparison with systems in Hong Kong.

Australian Government Department of the Environment, W. H. (2007, May 1). A *National Approach to Waste Tyres*. Retrieved November 18, 2007, from <http://www.environment.gov.au/settlements/publications/waste/tyres/national-approach/apps.html>.

This is a report from Australian government about the waste tyre management system which the country is using.

Bark, Rosalind; Barde, Jean-Philippe; Braathen; Nils Axel; Clark, Steven; Heady, Chris. (2001). *Environmentally Related taxes in OECD Countries: Issues and Strategies*. Paris: Organisation for Economic Co-operation and Development.

A discussion about the green taxes in the OECD. The report points out the pro and cons of the green tax.

Barde, J.-P. (1999). *Environmental taxes: Recent Developments in China and OECD Countries*. Paris: Organisation for Economic Co-operation and Development.

A report from 1999 of the OECD about the development of the environmental taxes in China and member countries

Board, C. I. (2007, November 9). *Overview of Tire Management in California*. Retrieved November 15, 2007, from <http://www.ciwmb.ca.gov/Tires/Overview.htm>.

An overview on the waste tyre management system in the California state

Board, N. B. (2007). *New Brunswick Tire Stewardship Board, Annual Report 2006*. Fredericton.

An overview on the waste tyre management system in the New Brunswick, Canada. The state is using a stewardship boards as a solution for their waste tyre problem.

Bosman, J. A., Milano, P. J., & Youkana, S. (2007). *An evaluation of the recycling practices on the island of Puerto Rico*. Worcester: Worcester Polytechnic Institute.

This past IQP from WPI students on the recycling system on Puerto Rico has aided us in our current research and will help us to get an idea on how to finish our IQP.

British Broadcasting Corporation (2002) *Irish bag tag hailed success*. Retrieved February, 2008, from BBC web site:
<http://news.bbc.co.uk/2/hi/europe/2205419.stm>

This website gives information regarding the impact of a plastic bag tax implemented in Ireland.

California Integrated Waste Management Board. (1996). *Effects of waste tires, waste tire facilities, and waste tire projects on the environment*. Sacramento: California Integrated Waste Management Board.

This research covers the waste management system and legislature of the State of California. This information was used to compare to that of Hong Kong.

Chan, P. (1996). *Scrap tyre management in Hong Kong : Economic and environmental perspective*. Retrieved on November 11th, 2007 from <http://sunzi.lib.hku.hk/hkuto/record.jsp?B17457786>.

This website was a brief description of the Hong Kong scrap tyre management in Hong Kong and China. It provides a look from the economic and environmental impacts on the waste tyre affects on Hong Kong.

Chung, C. (2007, May 28). Legislator hits out at 'punitive' plastic bag tax. *The Standard* , p. 02.

This newspaper article was written in opposition of Plastic Bag Tax.

Chung, C. (2007, May 2). Survey respondents back green groups in call for plastic-bag tax. *The Standard* , p. 02.

This newspaper article was written in favor of the plastic bag tax.

Cebreiro-Gomez, Ana; Heady, Chris; Vassnes, Erik; Ashiabor, Hope; Barde, Jean-Philippe; Braathen, Nils Axel; Scapecchi, Pascale. (2006). *The Political Economy of*

Environmentally Related Taxes. Paris: Organisation for Economic Co-operation and Development.

A recent report of the OECD about the environmental taxes, in this report, the OECD shows the economy perspective of the green taxes.

Chi-fai, C. (2007, May 28). Green solution to horse safety at Games stables; . *South China Morning Post* , 3.

An article talked about Jets Technics and their products which will be using for Olympic 2008.

Chi-fai, C. (2007). Recyclers to spend HK\$61m at new park. *South China Morning Post* , 3.

This article contains information on the new recycle park that Hong Kong's government has established known as Eco-park, as well as the plan for the use of this park in the future.

Clark, C., Meardon, K., & Russell, D. (1993). *Scrap tire technology and markets*.

Retrieved on November 5th, 2007 from

<http://www.knovel.com/knovel2/Toc.jsp?BookID=92>.

This site includes the new technology in the waste tyre recycling industry and an introduction to a new machine for the future market.

Container Recycling Institute (2007). *Bottle Bill Resource Guide*. Retrieved on February 21, 2008. <http://www.bottlebill.org/index.htm>

This site includes information about bottle bills around the world. This information was helpful in deciding whether or not deposit fees were successful and if they would be a reasonable option for waste tyre management in Hong Kong.

Editorial. (2007, May 27). Bag levy step in the right direction. *South China Morning Post* , p. 12.

Editorial. (2007, June 5). Hooray for plastic bag tax. *China Daily Hong Kong Edition* , p. 09.

Editorial. (2007, September 08). Plastic bag levy will do nothing to ease pressure on our landfills. *South China Morning Post* , p. 12.

A series of articles about the reaction of the public on the plastic bag tax in Hong Kong.

Farrell, M. (2000, March). Managing Scrap Tires Via Stewardship Programs. *BioCycle* , p. 67

Fung, F. (2007, September 04). *Government will press ahead with 50-cent plastic bag levy.* *South China Morning Post* , p. 02.

An article about the plastic bag tax policy in Hong Kong

Hong Kong Environmental Protection Department. (2007, September 12). *An overview on challenge for waste reduction and management in Hong Kong.* Retrieved November 9, 2007, from

http://www.epd.gov.hk/epd/english/environmentinhk/waste/waste_maincontent.html

This website shows that the Hong Kong Environmental Protection Department issued a statement on the waste reduction and management in Hong Kong. The article talks about the difficulty that the government in Hong Kong is facing today.

Hong Kong Environmental Protection Department Construction Waste. (2005, December 1). *Information on Hong Kong's Construction Waste Charging Scheme*. Retrieved February 15, 2008 from <http://www.epd.gov.hk/epd/misc/cdm/scheme.htm#h>.

This site provides all information about the EPD's charging scheme for construction waste. This model could be used when implementing a waste tyre stewardship board.

Hong Kong Environmental Protection Department. (2007). *Legislative Council Brief-Product Eco-Responsibility Bill*. Hong Kong .

This Brief discussed the implications of the Plastic Bag Tax. Included were discussions of the goals the tax aimed to achieve and how it will achieve them. Also included was an EPD survey of the public and businesses about their opinions towards the plastic bag tax.

Hong Kong Department of Transport (2007, December). *Registration and Licensing of Vehicles by Class of Vehicle, 2006 Values*. Retrieved February 2, 2008 from http://www.td.gov.hk/transport_in_hong_kong/transport_figures/index.htm

Provided statistics on how many and what type of vehicles were registered in Hong Kong for our calculations of Tyre Tonnage per Vehicle Type data.

Lee, C. (2005). *A critical review of waste management*. Retrieved on November 11th, 2007 from <http://sunzi.lib.hku.hk/hkuto/record/B3473725X>.

This web site contains a brief review of the current waste tyre condition in Hong Kong in 2005. It reflects the tradition of waste disposal and its critical problem in Hong Kong.

Luk, M. (2006). *Company gets on right track with used tyres*. South China Morning Post , 7.

An article on South China Morning Post introduces Jets Technics and the company's product.

Luk, M. (2006). *Environmental businesses in Hong Kong are recruiting to meet the growing demand for their products and services*. South China Morning Post , 7.

An article about Hong Kong new rising business, Jets Tehnics and their solution for recyclable waste such as tyre and plastic.

