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5 January 2015

Dear Miss Chan,

Follow-up Action Arising from Meeting on 28 March 2014

We would like to inform the EA Panel that the final report for "A Study to Promote Recycling of Plastic, Paper and Used Cooking Oil in Hong Kong" in Chinese and English has been uploaded onto EPD's waste reduction website at - https://www.wastereduction.gov.hk/en/assistancewizard/waste_reduction_study_report.htm Members are welcome to visit the website to view and download the report. Please feel free to liaise with the undersigned or our Ms. Evelyn SC Leung, if a hard copy is needed.

Yours sincerely,

(Wong Hon Meng)

for Director of Environmental Protection

c.c CEO[CBD]

A Study to Promote Recycling of Plastic, Paper and Used Cooking Oil in Hong Kong

Final Report - Prepared By
Environmental Management Division
Hong Kong Productivity Council
December 2014



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EXECUTIVE SUMMARY

1. Following the publication of the Hong Kong Blueprint for Sustainable Use of Resources 2013-2022, the Government established the Steering Committee to Promote the Sustainable Development of the Recycling Industry (the Steering Committee) in August 2013 to step up concerted efforts in reducing waste at source and promoting the development of the recycling industry.
2. The Hong Kong Productivity Council (HKPC) was commissioned by the Environmental Protection Department (EPD) to collect trade specific information in order to better understand and facilitate the promotion of recycling in Hong Kong with the objectives to:
 - a) look into the respective ecosystems specific to Hong Kong of three waste types - namely plastic, paper and used cooking oil (UCO); and
 - b) understand how recyclers operate, the difficulties they face and identify the possible points of intervention, approaches and means to promote the development of the recycling industry so as to reduce waste to landfill.
3. The EPD selected plastic, paper and UCO for the purpose of this study because plastic and paper each take up about 20% of the total quantity of municipal solid waste (MSW) going to landfills; and UCO, while small in quantity when compared to plastic and paper, is a unique waste type which recycling facilities have been set-up in Hong Kong.
4. This study was conducted by means of (a) Desktop Research and (b) Stakeholder Engagement. A total of 60 key stakeholders from the relevant trades related to the generation, collection and/or recycling of the identified types of waste and interested parties were successfully interviewed. Among them, 18 were waste producers/manufacturers, 9 were trade associations, 29 were waste collectors/recyclers (including NGOs), and 4 were technology providers.

Plastic Recycling

5. Plastic plays an important role in our daily lives. Its versatility allows it to have diverse properties and applications in virtually every sector of activities. The EPD commissioned a review on the estimation of waste recovery rate in 2012 in light of puzzling statistics since 2010 when the recycling rate started to drop. The result, released in early 2014, showed the problem was essentially caused by large fluctuations in local waste plastic exported for recycling. The review noted that some estimates of waste plastic recycling included non-locally generated quantities and over-estimated locally-generated waste plastic recovered for export, thus leading to inaccuracies in estimation. Traders and exporters of waste plastic likely made mistakes in how they made their customs declarations in light of confusion over definitions of what should be “domestic exports” vs. “re-export”. In light of the large quantities of traded waste plastic (3.2 million tonnes in 2012) being imported into Hong Kong annually with the vast majority then re-exported to mainland China and elsewhere, accurate customs declaration is important for Hong Kong to have an accurate picture of its own plastic recovery rate since most of our own recovered plastic is exported for recycling outside the territory.
6. To reduce waste plastic ending-up in landfills, Hong Kong has to collect more locally-generated waste plastic, and to organize collection in such ways that help increase its commercial value. Typically, the waste plastic collected from households, commercial and industrial (C&I) sources, as well as the 3-coloured bins are generally of mixed plastic types. The discarded plastics from households and 3-coloured bins are often also contaminated.

Waste recyclers avoid collecting contaminated waste plastic, and do not prefer collecting mixed waste plastic because they have to spend time and money to sort/pre-treat the waste, which affects their commercial viability.

7. To collect more waste plastic and to help increase their commercial value to recyclers, government policies and measures need to be directed at:
 - a) Promoting separation of the different types of waste plastic at source as much as possible so as to reduce mixed plastic recyclables; and
 - b) Raising public awareness that they should prevent contamination in order to maximize recycling opportunities.
8. Since mainland China's launch of Operation Green Fence (OGF) in early 2013, recyclers have had to introduce more measures to meet the mainland's requirements for all types of imported recyclables, including waste plastic. For example, some plastic recyclers have installed shredding machines and washing facilities. The trade also had to explore alternative outlets for the rejected cargoes.
9. Many stakeholders opined that the scarcity of land in Hong Kong, the high cost of labour intensive sorting, the high cost in transportation, and rising workers' insurance premium, are major factors making plastic recycling difficult in Hong Kong.
10. To further promote plastic recycling in Hong Kong, we make the following recommendations:

Short-term Measures

- a) It is noted that EPD, together with C&ED and C&SD, have been implementing measures to enhance the accuracy of relevant Customs declarations of waste plastic, and to collect additional data on sources of waste plastic included in domestic exports. EPD, C&ED and C&SD have also conducted thematic seminars for local collectors/recyclers/traders of waste plastic to provide them with enhanced guidelines on declaration requirements and trade classifications. We suggest the Government should continue with the above measures to enhance the accuracy and reliability of waste plastic recovery and recycling statistics.
- b) The Government should increase and sustain public education and awareness campaigns of how to do source separation of waste and pre-cleaning of the recyclables, which would improve the quality and quantities of recyclables, including waste plastic. The campaigns also have to explain that there are types of waste plastic that have no market. These include low grade mixed plastic, composite plastic and plastic mixed with metals.
- c) The Government could consider facilitating the establishment of a voluntary certification scheme to help formulate detailed parameters on good practices for plastic collection and recycling that cover management, operation, environmental performance, and occupational health and safety performance. This helps recyclers improve their standards of operation and workplace safety, thereby helping to lower insurance premium for the trade.
- d) The Government could facilitate plastic recyclers on obtaining the necessary land to set up their operation through bidding for short term tenancy sites.

Medium-term Measures

- e) With the establishment of the \$1 billion Recycling Fund and implementation of the MSW charging scheme, the Government may consider providing financial incentives and disincentives to promote recycling so as to increase the recycling rate and reduce waste to landfills. In the case of waste plastic, the Recycling Fund may enable and facilitate the trade to gain more technical support, such as compacting techniques so that the light and bulky nature of plastic can be transported more economically.
- f) When the voluntary certification scheme is in place (noted in c) above), the Government may explore whether there are merits to consider the introduction of a mandatory licensing system.

Paper Recycling

11. In Hong Kong, waste paper recycling has long been practiced. As paper waste recycling is a profitable business, there are currently over 240 paper waste collectors in Hong Kong but none carry out reuse or processing locally. Essentially all the collected paper waste is exported. Paper waste separation and recovery facilities (i.e. 3-coloured recycling bins) have been widely placed in housing estates, country parks, roadside, refuse collection point and leisure and cultural facilities etc. and cover over 80% of our population. The majority of the paper recovered include cardboards, newspapers, magazines, leaflets, envelopes, paper shopping bags, packaging materials, egg cartons and books, while beverage or milk cartons (i.e. the Tetra Pak containers) with plastic or aluminum interior coatings are not normally collected.
12. In 2012, 1.858 million tonnes of paper waste was generated in Hong Kong, of which 1.162 million (62.5%) was recovered and 0.696 million tonnes (37.5%) was disposed of at landfills. This means around 1,906 tonnes of waste paper are landfilled daily. Amongst the types of landfilled waste paper, newsprint and other paper waste (including Tetra Pak containers and tissue paper) are the two main types (27% newsprint and 41% other papers). A breakdown of the data revealed that, there were about 510 tonnes of newsprint, 100 tonnes of Tetra Pak containers, and 646 tonnes of tissue paper being disposed of every day.
13. We identified the following characteristics and obstacles in the paper recycling trade :
 - a) There has been an increase in the daily production of free printed newspaper in Hong Kong in recent years. As of 2012, it was reported that the daily quantity of free newsprint was 3 million copies. Together with the paid newspaper prints, there were more than 4.5 million printed newspapers produced daily in a city with a population of 7.1 million. The boom in free newspapers can have negative effect on landfilling if the proper channels of collection and recycling have not been established.
 - b) The newsprint that is disposed of at landfills was generally mixed and contaminated by other waste (e.g. food waste and residue). This indicates that the general public has not exercised adequate caution to separate the newsprints from the general refuse so that it could be recycled.
 - c) The substantial quantities of tissue paper disposed of at landfill are usually contaminated and has no recycling potential.
14. Extensive government intervention is unnecessary in the case of waste paper in light of the fact that there is a well-established trade sector and a global market for waste paper. It is noted that the Government has committed to providing suitable berths in Public Cargo Working Areas to support waste paper export. Nevertheless, there are various measures

which could be taken to enable even higher collection and recycling, thus further easing the pressure on our landfills. The recommended measures are presented below:

Short-term Measures

- a) Hong Kong should strengthen its practice of source separation of waste paper through sustained public education and awareness campaigns. The campaigns can be tied-in with the introduction of MSW charging to communicate to the public that waste paper is a valuable resource that could be reused/recycled and by separating it from other waste, it would also reduce their waste charge.
- b) The education and awareness campaigns can also urge the public to use less tissue paper in their daily lives whenever possible.

Medium-term Measures

- c) The Government could explore supporting a trade-operated collection system for free newspapers to address the trade's difficulties in finding suitable locations to set up collection points without obstruction at street level.

Used Cooking Oil (UCO) and Grease Trap Waste (GTW) Recycling

15. UCO and GTW are typical wastes generated from the operations of restaurants and food businesses. UCO is spent cooking oil. The grease and oil separated from wastewater by a grease trap (also known as grease interceptor) is called GTW. Both UCO and grease and oil separated from grease trap can be used to produce biodiesel.
16. There is no statistics on UCO generation in Hong Kong except the estimation by the local biodiesel manufacturers, who estimate that the annual generation of UCO in Hong Kong is around 20,000 tonnes. On the basis of references from trade and import/export data as well as those supplied by recyclers and the trade, HKPC estimates that around 5,000 tonnes of UCO are exported per year, while 11,000 tonnes are collected for recycling in Hong Kong into biodiesel. This means total UCO generation could be around 16,000 tonnes per year. A better system to estimate UCO generation in Hong Kong would be desirable. The amount of GTW generated annually is around 160,000-180,000 tonnes based on EPD's data. There is regulation to deal with this type of waste, which has to be taken to authorized facilities.
17. The challenges stakeholders face in this sector are as follows:
 - a) Some stakeholders alleged that some collectors sell the UCO they collect to plants outside Hong Kong for reprocessing into cooking oil for human consumption, and some collectors even skimmed-off oil content from GTW prior to it being sent for treatment. Local biodiesel recyclers could not compete with such collectors on price because cooking oil could be sold for higher prices than biodiesel. Using UCO to make cooking oil for human consumption would present a health problem. However, it is beyond the scope of this study to verify these allegations although it is important that they are dealt with if substantiated.
 - b) Some UCO producers, such as restaurants, reported that it was not uncommon in the trade to directly dispose of UCO and GTW, particularly for small-sized restaurants. It would be useful to explore ways to facilitate UCO producers to segregate UCO for recollection and recycling.