Mark, J. E., & Erman, B. (2005). *Science and technology of rubber*. Retrieved on November 5th, 2007 from <http://www.sciencedirect.com/science/book/9780124647862>;<http://www.sciencedirect.com/science/book/9780124647862>

This is an article on the development of rubber for future products that will have family uses. This article is very helpful for us in developing our solution for the overall problem.

Massachusetts Department of Environmental Protection. (2007) *Waste & Recycling:*

Bottle & Can Deposits. Retrieved February 24, 2008.

<http://mass.gov/dep/recycle/reduce/bottleca.htm>

This site offers in-depth information about the “Bottle Bill” for Massachusetts. It includes links helpful to educate consumers and retailers alike about the legislation and benefits of container deposit fees.

Moore, M. (2007, January 29). *British Columbia Privitizes its Scrap Tire Management* .

Tire Business , p. page 9.

An overview on the waste tyre management system in the British Columbia, Canada.

Moore, M. (1999, October 18). *Canada embraces scrap tire recycling*. *Waste News* , p.

page 41.

This article provided some useful information about the tyre recycling process in Canada.

Pfannenstiel, T., Claassen, S., & Cummings, L. (1995). *Reviewing the implementation of Kansas' waste tire disposal program: A K-goal audit of the department of health and environment*. Topeka, Kan.: Legislative Division of Post Audit.

This review looks into the program that Kansas City used for their waste tyre management program. This information is useful in comparison to Hong Kong's programs.

OECD. (1997). *Environmental Taxes and Green Tax Reform*. Paris: Organisation for Economic Co-operation and Development.

The green tax reform has been applied in the OECD member countries since the early of 1990s. This report shows the achievement and at the same time make a clear definition about the green taxes.

Pilorusso Research Associates Inc, VHB Research and Consulting Inc, & T.A.G.

Resource Recovery. (1991). *Scrap tire management in Ontario*. Ottawa, Ontario: Ontario Environment.

This research is a search on the management system for waste tyres in Ontario, Canada. This is useful information in comparison to Hong Kong's waste management systems.

Rapra Technology Limited. (1996). *Tyretech Asia 96 conference and exhibition : Book of papers from a two-day conference at Westin Plaza, Singapore, 3rd and 4th June 1996*. Shawbury, Shrewsbury, Shropshire, UK: Rapra Technology.

This is a report from a conference concerning technology for tyres that took place in Singapore in 1996. This is informative information for our research purposes.

Rubber Manufacturers Association (U.S.). (1990). *Testimony of the rubber manufactures association on scrap tire management and recycling opportunities : Presented to subcommittee on environment and labor and subcommittee on regulation, business opportunities and energy of the committee on small business, United States House of Representatives, April 18, 1990*. Washington, D.C: Rubber Manufactures Association.

This report from Rubber Manufacturers Association gives information on the use of waste tyres and how can they be used for recycling. It focuses more on the environmental aspects and opportunities for new businesses.

The Manitoba Tire Stewardship Board . (2007). Retrieved November 17, 2007, from <http://mbtirebd.home.skyweb.ca/index.htm>

The Standard (2006, August 28). Business ideas going to waste.

An article on The Standard addressed the problems that recyclers in Hong Kong are currently facing.

Tire Stewardship Board B.C. (2007). Retrieved November 19, 2007, from <http://www.tirestewardshipbc.ca/index.htm>

Tsang, S. Y. (2004). *A Modern History of Hong Kong*. London; New York: I.B. Tauris.

This resource is a book that we can use to learn more about the culture and traditions in Hong Kong. This can help us in finding a better solution that can be used for Hong Kong.

United Nations Conference on Trade and Development, & International Rubber Study Group. (1999). *Rubber and the environment : Proceedings of the joint workshop of the united nations conference on trade and development and the international rubber study group, 30 October 1998, Denpasar, Bali, Indonesia*. New York: United Nations.

This is a report on a conference between the United Nations and the International Rubber Study Group about the impact of rubber on the environment, especially waste rubber such as tyres.

United States Environmental Protection Agency. (1993). In United States Environmental Protection Agency (Ed.), *Scrap tire technology and markets*. New York: William Andrew Publishing/Noyes.

This data explores new technologies for waste tyres and their possible markets in the future.

United States Environmental Protection Agency. (2007). *Management of scrap tires*.

Retrieved November 10, 2007, from: <http://www.epa.gov/epaoswer/non-hw/muncpl/tires/index.htm>.

This data discusses the waste tyre management system in the United States. This can be used to help us find an answer for our recycling transportation problem at Jets Technics.

United States. Congress. House. Committee on Small Business. Subcommittee on Environment and Labor, United States, Congress, House, Committee on Small Business, & Subcommittee on Regulation, Business Opportunities, and Energy. (1990). *Scrap tire management and recycling opportunities : Hearing before the subcommittee on environment and labor and subcommittee on regulation, business opportunities, and energy of the committee on small business, House of Representatives, one hundred first congress, second session, Washington, DC, April 18, 1990*. Washington: U.S. G.P.O. :

This is a formal report from the United States government about the waste tyre condition and the solution, or opportunities for this main problem.

Waste Reduction Branch (Canada) . (1993). *Scrap tire project : 1993 project summaries*. Toronto: Ministry of Environment and Energy. Waste Reduction Branch.

This project description has research on waste tyres that was conducted in 1993 in Toronto, Canada. It contains many useful ideas on our topic.

Waste Reduction Group. (2007). *Recovery and Recycling of*. Hong Kong: Environmental Protection Department.

This is an annual report of the Waste Reduction Group and published by the Hong Kong Environmental Protection Department. The report address the

environmental problems that Hong Kong are facing and solutions that will be applied in the future.

Windsor, B. L., Li, J. Y., Carmichael, J. R., Gesley, J. J., (2007). *Tyre waste reduction in Hong Kong*. Worcester, MA: Worcester Polytechnics Institute.

This is an IQP research project on the waste tyre condition in Hong Kong and includes suggestions for a reduction method.

Yim, O. (2003). *Waste reduction and recycling equipment*. Retrieved on November 11th, 2007 from STAT-USA: <http://strategis.ic.gc.ca/epic/site/imr-ri.nsf/en/gr-77659e.html>.

This is an article on new equipment and instruments that have been invented recently for recycling waste in the North America.

Appendix A: Sponsor Description

Jets Technics Limited, a part of Jets Technics International Holding Ltd., is a private company which was founded by So Tat Wind and So Tat Chiu in 1980 under the name of Jets Construction Engineering Company. On 23 February 1988, Jets Technics was incorporated in Hong Kong to take over the business operations of Jets Construction Engineering Company. The Company was incorporated in Bermuda on 9 February 2004. Nowadays, Jets Technics is a leading manufacture of recycled and recreational product in Hong Kong. The company has developed a broad range of branded product such as:

- JREX (Fibre Wood Plastic)
- PLAY CUSHION (Safety Surfaces)
- CHILDSPEC (Playground Equipment)
- ROLLICK (All-weather Synthetic Sports Surfaces)
- TWILIGHT (Multi-purpose Resilient Surfaces)
- CONCERTO (Garden Furniture)
- ULTRA FIT (Fitness Equipment)
- TOP BEST (Covered Walkway)
- FOOT WALKER (Foot Massages Tiles).

The company mission is to become the leading manufacture in recycle and supply recyclable recreation products and materials worldwide. The customers of the company include Architectural Services, Department, Leisure & Cultural Services Department and Home Affairs Department, Hong Kong Housing Authority, property developers, property management companies and academic institutes. Jets Technics hopes to expand its market share within Asia and Europe.

The company has been listed on Singapore Exchange (SGX_ST) in 2004. Until 2 November 2007, its authorized capital is 800 million HKD, issued & paid-up capital

is 54.2 million HKD and par value is 0.220 HKD. Jets Technics income come from their main products which are recycle products and their stock on Singapore Exchange market. The company revenue in 2006 had been declined to HK\$ 63.1 million compare to HK\$ 102.4 million due to the decrease in demand of Hong Kong and Mainland China market. However, the sale is increased 12% since the company introduced new recyclable products; the company is looking forward to the avenue growth in 2007.

4/ How is the organization structured, i.e. what are the main divisions of labor and authority within the organization and partnering organizations? How many employees are there? What sections within your sponsoring organization are especially relevant to this project? (Organizational charts can be very helpful in understanding and presenting this information.)

Jets Technics Corporate Structure from its 2006 Annual Report on SDX:

BOARD OF DIRECTORS:

So Tat Wing (Chairman and Managing Director)

So Tat Chiu (Executive Director)

(Resigned on 28 July 2006)

So Tat Cho (Executive Director)

Wong Ying Lee (Executive Director)

(Resigned on 28 July 2006)

Chan Yin Ming, Dennis (Executive Director)

(Appointed on 1 July 2006)

Ong Chor Wei (Non-executive Director)

Au Chun Kwok Augustus (Independent Non-executive Director)

Seah Hou Kee (Independent Non-executive Director)

Cheung King Kwok (Independent Non-executive Director)

JOINT COMPANY SECRETARIES:

Chung Ka Kui, FCCA, HKICPA

Tan Min-Li, LLB (Hons), LLM

ASSISTANT COMPANY SECRETARY:

Ira Stuart Outerbridge III, FCIS

AUDIT COMMITTEE :

Seah Hou Kee (Chairman)

Cheung King Kwok

Ong Chor Wei

NOMINATING COMMITTEE :

Au Chun Kwok Augustus (Chairman)

Seah Hou Kee

So Tat Wing (appointed on 28 July 2006)

Wong Ying Lee (resigned on 28 July 2006)

REMUNERATION COMMITTEE :

Cheung King Kwok (Chairman)

Au Chun Kwok Augustus

Ong Chor Wei (appointed on 28 July 2006)

Wong Ying Lee (resigned on 28 July 2006)

REGISTERED OFFICE :

Clarendon House

2 Church Street

Hamilton HM 11

Bermuda

PRINCIPAL PLACE OF BUSINESS :

18th Floor, Saxon Tower,

7 Cheung Shun Street,

Cheung Sha Wan,

Kowloon, Hong Kong

Tel: (852) 2782 9088

Fax: (852) 2388 6627 / 2385 8433

SINGAPORE SHARE TRANSFER AGENT :

Lim Associates (Pte) Ltd

10 Collyer Quay

#19-08 Ocean Building

Singapore 049315

BERMUDA SHARE REGISTRAR :

Codan Services Limited

Clarendon House

2 Church Street

Hamilton HM 11

Bermuda

AUDITORS:

Baker Tilly Hong Kong Limited

Certified Public Accountants

12th Floor, China Merchants Tower

Shun Tak Centre

168-200 Connaught Road Central

Sheung Wan, Hong Kong

Partner-in-charge :Mr. Chan Cheuk Chi (Appointment since FY2006)

LEGAL ADVISOR TO THE COMPANY AS TO HONG KONG LAW :

Huen & Partners

Units 3309-11, 33rd Floor, West Tower

Shun Tak Centre

168-200 Connaught Road Central

Sheung Wan, Hong Kong

LEGAL ADVISER TO THE COMPANY AS TO BERMUDA LAW:

Conyers Dill & Pearman

50 Raffles Place

#18-04 Singapore Land Tower

Singapore 048623

PRINCIPAL BANKERS:

Hang Seng Bank Limited

83 Des Voeux Road Central

Hong Kong

Industrial and Commercial Bank of China (Asia) Limited

ICBC Tower

122-126 Queen's Road Central

Hong Kong

CORPORATE COMMUNICATIONS & INVESTOR RELATIONS:

WeR1 Consultant Pte Ltd

29 Scotts Road

Singapore 228224

The company organization chart:

Administration

- Human Resource
- Community Services
- Complaint Handing
- Logistics
- QA & Control

Environmental QC:

- Environmental QC team
- Hotline

Finance & Account:

- Accountants & Analysis
- Secretariat

Business Development:

- Business Developers
- Hotline

Material R&D:

- Machinery Development
- Machinery maintenance
- Lab

Design:

- Product R&D
- Advertising Design
- Project Design

Sales Department:

- Secretariat
- Sales team
- Hotline

Promotion Department:

- Marketing team
- Secretariat
- Hotline

Marketing (Overseas Division):

- Marketing team
- Secretariat
- Hotline

Marketing (China Division):

- Marketing team
- Development & Co-Ordination

Product:

- Production team
- Inventory
- Secretariat

Project:

- Secretariat
- Controlling team
- Hotline
- Project Co-ordination
- Installation team

We will be working with closely with the Business Development section whose function is adopting established procedure and the method of brainstorming, the section attempts to keep abreast of market demand and to create market trend. The section then puts forth proposal for the Board of Director's approval.

<http://www.jets.com.hk/Organization%20chart/Organization%20Chart.swf>

Appendix B: Massachusetts Interview Protocols

I/

Mainline Tyre Recycling

New Bedford, MA

508-990-0802

How long has your company been running?

How do you get the waste tires to your facility?

How much of Massachusetts does your program cover?

Do you work cooperatively with other companies?

Where does your funding come from?

-Private/Government?

How many workers do you have?

Does the plant operate 24/7?

What's your annual budget?

What machines do you use here?

-How many and how pricey?

What parts of the tires do you save/recycle?

-For any parts not saved, what happens to them?

What do you make from the tires?

Where have your products been used?

Are you currently developing any new ways to recycle tires?

II/

Massachusetts DEP "Pay As You Throw"

Joseph Lambert

617-574-6875

What government organization oversees waste tire recycling/disposal?

Have waste tires proved to be a problem in Mass.?

Is there a waste tire tax in Massachusetts?

How is it collected?

-When does the consumer pay it?

How is it used?

-Waste Tire Recycling Facilities?

-Other environmental funding?

-Environmental awareness/education advertising?

Is there tax enough, more than enough, or not enough to help the waste tyre recycling industry?

When was the legislature passed?

How long did it take?

Was social acceptance difficult?

How many problems do you have with illegal waste tyre disposal?

- Punishment?

- Resulting problems from negligence

How much influence did political parties have on the tax?

- Unanimously accepted in the House?

Do you work cooperatively with different companies for waste tyre management?

Are there any concerns that the waste tyre tax may not be working or worth it?

Appendix C: Interview with Mainline Tire Recycling

Interview with Mainline Tire Recycling

Mainline Tire Recycling

New Bedford, MA

508-990-0802

1. How do you get the waste tires to your facility?

Mainline owns trucks that pick them up from various places throughout New England. Mainline doesn't pay for pick-up; the sites (such as landfills and tire stores) pay the transportation charge.