- c) Some UCO producers, in view of their social responsibility, expressed their intention to choose collectors with proper recycling processes/outlets. However, currently there is no clear information or guidance for them to differentiate proper collectors from improper ones. It would be useful to provide relevant information to UCO producers to minimize the possibility of UCO entering improper channels at the source level.
- d) UCO is a good feedstock for biodiesel production and Hong Kong already has 3 biodiesel plants. However, the current local demand for biodiesel is small, primarily due to the less competitive price of biodiesel as compared to conventional diesel. In addition to cost, introducing more environmental initiatives to cut carbon emission could also help increase local demand for biodiesel.

18. The following recommendations are proposed:

Short-term Measures

- a) A voluntary certification scheme for UCO collectors could be established to help set standards of good practices in the trade and aid UCO producers in choosing responsible collectors.

Medium-term Measures

- b) The Government could commission studies on possible ways to promote the use of biodiesel and to evaluate the impact and implications of its larger scale usage in Hong Kong. The study should take note of the situation of local production and consumption of biodiesel in assessing whether there are justifications to mandate the use of biodiesel in the future.
- c) In the light of results from the study on promoting the use of biodiesel suggested in part (b) above and subject to consultation with stakeholders, the Government could consider whether to mandate the use of biodiesel territory-wide or in selected sectors/machine types in future. The increased use of biodiesel could also help reduce carbon emission at the global level and increase the percentage of renewable energy usage in Hong Kong.

1 INTRODUCTION

1.1 Objectives

In response to the Hong Kong Blueprint for Sustainable Use of Resources 2013-2022 which targets at further reducing the local waste disposal rate, the Steering Committee to Promote the Sustainable Development of the Recycling Industry (the Steering Committee) was established in August 2013 to step up concerted efforts in reducing waste at source and promoting the development of the recycling industry.

The Steering Committee is tasked to review the current local situation of collection and disposal of recyclables, the related policies and support measures, as well as to identify proactive approaches to facilitate development of the recycling industry, including the setting up of a “Recycling Fund” and its mode of operation, improving the network of community collection points, enhancing provision of land of sufficient tenure and adopting green procurement in the Government.

In addition, the Steering Committee would explore means to foster community support in recycling through public education and community involvement projects, and promote technological research and training and development of the workforce. The Steering Committee would also meet stakeholders to solicit their views in developing effective measures to promote the development of the recycling industry.

Key waste types that are recycled in Hong Kong include paper, plastic, metal, textile, used cooking oil, wood etc. Each type of waste has its own ‘ecosystem’. That is, it exists, grows or shrinks within a particular context of financial performance. It is only by understanding how each waste ecosystem functions and by designing suitable intervention points and options that a comprehensive and improved recycling policy can be attained.

This Assignment is to look into and collect essential background and trade specific information to facilitate the promotion of recycling in Hong Kong with the following objectives:

- a) to look into the respective ecosystems of selected waste types - namely plastic, paper and used cooking oil; and

- b) to understand their operation, difficulties faced and possible points of intervention, with a view to identifying for the Government possible approaches and appropriate means of intervention to promote the development of the recycling industry and to reduce waste to landfill.

1.2 Choice of Waste Types for this Study

The reasons that the Environment Bureau selected plastic, paper and used cooking oil for the purpose of this study are as follows: plastic and paper each take up about 20% of the total quantity of municipal solid waste (MSW) going to landfill; and used cooking oil (UCO), while taking up a small amount of landfill space, is a unique waste type where recycling facilities have been set-up in Hong Kong. With respect to other waste types – the Environment Bureau has already published a full policy report on food and yard waste, which together take up the largest portion of MSW disposed of at landfill (about 40%); and glass (about 3%) is already targeted to come under the existing producer responsibility scheme. The remaining types of waste include metals (less than 3% of landfill disposal), which already has a high recovery rate, and wood (about 4%) and textiles (about 3%). These types of waste may be considered at a later stage.

1.3 Waste-to-Resources Strategy for Hong Kong

After presenting the aims and principles of a proposed waste-to-resources (W-to-R) strategy at stakeholders' engagement sessions in October and November 2013, the Steering Committee has adopted it for further policy consideration.

The new strategy has two key aims – to help meet the Government's target to reduce MSW landfill disposal by 40% by 2022, and to help create an industry in which waste is viewed as a resource to be recovered and reused as far as practicable.

The principles of the new strategy is that where there are existing markets for specific recyclables, policy would play a facilitation role to increase recycling; and where there are no or inadequate price signals, policy would consider how best to mimic the way market incentives would work to help evolve the industry.

These principles are critical because successful commercial recycling requires that there is either a financial benefit associated with it or a cost for not doing so.

The Government believes the private sector should play as large a role as possible for W-to-R activities so that they can be sustained in the long-term.

The new policy needs to be based on sound principles. In this, it is vital that Hong Kong's recycling policy is based on a clear understanding of the different waste types, each deserving separate attention, as well as how they are inter-connected within the waste system. In this Study, we present the findings relating to the recycle of three types of waste, namely plastic, paper and UCO.

2 METHODOLOGY

2.1 Approach to Research and Engagement

In order to accomplish the stated objectives, this study was conducted through two main approaches: a) Desktop Research and b) Stakeholder Engagement with relevant trade establishments, with a view to examining the current recycling situation and collecting candid opinions of the various stakeholders so as to formulate practical, suitable and acceptable recommendations that will benefit the community and recycling industry. The detail methodology can be referred to Appendix 2A.

2.2 Summary of Engagement Schedule

To fully assess and evaluate the current situation on the identified types of waste, 60 relevant trades and stakeholders in the generation, collection and recycling of the identified types of waste were engaged to gauge their views and opinions. We approached over 90 key stakeholders and, of which, 60 key stakeholders were successfully interviewed. Among the interviewed stakeholders, 18 of them are waste producers/manufacturers, 9 of them are trade associations, 29 of them are waste collectors/recyclers (including NGOs), and 4 of them are technology providers. The breakdown of the interviewed stakeholders of different identified types of waste is shown in Figure 2.1 and Appendix 2B. Those stakeholders who were invited for the meetings but declined to participate the interview, did not reply or could not be contacted are listed in Appendix 2C.

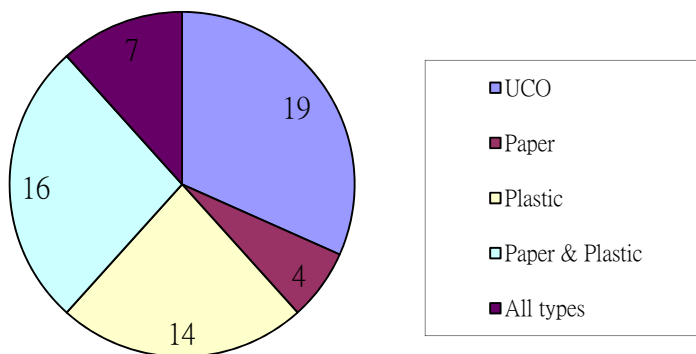


FIGURE 2.1 Breakdown of 60 Interviewed Stakeholders of the Three Selected Waste Types

The subsequent chapters cover the findings on Plastic, Paper and UCO based on desktop research and several rounds of stakeholder engagements.

3 PLASTIC RECYCLING

Plastic plays an important role in our daily lives. Its versatility allows it to have diverse properties and applications in virtually every sector of activities. For recycling purposes, plastic is generally classified into 7 major types: polyethylene terephthalate (PET), high density polyethylene (HDPE), polyvinyl chloride (PVC), low density polyethylene (LDPE), polypropylene (PP), polystyrene (PS), and ‘others’, which represents all other types of waste plastic.

Hong Kong’s situation for waste plastic is complicated although the general direction for policy-making is clear: the aim should be for Hong Kong to collect more locally-generated waste plastic, and to organise it in ways that help increase its commercial value.

It will take time to study and understand the local plastic “ecosystem” in order to examine how to facilitate higher quantities of collection of locally-generated waste plastic and experiment new ideas. This study, carried out within a few months, can only describe the complexities of waste plastic. There are of course short-term measures that Hong Kong could consider taking now, so as to kick-start the journey to deal with waste plastic, as other jurisdictions have had to do.

While Hong Kong generates a substantial amount of waste plastic, it has not been easy to organize its collection despite the Government’s implementation of a number of initiatives to encourage the community to reduce the use of single-use or disposable plastic products, and segregate plastic for collection and recycling.

At the same time, Hong Kong companies are very active in the international trading of waste plastic, including not only transshipment through Hong Kong but also importing waste plastic into Hong Kong before re-exporting it to mainland China. This aspect of the trade makes it difficult for Hong Kong to have a clear view of its own quantities of locally-generated waste plastic and its local recycling rate.

There have been criticisms of Hong Kong ‘exporting’ its waste plastic instead of recycling it into new products locally. We think this criticism is unjustified. This criticism would unlikely be made of New York, for example, which sends its waste plastic to another part of the U.S.

for reprocessing in light of the fact that the cost of processing in New York would be prohibitive. Hong Kong's waste plastic is mostly sent to the mainland for use as raw materials. In the case of New York, what is sent outside the city would not be considered as 'export', whereas it is so for Hong Kong. The local plastic recycling sector consists of both commercial and non-profit organisations (NGO) performing a variety of functions, with the majority engaged in the most basic activities of collecting, compacting and baling of waste plastic. The procedures in sorting, cleaning and pelletizing (turning waste plastic into pellets/flakes) not only increase its value but also qualify the pelletized waste plastic as having been "recycled locally". However, there are relatively few Hong Kong companies engaged in these activities. These companies also say they mainly rely on imported waste plastic for their business because they cannot depend on sourcing consistent quantities and quality of locally-generated waste plastic. Our observation is that reducing quantities of waste plastic sent to landfills requires locally-generated waste plastic to be organized in ways that can be collected and exported in larger volumes.

For the purpose of this study, references made to the local recycling sector or trade include those that are engaged in collecting, compacting and baling waste plastic, as well as those who carry out other procedures that qualify their output as having been recycled locally. The word "process" in this study refers to those procedures that lead to the output being considered as having been recycled locally.

There is one other important aspect of waste plastic that the public needs to realize. Only a limited range of waste plastic types that are clean and separated into homogenous forms are commercially viable. These include for example PET, HDPE, PP bottles and LDPE wrapping film. Moreover, some waste plastic is extremely difficult, if not impossible, to be turned into raw materials even if they are separated and collected. Thus, in general, mixed plastic recyclable is of no or very low market value. In many jurisdictions, such as the U.K., mixed plastic are usually combusted for energy recovery in incinerators. In Hong Kong, the attempt to recycle mixed plastic is also no longer sustainable due to tightened import control in mainland China after the launch of Operation Green Fence (OGF) in early 2013. Public education is needed to enable the public to appreciate what should be separated and only focus on the types of waste plastic that can be turned into raw materials after proper recycling.

We offer preliminary ideas on where along the locally-generated waste plastic chain government facilitation could be considered.

3.1 Ecosystem of Waste Plastic in Hong Kong

3.1.1 Quantity of Waste Plastic Generation in Hong Kong

According to the EPD's annual *Monitoring of Solid Waste in Hong Kong Waste Statistics* reports, Hong Kong generated 984,788 tonnes of waste plastic in 2012, of which 316,607 tonnes (32.1%) was recovered, and 668,181 tonnes (67.9%) was disposed of at landfills. The quantity of recovered recyclable plastic dropped from 843,197 tonnes in 2011 to 316,607 tonnes in 2012, as shown in Table 3.1. There had in fact been a downtrend in the quantity of recycled plastic since 2011, with a very significant drop in 2012. The EPD commissioned a consultant to conduct a study in late 2012 in order to investigate what appeared to be abnormally large fluctuations in the plastic recovery rate over recent years.

The *Comprehensive Review on Estimation of Waste Recovery Rate* published in early 2014 identified that some estimates of waste plastic recycling included non-locally generated quantities (i.e. some re-exports of waste plastic may be declared as domestic exports) and over-estimated locally-generated waste plastic recovered for export (i.e. some imported recycled waste plastic may be included in domestic exports). In years where there were high import/export activities, the recovery rates were also high but once the import/export activities dropped, as it did from 2011, the recovery rates also dropped. The fluctuation in the data related to waste plastic was the culprit that affected Hong Kong's overall MSW recovery rates.

The *Comprehensive Review on Estimation of Waste Recovery Rate* also re-examined the longstanding methodology of using the export quantity of domestic plastic to estimate the quantity of local waste plastic recovered for recycling. The review showed there were factors that likely resulted in data inaccuracy: firstly, most traders/exporters lacked clear understanding of the terms "Domestic Export" and "Re-export" used in customs declaration (i.e. there could be wrong declarations); and secondly, shredded imported waste plastic is

eligible for declaration as “Domestic Export” (i.e. non-locally generated plastic could have been included).

While the large fluctuations in recent years affected Hong Kong’s recycling rates from 2008 onwards, the rate from year to year had little impact on the actual quantities of waste plastic disposed of at landfills. In other words, the actual quantities of waste plastic disposed of at landfills did not change much between 2008 and 2012.

TABLE 3.1 Quantities of Disposed and Recovered Waste Plastic from 2008 to 2012¹

	Total Quantity (thousand tonnes)				
	2008	2009	2010	2011	2012
Exported for recycling	1021	1028	1573	839.3	308
Recycled locally	2	3	4	3.9	8.6
Total recovered for recycling	1023	1211	1577	843.2	316.6
Disposed of at landfills	622.9	622.3	708.3	618.2	668.2

3.1.2 Current Situation of Waste Plastic Recycling in Hong Kong

There is no mandatory requirement for source separation of waste in Hong Kong. Hence, the segregation of waste plastic from other recyclables and into individual plastic resins (a pre-requisite for proper recycling of waste plastic) has to depend on public environmental awareness and commitment, as well as the financial incentive offered by waste collectors to the building cleaners to salvage recyclables through this longstanding informal collection system.

¹ EPD (2012), Monitoring of Solid Waste in Hong Kong Waste Statistics for 2008-11, URL: <https://www.wastereduction.gov.hk/en/materials/info/msw2011.pdf>

Typically, waste plastic come from households, commercial and industrial (C&I) sources, as well as the 3-coloured recycling bins². Those collected from domestic buildings and 3-coloured bins are generally of mixed plastic (i.e. many different types of plastic) that is also often contaminated. Collectors do not prefer mixed waste plastic because of its very low commercial value and the high labour costs required to segregate mixed plastic into individual plastic resins. The collection, recycling and disposal channels of waste plastic are illustrated in Figure 3.1.

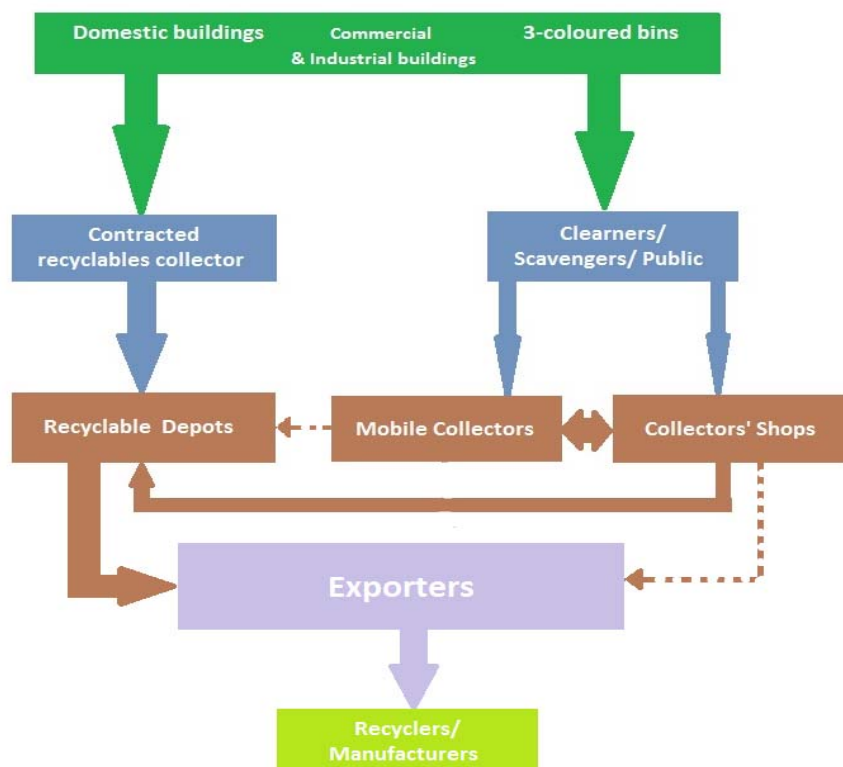


FIGURE 3.1 Major Stakeholders involved in the Flow of Plastic Recyclables in Hong Kong

In fact, the global market price for mixed plastic is much lower than for homogenous plastic. Some jurisdictions, like Japan and the U.K., only collect and recycle high value, homogenous plastic, including plastic bottles (made of PET and HDPE) and polyethylene (PE) packaging

² The 3-coloured bins are placed in various public places, such as by the roadside, in parks, sports venues, leisure and cultural facilities, and provided to housing estates to encourage community waste separation at source.

films because it is commercially much less attractive to collect other types of waste plastic, especially those that are contaminated or chemically-bonded.

In the U.K., PET and HDPE bottles are sorted by type and colour. Sorting increases their value by 3 to 5.5 times. Mixed waste plastic, like those collected by the 3-coloured bins in Hong Kong, would not be collected for recycling in the U.K. In mainland China, the price for processed recyclable plastic (in pellet or flake forms) is much higher than that for mixed plastic. Table 3.2 compares the values of different types of plastic recyclables in Hong Kong, the U.K. and mainland China. It can be seen that waste plastic command different prices according to its chemical nature and form.

During the stakeholder engagement for this study, many recyclers expressed that they preferred to collect single plastic material types, like PET and PE, instead of mixed waste plastic. Thus, the mixed waste plastic collected from the 3-coloured bins is of very low value and not preferred by the trade. There has been dramatic drop to the market value of mixed waste plastic since mainland China strengthened enforcement on controlling the quality of its imported waste plastic. With the commencement of the OGF, the value of mixed waste plastic has dropped dramatically since 2012. Local recycling companies are generally reluctant to collect and purchase mixed waste plastic due to a lack of outlets.

In Hong Kong, the majority of local plastic recyclers typically only carry out waste collection, baling and export operations. Some recycling companies sort plastic according to type and colour before baling to get a better price. Further processing still, as per Figure 3.4 through cleaning and pelletization, can raise the value of waste plastic to the best levels but this is less commonly done in Hong Kong due to the high costs of land and labour.

Among the 316,600 tonnes of recovered plastic for recycling in 2012, about 97.3% is exported³ and only 8,600 tonnes (2.7%) is recycled locally. Only where the pelletization process is completed in Hong Kong is it counted as “recycled locally”. Cleaning, sorting, compacting and baling are not sufficient for waste plastic to be classified as “recycled locally”.

³ EPD (2012), Monitoring of Solid Waste in Hong Kong Waste Statistics for 2011, URL: <https://www.wastereduction.gov.hk/en/materials/info/msw2011.pdf>

About 98% of Hong Kong's exported waste plastic goes to mainland China, as illustrated in Figure 3.2.

TABLE 3.2 Market Values of Recyclable Plastic in 2013

	Hong Kong [^]	The United Kingdom [#]		Mainland China [*]	
	HK\$ per tonne	GBP per tonne	HK\$ equivalent per tonne	RMB per tonne	HK\$ equivalent per tonne
HDPE natural colour bottle	4,000-6,000	300	3,900	5,700-6,500	7,000-7,900
Clear and light blue PET bottle	4,200-4,600	250	3,250	5,200-5,700	6,300-7,000
HDPE mixed colour bottle	3,000-5,000	150	1,950	5,000-5,700	6,100-7,000
Clear PE plastic film	3,000-4,200	350	4,550	6,500-8,100	7,900-9,900
Coloured PET bottle	2,000-3,800	50	650	3,600-4,300	4,400-5,200
Mixed colour plastic film	1,500-2,500	150	1,950	3,800-5,200	4,600-6,300
Mixed plastic types	0-200	Not collected	N/A	Not collected	N/A
Mixed PET and HDPE bottle	No data	55-75	715-975	No data	N/A

[^] These information is collected during the stakeholder engagement.