2. How much of Massachusetts does your program cover?

All of Massachusetts, including all of New England and New York

3. Do you work cooperatively with other companies?

A company in Littleton, MA ships the shredded tires (fuel) to Maine where they are used as fuel in paper mills. Also, another division of Mainline brings in large truck tires.

4. Where does your funding come from?

-Private/Government?

No government funding

5. How many workers do you have?

6 in the plant from 5-1 each day, as well as about 6 drivers on the road. So roughly 12 per day.

6. Does the plant operate 24/7?

Employees are there from 5-1 each day, but the plant operates 13 hours a day. Process about 60,000 tires a week.

7. What's your annual budget?

Confusion on this question, but roughly \$12,000 to keep the machines running per year.

8. What machines do you use here?

-How many and how pricey?

Bulldozer, one large grinder for whole tyres, and two fine grinders for shredded rubber.

9. What parts of the tires do you save/recycle?

-For any parts not saved, what happens to them?

Mainline doesn't really separate the steel but some falls out during the process. Nothing is done with the steel. The shredded tires are shipped to Maine paper mills for fuel.

10. What do you make from the tires?

Shredded tire fuel. Stopped making playground material 5 years ago because it was not profitable.

11. Where have your products been used?

Maine.

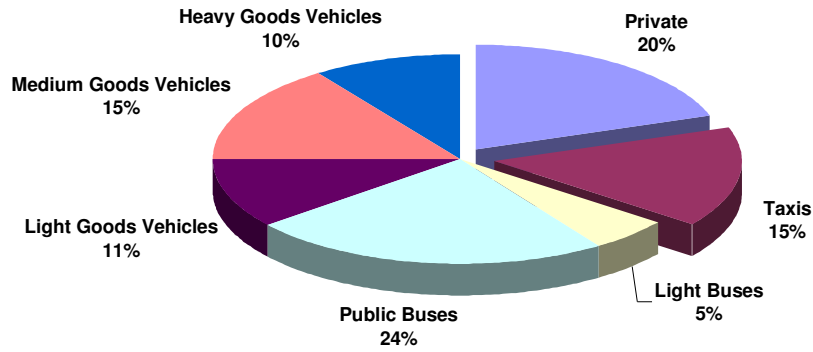
12. Are you currently developing any new ways to recycle tires?

Nope.

Other Notes:

Appendix D: Approximation of Annual Waste Tyre Amounts per Vehicle Type

Waste Tyre Tonnage per Vehicle Type



Type	Quantity in Hong Kong	Number of Tyres	Life of Tyres (Maximum)	Total Produced Annually	Average Tyre Weight (kg)	Tonnage (metric)
Private	441678	1670868	3 years	556956	9	5053
Taxis	18138	72552	2 months	435312	9	3949
Light Buses	6250	25000	3 months	100000	14	1361
Public Buses	12958	77748	7 months	133282	45	6046
Light Goods Vehicle	76114	304456	1.5 years	202971	14	2762
Medium Goods Vehicle	42886	257316	1.5 years	171544	23	3891
Heavy Goods Vehicles	3451	55216	1 year	55216	45	2505
Totals:	601475	2463156		1655281		25566

Sources:

Hong Kong Department of Transport, Vehicle Registration Statistics
 Environmental Protection Department Estimates on Waste Tyre Production
 Bridgestone Tires, Tire Weights by Vehicle Class
 Interviews & Windsor 2007 for Specific Tyre Life Data

Appendix E: Interview with Jamie Seaman, General Manager of New Brunswick Tyre Stewardship Board

Representative:

Jamie Seaman Eng, MBA
General Manager – NBTSB
(506) 454-8473
Phone Interview

1. How long has the board been in operation?

The board has been in operation since August of 1996.

2. What did the board have to do to begin operating?

The board had to set up the legislation so a board could charge a levy on all highway tyres sold in New Brunswick. They were \$9 for truck tyres and \$3 for car tyres. There are general standards for car tyre types.

The government chose this board because there were several boards already running the tyre recycling program. Pushing the work out to these boards was not successful. The stewardship board is run by the industry. They are a crown corporation; in Canada there is a difference between the government and private industry. Both are dealing with public accountability and puts distance between the board and the Department of the Environment.

3. What obstacles did the board face in beginning its program?

The biggest obstacle was getting a viable recycler to handle the amounts of material being produced. Also, the public sees the fees that go along with a stewardship board and they wonder where the funds are going to. The stewardship board aimed to take a higher road toward the approach.

Tire Drive Fuel, or TDF, is a huge market in the U.S. 60% of all tires go to this program in Canada as well. The fuel is used in pulp and paper mills, kilns for burning, or it goes to electric plants to create electricity (this happens in Connecticut). To do this, it is necessary to have a viable place for it to go. With a brand new program, retailers will deal with the levy.

4. How receptive was the community to your program?

There was lots of concern in the community because there was never a levy on tyres before. After its implementation, however, there was very little concern. With any program, there was the occasional complaint, but people were only concerned with wanting to know that their money was going toward a good cause. As long as the stewardship board can supply a good answer as to what the money is being used for, the community will want to help. There have been no negative press releases.

5. Statistically, how successful has your board been?

The board has been very successful; one of the best ones going. The level of recycling is excellent because there is only one place that the recycling takes place which makes it easy to manage. "Imitation is the best form of flattery" (Jamie Seaman). The contractor is privately owned. The board puts the job up for bid and the company with the highest bid that can do the job the best, gets it. This keeps the position competitive and it is hard to unseat the company.

6. Is the board completely independent of the government?

Yes.

7. Do you work cooperatively with other programs?

"Absolutely" (Jamie Seaman). The key is in information sharing with other boards. There is a national conference on waste tyres that board officials attend every year and conference calls are frequent. Some of the areas in contact are Nova Scotia, Quebec, and Newfoundland. Ontario does not have a program. Their program works dealer by dealer. That program only wants money, but does not care what happens to the tyres. The program is not doing its job properly.

8. What is your annual budget?

This information can be found on the stewardship board's website under annual reports.

Tipping fees= landfill gate fees. These are used by the stewardship board to offset the costs of management.

9. Does the board deal with illegal dumping of waste tyres?

Yes. This happens on a case by case basis. If places of illegal dumping are found, the board will sometimes pay to clean it up. It is not always the board's responsibility because the Environmental Department comes first.

10. How widely used is the PTE system?

The system is close to universal. It would probably be recognized by anyone, except maybe by tyre retailers.

11. What are the logistics that your truckers use in the transport of waste tyres?

The truckers use a "hub and spoke" system. This is similar to the airport system where there is a centrally located recycler and the truckers go out from there to pick up materials. There are one main recycler and 10-15 truckers. They are currently developing a website to handle the logistics. A retailer will be able to add the number of available waste tyres for pick-up and the recycler will respond to the retailer. The truckers will only accept a minimum of 50 tyres at a time.

12. What happens to the recycled tyres after they leave your company?

Lots of recycled products are made from waste tyres. These products can be seen on the stewardship board's website.

13. If so, what kind of action is taken?

People come in with different ideas. One of the popular ones is pyrolysis. The community is always looking for new recycled waste tyre markets. But, this is not the job of the stewardship board, it is the job of the recyclers.