[#] It should be noted that value of plastic in the United Kingdom are placed as it is regulated under a Producer Responsibility Scheme (PRS).

^{*}The plastic recyclable has been processed in pellet form / flake form.

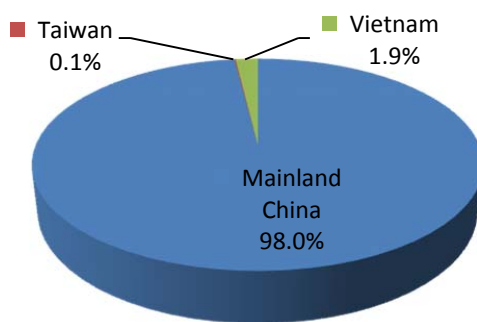


FIGURE 3.2 Countries/Areas to which Local Waste Plastic were Exported by Quantity in 2011⁴

The flow of waste plastic to mainland China is consistent with the findings in the report published by Waste & Resources Action Programme (U.K.) in 2006, which found that mainland China absorbed the majority (over 70%) of globally recovered plastic⁵. In 2005, mainland China imported around 5 million tonnes of waste plastic, while half of that was first imported into Hong Kong and subsequently re-exported to the mainland. Hence, Hong Kong has been acting as an important hub where waste plastic were temporarily stored before being ultimately transported to mainland China. Figure 3.3 shows the importance of Hong Kong's role.

⁴ EPD (2012), Recovery and Recycling of Plastic Waste in Hong Kong, URL: https://www.wastereduction.gov.hk/en/materials/info/wr_plastics.pdf

⁵ UK Plastics Waste – A review of supplies for recycling, global market demand, future trends and associated risks, URL: <http://www.wrap.org.uk/sites/files/wrap/UK%20Plastics%20Waste.pdf>

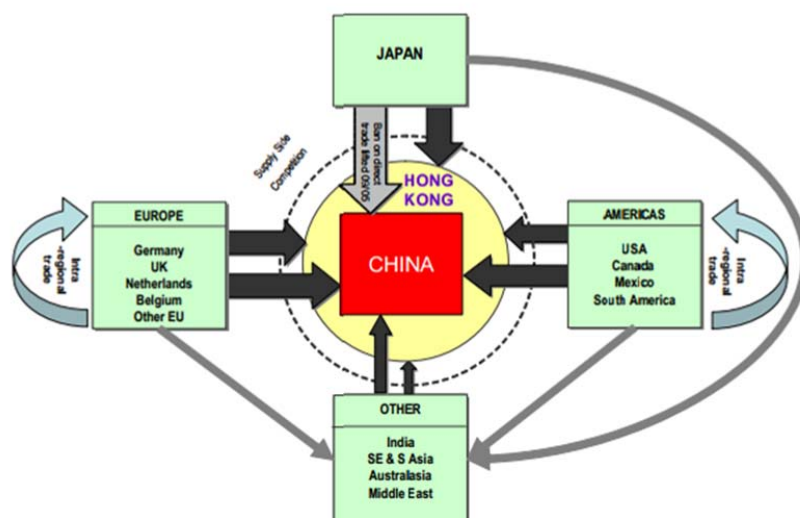


FIGURE 3.3 Main Components of the Global Trade in Recovered Plastic⁶

Being a duty-free port and a separate jurisdiction that is not subject to mainland China's import duties and customs law, Hong Kong offers two reasons for the global recycling trade to use it for re-export to the mainland⁷. Firstly, Hong Kong's plastic import procedures are relatively simple when compared to that of mainland China, where licences must first be obtained; and secondly, as a duty-free port, no customs tariff is levied on imports and exports of waste plastic passing through Hong Kong. Local recycling trading companies only have to pay profits tax⁸.

3.1.3 Trading of Plastic

The import/export figures for waste plastic from 2008 to 2012⁹ are summarized below:

⁶ UK Plastics Waste – A review of supplies for recycling, global market demand, future trends and associated risks, URL: <http://www.wrap.org.uk/sites/files/wrap/UK%20Plastics%20Waste.pdf>

⁷ Hong Kong - The Transit-port for recyclable wastes & secondhand goods, URL: http://www.ide.go.jp/English/Publish/Download/Spot/pdf/29/29_ch4.pdf

⁸ Waste Reduction GovHK (2012), URL: https://www.wastereduction.gov.hk/chi_html/workplace/index_lookforbusiness.htm

⁹ EPD (2013), Hong Kong's Waste Trade (Import & Export) Statistics, URL: http://www.epd.gov.hk/epd/english/environmentinhk/waste/guide_ref/stat_wta.html

TABLE 3.3 Quantity of Waste Plastic Import and Export in Hong Kong¹⁰

Quantity of Waste Plastic Import and Export in Hong Kong (thousand tonnes)		
Year	Import	Export
2012	~3,200	~3,200
2011	~4,000	~3,400
2010	~4,800	~4,200
2009	~4,700	~4,100
2008	~4,500	~4,200

Comparing the export and import figures, Hong Kong imported more than exported waste plastic. Questions had been raised about whether the large difference between the import/export quantities had been dumped in Hong Kong. Our assessment is the tonnage had economic value to the cargo owners and it would not have served their commercial interest to just throw it away. Moreover, the quantities of waste plastic disposed of at Hong Kong's landfills have remained fairly constant through those years. This is also in line with EPD's observation that there had been no spotting of imported waste plastic being disposed at landfills. According to the feedback from the stakeholders, the discrepancy in import and export figures may be caused by several reasons:

- 1) The classification of recyclables could possibly have been changed between the importing and exporting declarations, which would make comparing the import and export quantities under the same category difficult¹¹.
- 2) The waste trade figures are projected using the number of containers imported and exported, which can only produce rough estimates. Many commercial recycling trading companies would pack containers carrying waste plastic for export as dense as possible so as to reduce shipment cost and taxes in the mainland, which would not be reflected in the export figures.

¹⁰ EPD (2013) Hong Kong Waste Export and Import Figures, URL:

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

¹¹ LegCo press releases (2013) 環境局局長在立法會環境事務委員會特別會議的開場發言, URL:

<http://www.info.gov.hk/gia/general/201307/26/P201307260485.htm>

- 3) Import checking is more stringent than export checking. Hence the export quantity may not be as accurate, possibly resulting in lower figures.
- 4) Some recyclers preferred to store the imported waste plastic in Hong Kong to wait for better prices.

In order to understand better Hong Kong's import and export of waste plastic; as well as improve the accuracy of calculating the local plastic recycling rate, the *Comprehensive Review on Estimation of Waste Recovery Rate* has pointed out the complexities of the challenge and recommended further studies be made, including improvement on trade reporting. We will not go into further details in this study.

3.1.4 Local Recycling Channels in Hong Kong

At present, only a small number of private companies and one NGO, Yan Oi Tong, are recycling plastic locally i.e. turning waste plastic into pellets/flakes in Hong Kong. Yan Oi Tong currently operates the Plastic Resources Recycling Centre (PRRC), which undertakes the complete recycling procedures of pre-washing, disinfection, sorting, crushing, pelletization and re-generation of recycled flakes and pellets locally, as shown in Figure 3.4. The PRRC is established mainly for demonstration and education purposes and its treatment capacity is only around 6 tonnes per day. Another NGO (Buddhist Compassion Relief Tzu Chi Foundation Hong Kong) mainly collects and manually sorts waste plastic into different plastic types, and then passes them to the PRRC to recycle the materials.

During the stakeholder engagement, several private companies said that they were recycling plastic before exporting the materials.¹² Another company is currently developing a plant to recycle plastic with a capacity of 4 tonnes per hour (roughly 12,000 tonnes per year at 10 working hours per day 6 days per week). They indicated that they would target solely on using high value imported waste plastic, and planned to start operation around the second quarter of 2014.

¹² Examples of the private companies in the plastic recycling business include Hong Kong Telford Envirotech Group Limited, Fukutomi Company Limited, Brightworld Innovative Resources.



FIGURE 3.4 Flow Diagram of Plastic Recycling Processes in Hong Kong¹³

3.2 Difficulties in Recycling Plastic in Hong Kong

Technically, almost all types of plastic can be recycled to be used again as raw materials except thermoset plastic. However, only several types of plastic like HDPE, LDPE, PP and PET are economically attractive to recycle. According to the trade, the lack of suitable land, the high cost of labour-intensive sorting, the high cost of transportation, the rising cost of workers' insurance premium^{14,15}, mainland China's tightened import requirements, and the mixed nature of local waste plastic make plastic recycling commercially much less attractive in Hong Kong.

3.2.1 Land Availability

The sorting procedure of waste plastic requires much space. The comparatively lower profit margin of waste plastic recycling has made it difficult for plastic recyclers to offer high tender bids to compete with recyclers in the waste paper and scrap metal for short term tenancy (STT)

¹³ EPD (2012), Recovery and Recycling of Plastic Waste in Hong Kong, URL: https://www.wastereduction.gov.hk/en/materials/info/wr_plastics.pdf

¹⁴ Oriental Daily (2012) 探射燈：保費狂加 25 倍扼殺社區回收, URL: http://orientaldaily.on.cc/cnt/news/20121023/00176_097.html

¹⁵ Recycle Company Hong Kong Blog (2011) 「天價」購券保 回收商求助, URL: http://0/recyclecompanyhongkong.blogspot.hk/2011/12/blog-post_9211.html

sites or EcoPark tenancy offered by the Government. Out of the 33 STT sites currently leased to recyclers, only one site is engaged in waste plastic recycling that can turn waste plastic into pellets.

3.2.2 Cost in Employees' Compensation Insurance

The recycling industry as a whole is labour-intensive and regarded as high risk under the Employees' Compensation Insurance Residual Scheme Bureau (ECIRSB) due to various accidents and injuries associated with its operations. The current premium benchmark rate with effect from January 2013 is around 18% of payroll. The high premium benchmark rate increases the operation cost especially for the handling of low valued recyclables, such as waste plastic.

The lack of evidence on the occupational safety and health performance of the local recycling industry has led to increasing insurance cost. This problem is recognized although it will take time and effort to resolve. The Occupational Safety and Health Council is considering a voluntary Occupational Safety and Health Star Enterprise Pilot Scheme for the Recycling Industry. Its eventual launch would no doubt be useful to the trade.