14. Are you currently developing any new methods for waste tyre management and recycling?

For research and development funding, there is nothing directly being considered. A case by case basis stands for new methods if they look promising. Each consideration has to be justifiable because the board is using the public's money.

Appendix F: Interview with Jets Technics

Representatives:

Mr. John So, Sr., Company Owner

Mr. John So, Jr., Company Manager

Mr. Jacky Yau, Marketing Manager

Note: The protocol prepared for this interview was not followed directly, as it was found by the interviewers that the views of the company were considerably different from what was expected. Instead, an informational conversation was held.

1. What is the current cost of collection for waste tyres in Hong Kong?
 - Costs for recycling are the same for local and foreign tyres.
 - For the transportation of tyres, it costs \$120 Hong Kong per ton for local tyres
 - Hong Kong is a very small place, so it is a good place to start
 - Also, only ½ of the raw tyre material (by weight) is usable for recycled products. A lot of the extra weight is metal, which needs to be reset.
2. What is the cost to import waste tyres from other countries?
 - Transportation costs only take up a very small portion of the costs included in recycling.
3. What are the methods of collection?
 - Jets Technics pays contractors to collect tyres for transport to the recycling plants.
4. How could a tax help the most if transportation is not the biggest issue?
 - Jets Technics is NOT in favor of a waste tyre tax.
 - Jets Technics' view on the best way to help:
 - Most importantly, the government needs to stop tyres from being admitted into landfills
 - This will encourage companies to come to the collection points and set up recycling businesses
 - Charge a fee for dropping tyres at the collection points.
 - Legally get money from the people. The tax will only add to the charge at the collection points.
 - This will cause too many costs to recycle tyres through collection points, and possibly cause more illegal dumping.
 - If there is competition for recyclers, Jets Technics will eventually have to pay for its tyres.
 - If landfills continue to be an option, this type of business will not work (recycling businesses).
5. What is the company's production capacity? If supply sharply increased, would it be able to scale to match?
 - Right now, the plants are processing about 10,000 tons
 - Tyres are not counted in numbers, but by weight
 - This is because tyres come in many different sizes
 - Also, 4,000-6,000 tons of wires and other materials are included in this weight and sold
 - The company estimates a yearly capacity of 10,000 tons

- Even if the government gave all of Hong Kong's waste tyres to Jets Technics, the company would still be looking for more tyres elsewhere because it can handle more than Hong Kong can supply
 - Jets Technics is looking to set up a showcase to show its capabilities. It is looking to Europe as a big market supplier of tyres.
6. Is Jets Technics looking to expand in Hong Kong only or outside as well?
- The company is looking into advertising its products around the world.
 - In the past couple of years, many big private companies have shown interest due to a concern and awareness of the environmental issues at hand.
 - With more awareness, people will be more willing to pay to help
 - Without Public Relations, it cannot make business happen.
 - Jets Technics makes more products than just playground surfaces
 - Jets Technics wants to gain more connections with private companies internationally. This will allow more imports of tyres to help make more products.
7. What does Jets Technics feel about the media and public opinion of taxes?
- It is easy, but dangerous to believe the public on the environmental issues at hand. Media reporters only report support for the government even when it is not the right thing to help the environment.
 - For example, for the Plastic Bag Tax, the media is 100% in favor, but recycling companies are not because it is dangerous to them.
 - As long as there is a very good system to collect the bags, it is actually easier to use them. This is implying that the tax is designed to deter the public from using plastic bags altogether.
 - Jets Technics suggests that the best way to stop the bags from getting to the landfills is to place collection points for the bags to be recycled instead.
 - A suggested system would be when a new bag is purchased, an old bag should be brought in for reuse or recycling.
 - To parallel this with waste tyres, if the landfills are closed to tyres as well, the public will find alternative ways to dispose of waste tyres. This will hopefully be in the direction of recycling.
 - The problem still remains that there is a problem with the collection of wastes, not with financing the collection.
8. What problems is Jets Technics facing financially if it is not with transportation?
- Jets Technics is currently playing 4 roles: collector, recycler, manufacturer, and marketing.
 - For collecting, Jets Technics needs support from the government not through a tax, but to close the landfills to waste tyres so tyres will be more accessible. Once tyres reach the landfills, they are not retrievable.
 - For recycling, Jets Technics pays for this process. The machines need maintenance and energy to run. For example, the cutting machines have to be sharpened every 2 weeks.
 - Marketing is a business in its own because with poor awareness of using recycled products, there is not much of a market for them.
 - Jets Technics is not having financial difficulties, but having more of a problem getting people to make their waste tyres available to the company. It is too easy for people to just throw their tyres away in the landfills.

9. If the tax is passed on waste tyres, what would Jets Technics like to see done with the money?

- Jets Technics does not want to see a tax passed at all.
- The company will eventually have to pay for its waste tyres for recycling. For example, companies (like shopping stores) have to pay for their plastic bags. The public pays the government through the shopping stores.

10. How does Jets Technics feel about the government standpoint?

- The government needs to provide a good platform for recycling to get a leg up over disposal at landfills.
 - Jets Technics wants to see the government help recycling companies find and create a free market for waste tyres.
 - It is better to get more of a market for waste tyres than to place a tax on them.
 - If waste tyres and bags are treated as a business opportunity, it is possible to see how business can happen through it, not just how to solve the problem.
- Jets Technics feels that the waste tyre tax will not work in Hong Kong because it is still much easier for the public to dump their tyres. The Food and Hygiene Department is responsible for picking up waste tyres that have been illegally dumped or left on the streets, but they only bring them to the landfills and do not recycle them.
 - Once the tyres have reached the landfills, they are mixed in with the other Municipal Solid Waste (MSW) materials and cannot then be separated for recycling.

11. Would a Public Relations Program help Jets Technics' business?

- Yes and No; The government needs to first stop the landfills from allowing entrance to waste tyres first.
- Hong Kong needs to find an incentive for people to take their tyres to collection points.
- Jets Technics is looking into making Public Relations in Canada because the Canadian Embassy has invited them.
- Jets Technics is also interested in California's Stewardship Program because it is so successful in regards to the percentages of tyres being recycled there.
- In Hong Kong, Jets Technics is currently working with another company that is cleaning up after the U.S. military dumped metal parts, tanks, waste tyres, etc. there. The company is shipping the materials out at their own expense, and Jets Technics is taking these tyres off their hands.

12. Anything else?

- Jets Technics is disappointed in the government over the past 5 or 6 years. The government thinks that helping to finance new technologies will help the waste management problem, but it is only making companies more dependant on the government.
 - Jets Technics wants to see an end to the government funding.
 - The tax will not stop the government from allowing tyres to go to the landfills as trash.

- If there is no longer a problem with waste tyres, will the tax still be necessary? It is necessary to ask the EPD why they will not necessitate the needs of the recycling companies.
- By implementing a tax on waste tyres, the government is avoiding the overall problem.
- Those in favor of the tax do not understand the truth behind the problem and possible solutions. These people are controlled by the media. Those in favor of the tax are incapable of solving the problem.
- The government will only consider a proposal to shut landfills down to waste tyres after the tax has been implemented.
 - No realization that not all Environmental taxes are the right answer.

Appendix G: Interview w/ Bridgestone Tires

Representative:

William Chan

Asst. Manager -Customer Services

Bridgestone Aircraft Tire Co., (Asia) Ltd.

1. Approximately how many tonnes of tyres do you produce in the world per year?

Ans: Our production volume of retread tires in H.K. is around 3,400 metric tons per year.