3.2.3 Transportation Cost

Stakeholders pointed out that the light but bulky nature of plastic result in relatively higher transportation cost compared with other recyclables. For example, a full truck load of un-compacted plastic weighs about 0.5 to 0.8 tonnes when the vehicle can in fact take up to 5.5 tonnes in weight.¹⁶ Moreover, most of the recycling depots are usually far away in rural areas. These factors result in higher transportation cost. Those in the trade claimed that when compared with other types of recyclables, waste plastic has a smaller profit margin even if its value per unit of weight is higher.

¹⁶ MingPao(2012), 塑膠資源再生中心仁愛堂千萬環保園塑膠回收 只達目標兩成, URL: <http://life.mingpao.com/cfm/reports3.cfm?File=20120127/rptaa06b/gnc1.txt>

3.2.4 Market Price Fluctuation

As noted in section 3.1.2., Hong Kong's plastic recycling trade is highly vulnerable to changes in the supply and demand of waste plastic, as well as changes in mainland China's national policies and customs inspection. These factors impact price, and in view of the comparatively lower profit margin for waste plastic than other types of recyclables, it is commercially less attractive for the trade to invest in better infrastructure and carry out higher value-added procedures.

3.2.5 Tightened Import Enforcement - Operation Green Fence¹⁷

In February 2013, the mainland's law enforcement agencies launched Operation Green Fence (OGF) in order to strengthen the interception of illegal waste shipments with pollution risk by stepping up inspection and enforcement, but without changing the current national import standard and legislation. The OGF required inspection of all imported recyclables at all ports across the country to enforce the relevant national standards. Imported recyclables meeting the national standards were not affected. With the launch of OGF, cargoes of imported waste plastic that were not up to the mainland's required standards and cargoes that had not been pelletized were rejected. The OGF affected a relatively small number of shipments of recyclables from Hong Kong.¹⁸

The OGF affected the mainland's overall import volume of waste plastic. Since early 2013, the import and export of waste plastic into and out of Hong Kong have been greatly scaled back as a result. The OGF has had the effect of driving local recyclers, who wanted to remain in the business, to transform their business from merely trading to also improving their processing capability. In order to export plastic recyclables to mainland China, recyclers have

¹⁷ LC press releases (2013) Operation Green Fence and Steering Committee to Promote Sustainable Development of Recycling Industry, URL: <http://www.info.gov.hk/gia/general/201311/20/P201311200626.htm>

¹⁸ A total of 265 containers were rejected, see LegCo paper CB(1)1104/13-14(03) for discussion 24 March 2014.

to introduce more measures like installing shredding machines and washing facilities. The trade also had to explore alternative outlets for the rejected cargoes.

3.2.6 Mixed Waste Plastic

Currently, the collection programme implemented in Hong Kong's housing estates and public places cover all types of plastic that are mixed in terms of type and colour. Recyclers made it clear during engagements with them that they preferred collecting single plastic material type, like PET and HDPE/LDPE, instead of mixed types. They also pointed out that waste plastic collected from non-C&I sources were sometimes contaminated, which makes recycling impossible.

3.3 Overseas Experience in Waste Plastic Recycling

The challenges that other jurisdictions face are not so dissimilar from ours. We have reviewed the relevant policies implemented in Japan, South Korea, EU, the U.K., and the U.S. Their approaches are summarized below. Appendix 3A provides detailed descriptions.

3.3.1 Selection of the Types of Waste Plastic to Be Recycled

In some jurisdictions, only some types of waste plastic are recycled. For example, Japan and the U.K. only recycle PET bottles, HDPE containers and plastic packaging films, including PE and PP because these have higher market prices and thus give recyclers greater potentials for better profit margins.

PET is most commonly used for beverage bottles. HDPE containers are usually used for holding detergents or milk. Plastic packaging films are mostly used by the C&I sector – they are in general homogenous and clean, which favours recycling.

Other types of plastic, especially those that are chemically-bounded or contaminated, are not collected for recycling in Japan and the U.K., because of expensive pre-treatment that is needed, including high use of energy. In Japan, these types of plastic are separated out nevertheless for its combustible quality and used for energy recovery by incineration.

3.3.2 Incentivizing through Producer Responsibility Scheme

Jurisdictions like Japan, South Korea and the U.K., have established producer responsibility schemes (PRS) for recyclables to incentivize and sustain collection and recovery. Common PRS include paper, metals and plastic. The revenues collected from producers are used to fund/offset the cost of recycling. Plastic usually command a higher PRS charge than other recyclables because it is commercially less attractive. Indeed, different charges may be set for different types of plastic (see 3.3.3 below).

By funding/offsetting the costs of transportation, land tenancy, insurance coverage etc. it helps to ameliorate market fluctuations for recyclers. In South Korea, the payment received is used for increasing the recycling capacity and expanding infrastructure, such as at plastic recycling centres and dealing with hard-to-deal-with items (e.g. plastic sheets from greenhouses). In the U.K., the charges of each type of recyclables under the PRS are related to market conditions, with higher recycling charges for waste with lower recycling rate. Hence, the British PRS helps plastic recyclers' to cope with difficult market conditions.

Other jurisdictions that do not use PRS usually provide financial assistance to plastic recyclers by subcontracting the recycling job through open tendering.

3.3.3 Differentiated Pricing for Different Plastic Types

Japan, South Korea and the U.K. use PRS to price different types of plastic. For example, Japan set different prices according to the material type (PET bottles and plastic packaging films). The U.K. set different prices according to the material type, homogeneity and colour with natural colour commanding higher prices. Thus, the price of natural HDPE is higher than PET, followed by mixed colour HDPE, mixed HDPE and PET plastic bottles, and coloured PET. Clear and natural PE and PP have a higher price than the mixed and printed ones.

3.3.4 Boosting the Recycling Rate by Education and Management Measures like Quantity-Based Waste Charging

Some cities in the U.S., like Seattle, maintain a high recycling rate through continuous public education. If the Seattle Public Utilities, which provides garbage collection service, sees that a particular household disposes of many waste types that can be recycled, the service will leave a tag to request the householder to sort the recyclables out and not take the garbage away on that occasion. The collector will return the following week. While no fine is imposed for failure to segregate waste, continuous education has helped Seattle to maintain its recycling rate.

Table 3.4 shows the measures the South Korean government introduced in the past two decades to reduce generation and recycle waste. Volume-based waste charging and disposable products ban serve as socio-economic tools to reduce plastic disposal at source and increase the quantity of plastic recyclables collected.

TABLE 3.4 Waste Management Measures Introduced by South Korea¹⁹

Year	Measures
1992	Waste Deposit-Refund System
1995	Volume-based waste charging system (per bag charging)
1999	Banning or restricting the use of disposable products (by Promoting saving and re-use of resources)
2003	Extended Producer Responsibility (EPR) Scheme

3.3.5 Financial Support to Small Recycler

South Korea's Ministry of Environment provides long-term low interest loans to small recycling businesses for the development of recycling facilities and technologies. The government allocated a total of 930 billion Korean Won (HK\$6.6 billion) for investment in

¹⁹ Waste Treatment Policy and Measures in South Korea, URL:
http://www.legco.gov.hk/yr12-13/english/panels/ea/duty_v/eavp1304-3-e.pdf

recycling waste projects from 2009 to 2012, which was estimated to create about 16,000 new jobs in the industry. These measures were aimed at strengthening the foundation for recycling. Financial support was particularly important for recyclers handling recyclables of low commercial value like plastic.

3.4 Collection of Stakeholders Opinion and Views

As a part of this study, we interviewed about 37 stakeholders relating to waste plastic recycling (including recyclers whose business include plastic and other recyclables). We solicited their views on separation and collection, the difficulties they encountered in their business and the type of assistance they thought they required.

3.4.1 Subsidizing Costs

The majority considered financial assistance is required to offset the high costs of transportation, sorting, cleaning and processing of locally-generated waste plastic. A summary of the views is described in Appendix 3B.

In addition, they suggested that their operations could be further enhanced through the following measures:

3.4.2 Establishing Centralized Collection Points

The current collection system for recyclables is based on recyclers entering into contracts with building management companies to take the recyclables away. According to the recyclers, the system is inefficient and expensive because an individual recycler often ends up going to many places in several districts to pick-up recyclables, thereby increasing their cost. They suggested that a new system be designed whereby they could contract with the Government to pick-up larger quantities of recyclables from community-district-based, centralized collection points. The recyclers could then pick-up the recyclables from these collection points instead of collecting small quantities from a large number of locations. The recyclers suggested that

such a system would enable them to organize transport logistics better. Such a system would of course also require the recyclables to first be taken to the centralized collection points.

Some recyclers also suggested that there should be more mobile waste plastic collection points/stations being established to encourage more residents to recycle their waste. These mobile points/stations could also be used to promote the proper segregation and recycling of waste plastic such as cleaning beverage bottles, sorting of different plastic, etc.

3.4.3 Developing Certification/Licensing Schemes

The recyclers suggested that there could be some sort of “certification” or “licensing” scheme for Hong Kong’s recycling trade although the ideas put forward were embryonic and unclear definitions of what “certification” and “licensing” would be. The key driver behind the suggestions is for there to be appropriate differentiation among the range of recyclers which could lead to various types of commercial benefits. The potential benefits include lower insurance premium for companies observing high operational standards, improved customer identification of the capabilities of companies offering recycling services, and the qualification recycling companies would need to apply for any future government subsidies.

Insurance: As noted in 3.2.2, the cost for Employees’ Compensation Insurance for the recycling industry saw a 5 to 9 fold increase because of concern over the high risk of recycling operations to workers. Some recyclers suggested that a certification scheme for recyclers could help the good performing companies to be accorded lower insurance premium as a result of their higher occupational and safety standards for workers.

Specific licenses: The trade emphasized that anyone could set-up a “recycling” business irrespective of which aspect of the recycling chain they are engaged in and their actual capability. Some recyclers raised the idea of a licensing scheme to regulate recycling operations. Some suggested that there could be different types of licenses for the different types of recycling activities. For example, some companies only do collection, some do sorting and cleaning, some are engaged in the more technically sophisticated business of recycling waste, while some companies are engaged in more than one type of activities. They

suggested that there could be a different licence for each type of activity so that customers, including the Government, could differentiate the real capability among recycling companies.

Government subsidies: Some recyclers raised the question of what would be the qualification for application in the event that the Government decided to provide subsidies to the recycling trade. Their assumption was that there would be some sort of differentiation based on capability.

The issue of developing some sort of differentiation scheme for recycling companies could be seen positively – it shows the trade’s recognition that the recycling sector could be better organized and professionalized. The likely impact of professionalization is greatest on small and medium-sized recyclers.

3.4.4 Direct subsidies for hiring staff

Although this was not raised at our engagement sessions with the trade and recycling sector, we note there have been calls from trade union-related political parties for the Government to subsidise the hiring of low-skilled workers in the collection and sorting of recyclables. Such a suggestion seems to have been based on an assumption that the work could easily be done by unskilled workers at a certain level of efficiency and that such workers are available. We are unsure whether the assumption is correct and this is not what the trade is suggesting. The goal of the recycling sector and also the direction of government policy are to upgrade the sector, which involves upgrading of skills, facilities and performance.

3.5 Possible Interventions to Enhance Plastic Recycling

Taking into account the discussion in previous sections, we recommend the Government to consider the following:

3.5.1 Short-term Measures

a) Enhance Accuracy of Customs Declaration

It is noted that EPD, together with C&ED and C&SD, have implemented measures to enhance the accuracy of Customs declarations of waste plastic, and to collect additional data on sources (local/foreign) of waste plastic included in domestic exports. This measure will effectively enhance the reliability of the recovery statistics of waste plastic and also the MSW recovery rate.

Also, EPD, C&ED and C&SD had conducted three thematic seminars for local collectors/recyclers/traders of waste plastic in April and May 2014, and provided them with enhanced guidelines on the declaration requirements and trade classifications of waste plastic, with a view to enhancing the accuracy of trade declarations. It is understood that these seminars will continue to be conducted regularly.

We believe that the overall direction of the above measures is correct. We suggest that the Government should continue with the above measures to enhance the accuracy and reliability of waste plastic recovery and recycling statistics.

b) Raise Awareness on Practice of Cleaning and Separation of Waste Plastic

There are two major obstacles the trade faces: the first, and most important, is contamination (such as with residual drink in plastic bottles); and the second is the mixed nature of waste plastic in Hong Kong. This is why many recyclers prefer to deal with imported waste plastic that has been pre-sorted and cleaned rather than collecting local waste plastic that is often contaminated and/or mixed.

The EPD has long-provided information about waste plastic on its website. If the Government wants the Hong Kong community to be mobilized to deal properly with waste plastic, it needs to consider how to design and launch a major public education campaign focused on waste plastic. Like communities elsewhere in the world, people can learn to identify the different plastic types according to the Society of the Plastic Industry Resin Identification Code, develop new habits to separate their waste plastic, and even clean it so as to increase recyclability.

Hong Kong may make reference to other jurisdictions' practice on plastic waste recycling (e.g. Japan and the U.K.), which mainly focus on the recycling of high-valued plastic, such as PET and PE bottles. However, there are also types of mixed waste plastic which are extremely difficult to recycle. These include low grade mixed plastic, composite plastic and plastic mixed with metals. Public education needs to explain which types of plastic cannot be recycled under the current circumstances.

In Hong Kong, consideration can be given to how new public education programmes could be designed and launched in schools, residential areas and with housing management companies, C&I sector, and among the general public etc.

c) Facilitate scheme to lower insurance premium

It will help the recycling trade to lower their overall cost if the trade could be seen to demonstrate good occupational safety and health practices. The Government could consider facilitating the establishment of a voluntary certification scheme to help formulate detailed parameters on what are considered good occupational health and safety performance for adoption by the trades. Such a system could help differentiate the capability and responsibility of different recycling companies. The scheme could provide benchmarks for the trade to improve its overall health and safety operation, including management, which would also serve to differentiate the well-managed companies. In developing the technical criteria for the scheme, active communication should be maintained with the Employees' Compensation Insurance Residual Scheme Bureau (ECIRSB) to solicit their input so that the certified companies may be accorded lower employees' insurance premium.

d) Help Plastic Recyclers in Short Time Tenancy (STT) Site Tenders

As local waste plastic recyclers find it hard to compete over STT site tenders against recyclers of higher-value recyclables, the Government can consider how to assist plastic recyclers in tendering Government STT sites.

3.5.2 Medium-term Measures

e) Financial incentives and disincentives

In terms of financial incentives, the Government has reserved \$1 billion to set up a Recycling Fund to support the industry. The provision of direct financial support to the recyclers could help them improve their skills, facilities and performance, thereby increasing the effectiveness and competitiveness of the recycling industry as a whole. As one of the less efficient and profitable sector, plastic waste recycling should benefit from the establishment of the fund.

In terms of financial disincentives, the Government's intention is to put in place a MSW charging scheme. While details for a quantity-based scheme are still being worked out, it will alter the financial incentives of the waste business, including waste plastic. As with other jurisdictions that already have MSW charging schemes, we too can expect a greater drive to reduce waste as source, as well as a willingness to separate out recyclables. As the proposed details for the MSW charging scheme become available, the Government can better gauge its impact, including how it may change the waste plastic sector. Adjustments can also be made after the Government receives feedback.

In seeking funding support from the Recycling Fund, the following components and considerations are worth pursuing:

Compacting to reduce logistic costs: To increase the efficiency of the waste plastic trade, one possibility is to reduce volume by compacting so that the frequency of pick-ups could be reduced, which would save transport and logistics cost.

The compacting approach presents many challenges, however. Firstly, it is only worth compacting cleaned waste plastic because it will be very difficult to carry out cleaning after compaction. Compaction reduces the space needed for storage at housing estates and community collection points, which should also make it more attractive for collectors because they can pick-up more each time. Appropriate training should be conducted to familiarize the workers at the housing estates/community collection points on the washing and proper operation of the compactors. Not all estates are suitable for installing compacting facilities. The success of this approach depends on many factors, such as the availability of space for the installation of the compactor, the willingness of residents and the estate management

companies to carry out extra work and absorb the additional costs (such as use of more electricity for compacting), and contract terms between collectors and estate management companies enabling such an approach etc. The funding proposals should preferably address these factors in a holistic manner.

Collaboration between recyclers and NGOs: One recycling company noted that they are interested to enter into contracts with local NGOs which collect waste plastics but since most of the NGOs do so with government funding, their collected plastic have to be sold via tenders, which is seen to be more trouble than it is worth for small quantities on offer. We recommend that under the Recycling Fund, the Government should provide flexibility to facilitate collaboration between recyclers and NGOs in enhancing waste reduction and recycling.

f) Regulating Waste Plastic Collection and Disposal

With the voluntary certification scheme mentioned above in place, it is envisaged that the operation of local recyclers can be upgraded. To judge whether the scheme is satisfactory, a measure is whether after a period of time, more locally-generated waste plastic are collected and processed in a quality manner by the recycling sector. If the situation remains unsatisfactory, the Government may explore whether there are merits to introduce mandatory licensing to regulate the collection and recycling activities of plastic.

With a mandatory licensing system, regular verification checks can be conducted to assess whether the licensees are fulfilling the conditions of the license they hold. It could ensure that the waste plastic are properly processed and exported, while the employees are working in a satisfactory environment meeting occupational safety and health standard. Improvements in the general standard of the recycling industry could help the industry gain intangible benefits like recruitment of younger workers and better reputation and status in society.

However, the design and operation of a licensing scheme could be complex. A mandatory licensing system would also set a strict and inflexible system that might prevent local/district-based small recyclers from participating. Such system might have more constraints on efficiency, competitiveness, versatility and incentive for innovation. It would

require time for the transportation and treatment of recyclables, the setting of appropriate licensing conditions and compliance costs involved, etc. to take shape.

4 PAPER RECYCLING

Paper recycling is defined as the salvage of discarded paper and paper products that have been used (or are unwanted) for reuse/reprocessing. Producing virgin paper is both resource and energy intensive. Hence, the use of recycled paper can substantially reduce resource and energy demands.

In Hong Kong, waste paper collection for recycling has been practiced for a long time. The quantity recovered annually is respectable, and the waste paper collection and export activities (mainly to mainland China) are well-developed. The types of waste paper recovered can be broadly divided into 3 major categories: cardboard, newsprint, and office paper.

There is an active international market for waste paper and thus there are adequate price signals for the recovery and reprocessing of waste paper. The challenge is how more waste paper can be collected for export since it is unrealistic to expect reprocessing activities to be conducted in Hong Kong.

4.1 Ecosystem of Paper Waste in Hong Kong

4.1.1 Quantity of Paper Waste Generation in Hong Kong

In 2012, the EPD's annual *Monitoring of Solid Waste in Hong Kong Waste Statistics* report shows that Hong Kong generated 1.858 million tonnes of paper waste, in which 1.162 million (62.5%) was recovered and 0.696 million tonnes (37.5%) was disposed of at our landfills (see Table 4.1). Newsprint (27%) and other paper waste (41% including Tetra Pak containers and tissue paper) are the two main contributors. Of the breakdown of these two types of waste paper, there were 510 tonnes of newsprint, 100 tonnes of Tetra Pak containers, and 646 tonnes of tissue paper being disposed of every day.

TABLE 4.1 Quantities of Disposed and Recovered Waste Paper in 2012²⁰

Composition		Quantity (thousand tonnes)			
		Domestic	C&I	Overall	
Waste paper disposal at landfills	Cardboard	83	72	155	
	Newsprint	137	49	186	
	Office Paper [#]	33	37	70	
	Others	169	116	285	
	Sub- total	422	274	696	
Waste paper recovery	Exported for recycling	Paper	-	-	1,162
		Sub- total	-	-	1,162
	Recycled locally		-	-	-
	Sub- total		-	-	1,162
Total waste paper generation		-	-	1,858	

[#] Office paper refers to printing paper and copy paper from offices.

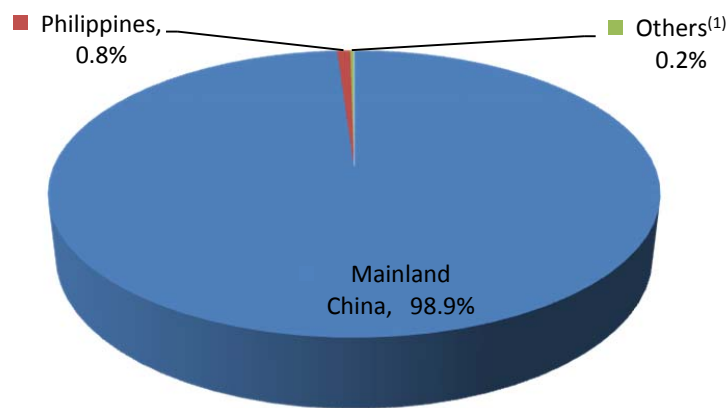
4.1.2 Collection, Recycle and Disposal Channels

The quantity of recovered paper in the past 5 years remained fairly stable, varying between 1.027 and 1.278 million tonnes per year (Table 4.2). All of the paper waste collected was exported out of Hong Kong by sea, with 98.9% to mainland China, 0.8% to the Philippines and the remaining 0.2% to Thailand, Vietnam, Taiwan, Korea and Congo as shown in Figure 4.1. The typical market price for waste paper was \$1,798 per tonne in 2011.