2. Approximately how many tonnes of tyres sell in Hong Kong per year?

Ans: Total sales quantity is around 5,250 metric tons per year.

3. What types of service do you provide for tyre replacement, repair, or others?

Ans: Tire Retread is the main manufacturing processes in our factory.

4. Can you share how Bridgestone recycles end-of-life tyres? By what means?

Ans: We dispose end-of-life tires locally. Selling them to reject tire trader or drop in Landfill.

5. Do you offer a recycling option to tyre buyers in H.K.?

Ans: They can send back worn tires for retreading.

6. Does Bridgestone have any finance support for this option?

Ans: Retreading cost will be charged to our customers.

7. How do you transport the waste tyres to the recycling facilities? (If at all)

Ans: We transport the waste tires by truck.

8. Besides the recycling method, do you have any other options for handling the end-of-life tyres?

Ans: No other options.

9. Do you think a tax on waste tyres will help the waste tyre management issues in H.K. effectively?

Ans: Hong Kong is a free port which thrives on free trade. It would be better to levy only surcharge on waste disposal, rather than impose tax on it.

10. What are your views on the implementation of a waste tyres tax in H.K.? What might be the positive or negative effects on your business?

Ans: It is not easy to implement a waste tyre tax in H.K. As impose the tax on waste tires is not only tax on manufacturers but also involves all car owners. Thus, the administration cost is quite expensive for H.K. Government. Of course the waste tyre tax is an additional cost to our products, which will make our products less competitive in market. However, the tyre industry in Hong Kong will possible earn better image in the world. As one of them, we will get positive effects on our business.

11. Would you be willing to pay such a tax if it is implemented? Approximately how much?

Ans: We prefer to pay surcharge on waste disposal instead of paying tax. The charges should be reasonable.

12. Do you have any suggestions for an alternative to a waste tyre tax in H.K.?

Ans: Setting standard charges for the disposal of waste in Landfill.

13. Can you share how the government in handling waste tyres issue in your other regions?

Ans: We have no such information.

Appendix H: Interview with Hong Kong Environmental Protection Department

Representatives:

Alfred K. M. NG

Senior Environmental Protection Officer

Waste Management Policy Division

&

Mac C. T. NG

Environmental Protection Officer

Waste Policy Group

Introduction:

- Eco-Park:
 - Phase 1- plastics, tyres, and wood
 - Phase 2- still in development, looking for recyclers of different materials
 - Possible arrangements for a visit
- 10 Refuse Transfer Stations
 - District based
 - Food and Hygiene Department manages them
 - 2 types: barge and container transportation to landfills
 - Very clean, taken care of in the early morning so public does not have to deal with it or smell it
 - Containers are kept especially clean, looks like regular trucks
- The Kowloon Bay holding site for tyres before going to the landfills no longer exists.

Questions and Answers:

1. How long has the EPD recognized waste tyres as a significant source of the waste problem in Hong Kong?
 - “Vehicle tyres are just a minor proportion” (Mac C. T. NG) of the overall Municipal Solid Waste (MSW) problem in Hong Kong.
 - 3.4 million tonnes of MSW are disposed of per year
 - There has been a gradual reduction in the amount of tyres entering the landfills in the past few years.
 - Approximately 17,000 tonnes in 2005
 - ~7,000 tonnes in 2006
 - ~4,000 tonnes in 2007
2. What steps has the EPD taken to help the management of waste tyres?
 - The EPD is not looking just at the waste tyre problem, but as a range of recyclable wastes.
 - The EPD is working with a company that makes rubber “crumbs” from waste tyres
 - This company ships the rubber crumbs to China for use as road surfaces

- The material is also used in and around the Eco-Park to be tested as an efficient and capable road surface
 - The Highway Department is looking into this product, a mix of rubber material and asphalt, as a possible road surface
3. How does the EPD plan to address the waste tyre management problem? If by a tax, has the EPD researched any other possibilities, such as a gate fee?
- The EPD has just introduced an ordinance, a Producer Responsibility Scheme (PRS) Bill.
 - This is a legal framework for the regulation of the scheme
 - Rough sketch of the Bill drafting process:
 - First, the EPD looks at the internal mechanisms of the problem at hand. Mainly, these are human rights and competition.
 - Second, the report is sent to the Executive Council to be looked at by the Chief Executive
 - Third, it is brought to the public through a “Gazette”
 - Fourth, it is called a “Blue” due to the paper it is written on and brought to the Legislative Council (LegCo), where committees deliberate
 - At this point, the public may write in and give opinions
 - Fifth, an amendment is written up, where the parts, mechanisms, or rules can be rewritten to suit everybody
 - Sixth, the LegCo brings it through second and third readings for more deliberation
 - Seventh, it is either signed by the Chief Executive, making it a law, or it is dismissed
 - The Plastic Bag Tax is the first PRS to be attempted.
 - The waste tyre PRS is still being researched: “Vehicle tyres, we are still thinking” (Alfred K. M. NG) about a PRS that will suit its proper management.
 - On a tax on waste tyres, they have not narrowed down the options to a tax yet, but are still trying to determine what will work best.
 - The EPD’s main goal is to “divert waste tyres from landfills” (Alfred K. M. NG).
 - This was mentioned in a “mostly” type sense, and not to completely shut the tyres out of the landfills.

4. Skip Question #4

5. What obstacles lie ahead for the implementation of a waste tyre program?

- “Need to seek support from the Community” (Alfred K. M. NG) and related businesses.
- A new scheme will introduce some change and will take a lot of support to implement successfully.
- Need to determine what needs to be done to centralize the mechanism and support around the idea.
- “Need to study the pros and cons of different solutions” (Mac C. T. NG).

- The EPD recognizes that it needs to address a lot of problems and “find what is acceptable to most of the parties” (Mac C. T. NG)
 - The EPD wants to ensure that this will be successful, so it is necessary to make those involved as satisfied as possible.
- 6/7. Questions 6 and 7 were combined: How receptive do you feel the community will be to your program? What can you tell us about the Plastic Bag Tax? What seems to be the community’s response? Where do the funds collected by the Plastic Bag Tax go?
- There is a trial scheme going through a process now (the Plastic Bag Tax). The companies collect a donation.
 - This money is not for profit, but there is no clear definition as to where the donated money goes to.
 - The government does not tell where the money is going very clearly, but this does not mean that there is no support for the scheme.
 - “The support us” (Alfred K. M. NG) in wanting to reduce the numbers of plastic bags for an environmental cause. This applies to waste tyres as well.
8. If or when the waste tyre tax is implemented, what does the EPD plan to use the funds collected for?
- The EPD has not decided whether there will be a tax yet or not. They only want to reduce the tyres going into landfills. This is not a revenue generation.
9. Is there anything more you can tell us about the legislative process of implementing a waste tyre tax, such as a proposed deadline or the legislative timetable?
- This question was answered in Question 3 above.
10. As a whole does the EPD feel that implementing a waste tyre tax will be beneficial to the Hong Kong community?
- Research on other countries’ experiences before with management systems are being completed at this time before firming up on a specific scheme.
 - This was referred to as a “study for overseas appearance” (Mac C. T. NG).