²⁰ EPD (2012), Monitoring of Solid Waste in Hong Kong Waste Statistics for 2011, URL: <https://www.wastereduction.gov.hk/en/materials/info/msw2011.pdf>

TABLE 4.2 Amount of Exported Recovered Paper²¹

	Total Quantity of Recovered Paper Exported for Recycling (thousand tonnes)
2008	1,091
2009	1,027
2010	1,195
2011	1,278
2012	1,162



⁽¹⁾Others included Thailand, Vietnam, Taiwan, Korea and Congo

FIGURE 4.1 Countries/Areas to which Local Waste Paper was Exported to by Quantity in 2012

²¹ EPD (2012), Monitoring of Solid Waste in Hong Kong Waste Statistics for 2008-11, URL: <https://www.wastereduction.gov.hk/en/materials/info/msw2011.pdf>

Table 4.3 shows Hong Kong's 2012 trade figures in paper and waste paper which shows that essentially the locally-recovered paper waste is transported out of Hong Kong.

TABLE 4.3 Trade statistics of waste paper and paper in 2012.²²

	Total Quantity in 2012 (thousand tonnes)
Import	81
Export	1,162
Re-export	9

There is no mandatory requirement to recover waste paper but this is a profitable business, with over 240 paper waste collectors in Hong Kong²³. Waste separation and recovery facilities (i.e. 3-coloured recycling bins) have been placed in housing estates, country parks, roadside, refuse collection points and leisure and cultural facilities etc. covering over 80% of our population. The majority of the paper recovered and collected includes cardboards, newspapers, magazines, leaflets, envelopes, paper shopping bags, packaging materials, egg cartons and books.

In Hong Kong, paper waste is mainly collected through waste collectors, scavengers and cleaners. The paper waste is then separated by types into white paper and computer printout, cardboard, and newspaper. The sorted waste is then shredded and compressed into bales that are easier to transport and export. Figure 4.2 shows the flow of waste paper from collection to separation to export. Table 4.4 shows the market price of paper waste in 2013 at the scavenger level.

²² Hong Kong Merchandise Trade Statistics Imports (2012), URL: <http://www.statistics.gov.hk/pub/B10200012012MM12B0100.pdf>

²³Waste Reduction Website, EPD (2013), URL: https://www.wastereduction.gov.hk/apps/vicinity_result.jsp?collection_type=collector&material_type=all&district_id=0

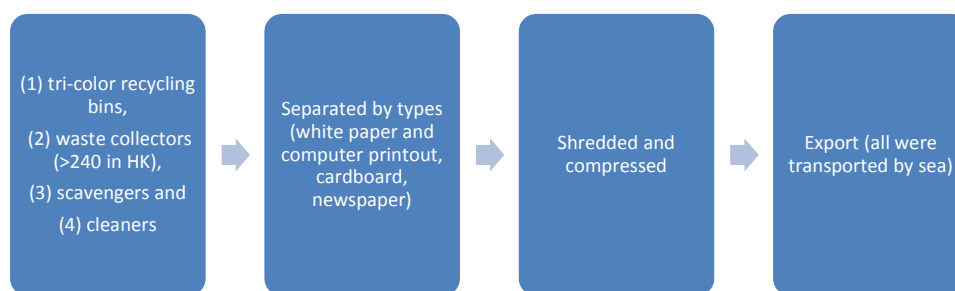


FIGURE 4.2 Waste paper collection and recycling channels in Hong Kong

TABLE 4.4 Market Price of Paper Waste in 2013 (Scavenger Level)

Location	Market Price
Hong Kong	HK\$0.5/kg
Taiwan	TW\$3-5/kg (HK\$0.8-1.3/kg)
Mainland China	RMB\$0.8-1.5/kg (HK\$1-1.9/kg)

4.2 Difficulties in Recycling Paper in Hong Kong

Most of the stakeholders described the paper recycling business in Hong Kong as mature. Some of them indicated that there may be scope to increase the level of collection through strengthening the recovery of newsprints. As noted in 4.1, about 700,000 tonnes of waste paper is being landfilled every year, of which about 180,000 tonnes are newsprints. We summarise below the findings from our desktop study and stakeholder engagements about the difficulties in recycling these types of paper waste. Detailed views and comments from stakeholders are elaborated in Appendix 4A.

4.2.1 Large Amount of Free Newsprint and Contamination of Disposed Newsprint

Firstly, there has been a steadily decreasing trend in the quantity of newsprint disposed of at the landfills since 2007 as shown in Table 4.5. The reasons may be due to the proliferation of electronic newspaper subscription and higher participation rate of paper recycling. However this downward trend was reversed in 2012 with a rebound of 2.8% over 2011. This may have been due to the increase in the quantity of free newspapers.

According to the statistics of Hong Kong Audit Bureau of Circulations²⁴, the quantity (in terms of circulation per issue) of printed free newspaper distribution has significantly increased in recent years. In 2012, Hong Kong produced 3 million copies of free newspapers every day²⁵. Together with paid newspapers, there were more than 4.5 million copies printed every day for a population of 7.1 million people – that was two copies for every three residents. Moreover, it should be noted that the daily issue quantity of some major players of free newspapers, e.g. *Headline*, *Metro* and *am730*, has increased substantially from 2007 to 2012 as shown in Table 4.6, with two new newspapers joining the market in 2011 and 2012 (*Sky Post* and *Good News* respectively).

Table 4.5 Quantity of Paper Waste Disposed of at the Landfills from 2007 to 2012

Year	Paper waste disposed of at the landfills (thousand tonnes)	Newsprint disposed of at the landfills (thousand tonnes)
2007	863.2	271.9
2008	800.4	229.6
2009	753.4	213.2
2010	731.5	194.5
2011	704.8	180.7
2012	695.3	185.8

Source: Monitoring of Solid Waste in Hong Kong 2007, 2008, 2009, 2010, 2011 and 2012

²⁴ HKABC (2013), URL: <http://www.hkabc.com.hk/en/index.htm>

²⁵ RTHK, 探討香港中文免費報業的市場 URL: http://rthk.hk/mediadigest/20120214_76_122836.html, Retrieved on 27 Feb 2014

TABLE 4.6 Average Circulation per Issue of Some Free Newspapers

Year		2007	2008	2009	2010	2011	2012
Free Newspaper	Metro	345,866	348,867	326,971	336,565	374,282	401,349
	Headline Daily	700,789	726,592	739,687	784,661	839,807	882,787
	am730	280,585	290,222	310,700	358,143	390,748	401,551
	Sky Post	-	-	-	-	503,888	504,154
Total		1,327,239	1,365,681	1,377,358	1,479,369	2,108,724	2,189,840

The boom in free newspapers can have negative effect on landfilling if the proper channels of collection and recycling have not been established. Currently, some free newspaper publishers (e.g. Metro Hong Kong) have street-level collection and recovery systems to reuse and recycle their newspapers. However, one of them mentioned that it abandoned this recycling practice due to the difficulty in finding suitable locations to establish street-level collection bins to recover the newspapers.

Secondly, scavengers and collectors do not want to collect contaminated newsprint. Contamination indicates that the general public has not exercised adequate care to separate the newsprints from general refuse. Failure in upstream separation renders the newsprint unrecoverable. Raising public awareness is essential to correct this problem.

4.2.2 Difficulty in Reduction of Quantity of Disposed Tissue Paper due to Hygienic Reason

Every day, nearly 650 tonnes of tissue paper ends up in our landfills. Its recyclability is virtually non-existent because it is normally contaminated and therefore unhygienic and impracticable to recycle. The most practical way to reduce the generation of tissue paper is to appeal to the public to use less of it. For example, public education could encourage the public to use handkerchief whenever possible but it will not be easy to change habits and attitudes since disposability of tissue paper is seen to improve hygiene practices.

4.3 Policies in Other Jurisdictions to Regulate and Promote Paper Recycling

General paper waste collection and recycling is well-established in many places because there is strong market demand. The market can sustain itself as it is generally a profitable business. Nevertheless, some places further implement PRS and the revenue generated is used to subsidize recyclers to enhance paper recycling and the more difficult-to-recover paper products, such as Tetra Pak containers.

a) Taiwan

Tetra Pak container is classified as a regulated recyclable waste (RRW) under Article 15 of Taiwan's Waste Disposal Act, while general paper waste is unregulated. Waste that can be reused/recycled, that takes a very long time to decompose or can cause serious pollution are classified as RRW. Up until the end of 2012, there were 13 categories and 33 items listed as RRW, including glass and Tetra Pak containers.

Manufacturers or importers of Tetra Pak containers have to bear the responsibility for recycling, cleansing and disposal, and pay the resource recycling fee based on sales or the imported amount. The fee collected is put into the Resource Recycling Management Fund to subsidize the trade in waste recycling and disposal. The operation of the fund is illustrated in Figure 4.3. To facilitate the public to recycle RRW, the government provides collection bins to supermarkets, convenience chain stores, retail chains of cosmetic products, convenience stores in transport terminals and stations, gas stations, beverage chain stores, fast food chain restaurants, etc. The collected Tetra Pak containers are processed by 4 major paper recycling companies.

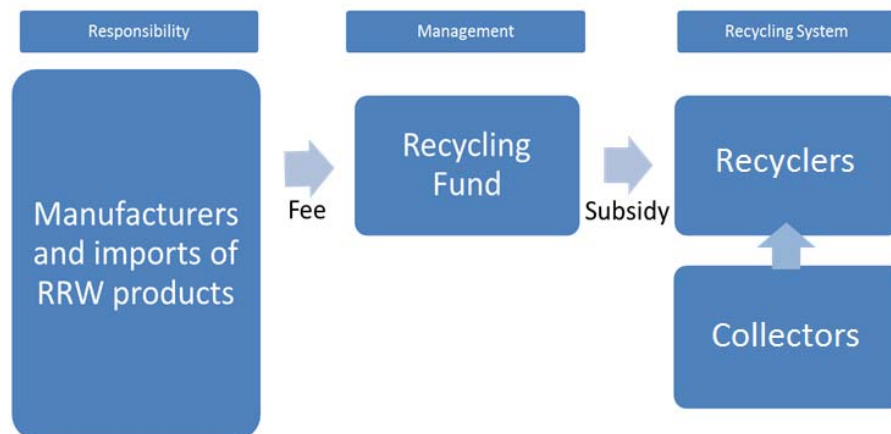


FIGURE 4.3 Recycling Management Fund Operation

General waste paper (paper board, office paper and newsprint) is unregulated, and manufacturers and importers do not need to pay the resource recycling fee. General waste paper is comparatively clean, homogenous and easier to recycle than the RRW. General waste paper can be sold to waste recyclers or collected by the Municipal Collection Team.

b) Japan

Japan has a long history in paper recycling. The government established the Paper Recycling Promotion Center in 1974 to support the paper industry, paper waste dealers and the government. The Center played a significant role in promoting collection and standardization of the quality of waste paper.