Appendix I: Hong Kong Environmental Protection Department Follow-Up Interview Questions

When: Tuesday, February 26, 2008. 10-10:30am

Where: Environmental Protection Department:

45th Floor, Revenue Tower,
5 Gloucester Road,
Wan Chai, Hong Kong

Interviewers: Curtis Schaaf & Sarah Tracy

Interviewee: Mac C. T. NG, Environmental Protection Officer for the Environmental Protection Department

1. How has the amount of waste tyres decreased so dramatically in the last 3 years?
“There’s about 600,000 vehicles running around on the roads” (Mac C. T. NG, 2008) in Hong Kong. There has been no drop in vehicle numbers, so the economic developments around Hong Kong have made a major contribution to this drastic drop. There are very high driving requirements such as a need to change tyres before they reach the end-of-life stage. Tyres are sent to other countries from the landfills that retreat and reuse them. Two of these countries are North Korea and Vietnam.
2. What companies/organizations/programs are responsible for this decrease?
There are no named companies or organizations, but there is a good market for tyres. Automobile garages take care of everything. Private cars especially “never change their own tyres. They take them to garages to do it for them”. There are two options for tyres at garages; they either dispose of tyres if they have no recycling value or they sell them to traders. These traders collect tyres at many different garages.
3. If the number of tyres has been steadily decreasing, why is the EPD researching other possibilities for waste tyre management?
*“We are reviewing the situation” (Mac C. T. NG, 2008) still. “The tonnage [of tyres being sent to the landfills] is much different from what it used to be” (Mac C. T. NG, 2008).
If there is a good market that is running smoothly, such as there is with aluminum cans, “we will not introduce something else to disrupt it” (Mac C. T. NG, 2008). Half the tyres that go to the landfills come from the government, half from private sector. Reference collection points are used in this process.*
4. What parts of the current waste tyre management system in Hong Kong does the EPD see needing financial assistance?

“In the last several years, 4 million dollars have been used for recycling to turn tyres into products” (Mac C. T. NG, 2008). Some of the money is being used for research and development, but not a substantial amount. For this, Earthlink is a research project being done at a university to create rubber soil. The soil is a mix of rubber and cement. The EPD gives this research financial support. Rubber crumbs for roads are currently being financed as well.

5. According to the EPD’s website, a waste tyre management system is estimated to be in place by the end of 2008. Do you believe this is a reasonable estimate? *2008 was “our original target” (Mac C. T. NG, 2008). However, the plastic bag bill was just recently submitted and another bill cannot be introduced until the first is passed. It will take longer than 2008. An estimate cannot be made at this point because there is no fixed time. “We don’t say a fixed time” (Mac C. T. NG, 2008).*
6. Our project has determined possible solutions for waste tyre management in Hong Kong; we would like to have your opinion on each:

- **Stewardship Board:** A private entity initially formed by the EPD that would directly manage funds for waste tyre management without involving the treasury. This would break down communication barriers between consumers, retailers, and recyclers. This board could be modeled after the EPD’s current system for construction waste.

“We have studied on this kind of option. We have a lot of tyre suppliers” (Mac C. T. NG, 2008). It is necessary to look at several factors before implementing a system. First, a system must be cost effective. There are only 4,000 tonnes of tyres going to landfills now. Spending millions of dollars on this small amount of tyres would be over spending. Also, the amount of time it takes for a system to be implemented is an important factor determining if the system can make a significant difference.

- **Landfill Gate Fees:** Funds would be collected when disposing of tyres at landfills or collection points that would directly fund transportation. *This is “quite a good option” (Mac C. T. NG, 2008). However, there have been problems with this option overseas. If a fee is implemented at the gates, people will illegally dump their tyres elsewhere. Half the tyres that are collected now come from refuse collection points because people already do not want to go to the landfills.*

- **Deposit Fees:** A significant sum would be added to the original price of tyres, when the consumer returned the tyre to a proper waste tyre collector they would receive their money back. We believe this would give consumers incentive to recycle rather than throw away.

This system would ensure that the money is collected and is allocated to a suitable place. Around 10 years ago, glass bottles were put through a system like this. However, “vehicle owners will always return their tyres to the garage” (Mac C. T. NG, 2008) anyways. “They will not change [their tyres] by themselves and return them” (Mac C. T. NG, 2008). They will bring them to a garage because most of the people do not even know how to change a tyre and the garage will take care of the tyres for them. Also, it is important to note that there are “over \$7 million in administrative costs” (Mac C. T. NG, 2008) for the implementation of any system such as this.

- **Possible Changes to Current Waste Tyre Policy:** We believe that significant improvement in waste tyre management could be seen with the following policy changes: Banning tyres from landfills, the creation of tyre monofills outside of landfills, refusal to collect tyres with household trash, and increased public awareness about fines for illegal dumping.

Banning from landfills: “Not all tyres can be recycled” (Mac C. T. NG, 2008). Some are in bad shape and have no recycling value. Therefore, some tyres must be thrown away.

Creation of monofills: Tyres are already collected at refusal collection points. These points are currently functioning.

Refusal to collect with household trash: Also, tyres are not mixed together with household wastes because vehicle owners do not change their own tyres. They are brought to garages and kept there until they are collected by traders and recycling contractors.

Increased public awareness: “We already have a very good message” (Mac C. T. NG, 2008) to recycle. People are less likely to throw tyres into the landfills because they have to be cut in half first. This makes just throwing them away more difficult. There are very hefty punishments for the illegal dumping of waste tyres. For the first offense, it is a \$200,000 fine and up to six months imprisonment. A second offense results in \$500,000 and up to two years imprisonment.

7. We have collected data on the percentage of waste tyres each type of vehicle contributes to Hong Kong. Included in this, the EPD website states that 75% of these tyres are recycled. Could you make comments on where tyres from these particular sectors are recycled and which sector contributes to the remaining 25% of non-recycled waste tyres?

Of the 75% of tyres that are recycled, “how can you know that? I do not know it” (Mac C. T. NG, 2008). This information does not appear to have come from the EPD website. It is possible to guess amounts, but there is no way to know. “Most tyres come from healthy usage” (Mac C. T. NG, 2008). Bus companies and goods trucks

retread their tyres, as well as many other companies that recycle. “There are no figures” (Mac C. T. NG, 2008), but there are thousands of recyclers. The process of recycling tyres into rubber crumbs is dangerous. “The metal fibers can get into the air and catch fire” (Mac C. T. NG, 2008). It is more profitable to sell tyres outside of Hong Kong than to recycle them here. The comparison between recycling tyres and exporting them is that a “major part are exported” (Mac C. T. NG, 2008). Making rubber crumbs into products here is not a significant portion. Exporting waste tyres is done the most, followed by retreading the tyres here in Hong Kong, and finally recycling the tyres into rubber crumb products here also.

Appendix J: Interview with Friends of the Earth

Representative:

Edwin Lau (Director)

1. What achievements has Friends of the Earth made in the past?
Don't want to claim too many victories, you can read from our website for those battles we fought in the past to effect policy changes by the government and some changes by the private sector.
2. What types of environmental issues are you seeking to improve currently?
Air quality, energy efficiency, waste management
3. What are your project goals for the future? What changes or improvements are you looking to make?
We aim the government to establish appropriate policies for the environment; individuals to have a caring attitude towards the environment; the private sector to do better in corporate social responsibility.
4. What do you know about the waste tyre management situation in Hong Kong?
Government tries to get a contractor to collect the used tyres and have them recycled properly instead of letting them to be disposed of at landfills. But it is not very successful at the moment.
5. What contributions are you willing to make to ensure that Hong Kong has an efficient waste tyre management system?
Producer Responsibility legislation is the key to the success of taking used tyres out from the waste stream. Producers have to pay for the cost of recovery, and users have to bear part of the cost under the polluter pays principle.
6. Are you aware of the Producer Responsibility Schemes (PRS), including taxes, that the government and EPD are implementing on recyclable waste materials?
Yes, government is trying to establish umbrella legislation on PRS so that later on all products could be covered under the bill. The first product will be plastic bags.
7. How do you feel about the Plastic Bag Tax? Do you have similar views of a possible waste tyre tax?
I believe plastic bag tax would deter people from the excessive use of plastic bags which are free of charge now. Users will not throw away used tyres as they will go to garage to change their tyres, so government should ask producers to take care of the recovery of used tyres with their own efforts and not just dumping the tyres in our landfills, because dumping municipal solid waste in our landfills is still free currently.
8. Can you estimate what type of impact a tax on waste tyres will have on Hong Kong citizens or tyre retailers and recyclers? Any estimations for the environment?

The impact on private car owners will not be big, but would be bigger on commercial vehicles owned by individuals and small companies, cos it will raise their operation cost. For tyre retailers, they would probably transfer part of the cost to users. Recyclers would be happy to help retailers to collect the used tyres with a fee. These recyclable used tyres should not be disposed in our landfills and they should be recycled to produce another material for reuse.

9. Do you think a tax on waste tyres will be effective in Hong Kong? Why or why not?

Under the PRS, a tax on tyres would provide the money for government to facilitate the collection and recycling of used tyres and will improve the current situation.

10. Would you rather an alternative to a waste tyre tax be implemented? If yes, do you have any suggestions?

Besides taxing the tyres, a landfill ban for tyres can be considered, but the implementation mechanism is another aspect the government may find it hard to implement.

11. Can you relate your mission statement to the political, legal, environmental, social, and technological aspects of a possible waste tyre tax in Hong Kong?

Yes, we urge the government to develop appropriate environmental policies to tackle various environmental issues and used tyres is one of the issues under waste management.

Appendix K: Interview with Urban Taxi Association

Representative:

Mr. Kwok

Urban Taxi Association Chairman

1. How many taxis does your company have in operation?

5000 committees, 80% hire cars, 20% owned
18000 taxis in Hong Kong, 3 colors, red-15000, green-2000, blue-50
40000 drivers-(shifts...6am-5pm & 5pm-6am)

2. How long has your company been in operation?

1986, 22 years

3. Approximately how far do your taxis travel daily? (Kilometers or hours)

6am-5pm : 230km

5pm-6am : 260-280km, less congestion

4. How often do your taxis change their tyres?

2 types of tyres bought: Toyo (harder tyre) – 1.5-2months
Yokohama/Michelin (France/Philippines): (softer) approx 40 days
\$320-400 HKD for one tyre

5. Where do they change their tyres?

No fixed location for tyre change. Go to different shops, but there is one company responsible for changing the tyres only, such as Toyota (bad example though, it's expensive).

6. How are your waste tyres disposed of? Recycling? Retreading? Landfills?

He guesses that company that collects tyres put in landfills. Recalls that ~5 years ago that HKPU invented technology that breaks tyres into crumbs and puts into asphalt, there was no support from HK government.

7. How do you feel about tyre recycling?

Does not support landfill method because he wants recycling. No support from Hong Kong government. He supported HKPU method mentioned 5 years ago (tyre paving). This would create safer roads and decrease noise.

8. What are your views on the implementation of a waste tyre tax, which will be used to pay for tyre recycling?

He supports a tyre tax, but emphasizes that if the tax is going to the treasury he does not support it. He wants the money to go the environmental industry.

9. Would you be willing to pay such as a tax? How much?

Willing to pay the tax if this money would be put to good use in environmental funding. Willing to be \$20 per tyre.

Do you have any alternative suggestions to a waste tyre tax?

The interviewee emphasizes that he supports the environmental movement in Hong Kong, however he does not support giving money to the treasury.

Appendix L: Citybus Interview Questions

1. How many buses do you have in operation?
2. How many hours (or kilometers) are your buses driven per day?
3. Do you buy your tyres from a local retailer?
 - a. If yes, which one(s)?
 - b. If no, how do you obtain your tyres?
4. Approximately how often do you change the tyres on your buses?
5. How many waste tyres do you produce per month? Year?
6. How do you dispose of your waste tyres?
7. How are they transported to this destination?
8. Who is responsible for the costs of transportation?
9. How do you feel about tyre recycling?
10. What are your views on the implementation of a waste tyre tax?
11. Would you be willing to pay such a tax?
12. Do you think a tax on waste tyres will help the waste tyre management issues in
Hong Kong?

Appendix M: Interview with Citybus

Representative:

Mandy Pang

Public Affairs

Only questions which were responded to are listed here; the protocol for the interview was sent via e-mail, and was returned by fax. Not all questions were answered.

1.) How many buses do you have in operation?

The fleet size of Citybus Franchised One and Franchised Two are 747 and 172, respectively, as at 31 December 2008.

2.) How many kilometers are your buses driven per day?

The daily bus kilometers of Citybus Franchised One and Franchised Two are 162,000 and 78,000, respectively.

3.) Approximately how often do you change the tyres on your buses?

The first life of a new bus tyre is normally between six months to one year, but their operational can be extended up to two years through two or three times retreading.

4.) How many waste tyres do you produce?

About 8,000 scrapped tyres are collected and recycled by a registered tyre recycling company each year. These scrapped tyres are converted to playground flooring instead of dumping in the landfill sites.

5.) How do you dispose of your waste tyres?

The waste tyres are handled by the contractor.

Appendix N: General Interview Invitation Letter



Worcester Polytechnic Institute
100 Institute Road
Worcester, MA 01609-2280
1-508-831-5000, Fax: 1-508-831-5485
www.wpi.edu

January 13, 2008

Dear Sir/Madam,

We are a student research team from Worcester Polytechnic Institute, an engineering and science university in the United States. We are currently researching the disposal of waste tyres and the possible impacts of a waste tyre tax in Hong Kong. As part of this research, our team has traveled to the city and will be working here with help from students from Hong Kong Polytechnic University until the end of February.

We understand that the waste tyre management system in Hong Kong is undergoing many changes over the next few years and will affect many companies and organizations in this community. During our research we discovered that taxis make up a large part of the vehicles used in Hong Kong and therefore make up a large percentage of used tyres. We would like to ask for your view on this problem. Any information we receive from you will be very important to our project, as many parties are interested in our findings. Upon completion of our project we will be presenting our information to any party interested in our conclusions and recommendations, to which we would be most pleased if you would attend. We are sure that the findings of our project will be very useful to the taxi association as it will include recommendations on a waste tyre levy and the major impacts it has on Hong Kong.

If you are available for an interview via phone or in person, we would greatly appreciate it. If not, we would also be grateful for any other information you could give us, particularly other potential contacts who you believe would be helpful in our research. You may contact us at hkwpi@wpi.edu, or our mobile phone at (852) 9786-9891, or leave a message at our hotel desk at (852) 2261-9364, Attention: Room 1403. Thank you for your time.

Sincerely,

WPI Student Research Team

Curtis Schaaf
Chemical Engineering
Worcester Polytechnic Institute
Class of 2009