Paper in Japan is regulated by the Law for Promotion of Effective Utilization of Resources. It promotes the reduction of waste and reuse and recycling of used products as raw materials. Pulp and paper related businesses are required to rationalize the use of raw materials in order to reduce waste and by-products, as well as promote the use of by-product as recyclable resources. Paper manufacturers are encouraged to use recyclable resources and parts²⁶.

²⁶ Law for the Promotion of Effective Utilization of Resources (2001), Japan, URL: <https://www.env.go.jp/en/laws/recycle/06.pdf>

There are several measures taken by the Government to support the recycling industry.²⁷

- 1) **The Industrial Technology Research Grant Program** provides R&D grants to young researchers at universities and institutes to develop talent and applications in industrial technologies. Research terms last typically two or four years with upper limits in the amount of the grants (30 million yen for 2 year-grants and 50 million for four-year grants).
- 2) **Interest Subsidies** are provided to private financial institutions to help business operators pay interests on the cost of establishing or renovating recycling facilities.
- 3) **Loan Financing** to provide low interest loans for the introduction of new equipment to reduce, reuse and recycle waste (3Rs).
- 4) **Tax Breaks** to reduce taxes, including special initial depreciation of equipment, property tax and business office tax upon the introduction of new 3Rs equipment.

c) Indonesia

Indonesia is exploring the recovery of Tetra Pak containers. An NGO-operated Tetra Pak container recycling plant has been set-up in West Java. The plant purchases discarded Tetra Pak containers with funding from the Tetra Pak Company and earns income from the sale of the pulp extracted from the waste. The annual operating cost is about HK\$446,600 (IDR 700,000,000) for treating around 500 tonnes. The business is not commercially viable at this stage and is sustainable only by the funding from Tetra Pak Company. Nevertheless, a cost-benefit analysis study conducted in 2009 suggested that the plant could be profitable if the processing capacity could be increased²⁸.

²⁷ Ministry of Economy, Trade and Industry (2011), URL:
<http://www.meti.go.jp/policy/recycle/main/data/pamphlet/pdf/handbook2010-eng.pdf>

²⁸ Dunais, M. (2009). *COST BENEFIT ANALYSIS OF ASEPTIC CARTON RECYCLING IN BANDUNG, INDONESIA*. URL: <http://dukespace.lib.duke.edu/dspace/handle/10161/978>

One local recycler believed that Tetra Pak containers could be recycled more easily than plastic. The collected containers could be washed and then separated into its components. The market value for the aluminum from Tetra Pak could command around HK\$20,000 per tonne, which is attractive. It estimated that for a Tetra Pak recycling plant to be commercially viable, at least 25 tonnes (~10,000 tonnes per year) must be collected and recycled per day. This tally with the Indonesian experience that Tetra Pak waste recycling, without a PRS or government support, could only be viable with a sizeable processing capacity.

d) United Kingdom

Many local authorities in the U.K. have added Tetra Pak containers to the regular household collection of recyclables, and many more offer collection points at recycling facilities. Since 2006, the Tetra Pak Company has offered advice and financial support to local authorities to initiate recycling schemes. The Tetra Pak Company also provided an initial £300,000 to the National Recycling Fund and, along with the Alliance for Beverage Cartons and the Environment ACE UK, invested a further £1.2m to support local authorities to set up recycling and collection facilities.²⁹

4.4 Possible Interventions to Promote Paper Recycling

We do not believe extensive government intervention is needed in the waste paper recovery business since there are global price signals and the sector in Hong Kong is mature and well-developed. Moreover, the Government has already been quite receptive to the needs of the waste paper trade, which had expressed the need for dedicated berths to facilitate export. The Government responded to this in the Chief Executive's Policy Address 2013. The Government's plan is to allocate suitable space in the Public Cargo Working Area for the trade when the current contracts for berths usage come up for renewal.

²⁹ Tetra Pak (2013), URL:
http://www.tetrapakrecycling.co.uk/recyclable_actions.asp

Beyond providing dedicated berthing space there are a number of other useful measures to reduce waste generation and increase collection so as to minimize waste paper disposal in landfills. We recommend the following measures be considered:

4.4.1 Short-term Measures

a) Strengthen Hong Kong's practice of source separation

A public education campaign can be designed to focus on waste paper separation. As the Government is already committed to implementing MSW charging possibly by 2016-17, paper waste separation can help the public reduce their waste charge and contribute to a better environment.

b) Reduce Usage of Tissue Paper through Education, Promotion and Campaign

There is a sizeable quantity of tissue paper waste disposed of at landfills. The tissue paper waste cannot be recycled due to hygiene concerns. However, the Government can launch a public awareness campaign to encourage general public to use less tissue paper in their daily activities.

4.4.2 Medium term Measures

c) Establishing a Trade-Operated Collection System for Free Newsprint

The large number and quantities of free newspapers warrant consideration of how they can be collected and recycled so they do not end up in landfills. Publishers say they have difficulties finding suitable locations to set-up collection of their papers without causing obstruction at street level or nearby premises. The Government may consider how to support a newspaper trade-led-and-operated system to solve the problem.

5 USED COOKING OIL AND GREASE TRAP WASTE RECYCLING

Used cooking oil (UCO) and grease trap waste (GTW) are some of the typical waste generated from operations of restaurants and food businesses. UCO, as its name suggests, is spent cooking oil after undergoing a cooking process. Grease and oil separated from wastewater by a grease trap (also known as grease interceptor) are collectively termed GTW.

Market demand for UCO is quite strong in Hong Kong as part of an international market for production of biodiesel, animal feed and oleochemicals etc., and following the emergence of local biodiesel manufacturing in recent years. A policy on UCO recycling could achieve multiple objectives that include facilitating local UCO collection and recovery to maximize use of the resource and minimize waste, supporting biodiesel manufacture as a green industry, increasing use of renewable energy and reducing carbon emission. This study looks at the current situation in Hong Kong, relevant policies in other jurisdictions, available technologies to recycle UCO and views from local biodiesel manufacturers in order to identify potential policy direction.

Regarding GTW, Hong Kong requires restaurants and food businesses to install grease traps and separate out the oil and grease before discharging wastewater into the sewer. The separated GTW is required to be transferred to the approved GTW treatment facilities. Around 10% (by weight) of grease trap oil (GTO) separated from the GTW can be utilized by biodiesel manufacturers as feedstock for biodiesel production. Biodiesel manufacturers can also acquire GTW directly from restaurants and food businesses for further processing.

5.1 Ecosystem of Used Cooking Oil and Grease Trap Waste in Hong Kong

5.1.1 Quantity of Used Cooking Oil and Grease Trap Waste Generation in Hong Kong

There are no available statistics on UCO generation in Hong Kong, except the biodiesel industry's estimate of 20,000 tonnes per year. To estimate the annual generation of UCO in Hong Kong, we drew references from UCO generation volumes in other jurisdictions such as Taiwan and the UK, collected relevant information from the trade and analysed import and export data from Census & Statistics Department (C&SD). Our analysis arrived at an estimated generation volume of around 16,000 tonnes per year. Details of the calculations and benchmarking with other jurisdictions are illustrated in section 5.12 and Appendix 5A. Our annual generation estimate of 16,000 tonnes is not far from the industry's estimate of 20,000. For the purpose of maintaining uniformity, annual UCO generation of 16,000 tonnes will be used in this study.

Regarding the quantity of GTW generation in Hong Kong, from the survey data provided by the Environmental Protection Department (EPD), there were around 160,000 to 180,000 tonnes of GTW received in Grease Trap Waste Treatment Facility (GTWTF) from 2011 to 2012. As there is no data on the quantity of direct disposal of GTW that does not go through the GTWTF, it can therefore only be concluded that the generation of GTW in Hong Kong is no less than 160,000 to 180,000 tonnes per year.

5.1.2 Collection, Recycling and Disposal Channels

UCO is recyclable, and is not classified as hazardous waste in many jurisdictions including Hong Kong. Currently, UCO is not regulated under Hong Kong's Waste Disposal Ordinance or import / export control³⁰.

In accordance with the Water Pollution Control Ordinance, it is unlawful to dump UCO directly into the sewer without treatment. However, it is permissible for the restaurants and

³⁰ HKSARG (2013), LCQ3: Collection and recycling of used cooking oil, URL: <http://www.info.gov.hk/gia/general/201301/23/P201301230415.htm>, Retrieved on 13 Dec 2013

food businesses to mix UCO with other kitchen waste for co-disposal. Small businesses with small amounts of UCO may be more likely to adopt such an approach. On the other hand, larger businesses with larger amounts of UCO usually sell their UCO to UCO collectors.

The UCO from restaurants and food businesses gathered by UCO collectors can either be sold to local biodiesel manufacturers or exported. The current price offered by UCO collectors to restaurants and food businesses ranges from HK\$2,000 to HK\$5,000 per tonne, while the average price paid by local biodiesel manufacturers for UCO is around HK\$4,000 per tonne (around HK\$4 per litre). Outside Hong Kong, there is also a robust market for UCO. In the U.S., the recent market price of yellow grease (the American term for UCO) can be as high as USD 33 per 100 pounds (equivalent to HK\$5,641 per tonne)³¹. In the U.K., UCO, depending on the quality, can be sold to biodiesel manufacturers by collectors for around £0.25-0.60 per litre (around HK\$3,478 - 8,337 per tonne)³². A summary of market prices of UCO is shown in Table 5.1.

TABLE 5.1 Market Price of UCO in Different Jurisdictions

	Market Price in Foreign Currency	Market Price Equivalent in HK\$
Hong Kong	Not applicable	HK\$4,000 per tonne
United States	USD 33 per 100 pounds	HK\$5,641 per tonne
United Kingdom	GBP 0.25-0.60 per litre	HK\$3,478 - 8,337 per tonne

As shown in Table 5.1, export of UCO can command a slightly better price than selling to local biodiesel manufacturers. Attempts were made to estimate the amount of UCO exported from Hong Kong, but this was not easy because there was no separate classification

³¹ United States Dept. of Agriculture (2013), National Weekly Ag Energy Round-Up, URL: <http://www.ams.usda.gov/mnreports/lswagenergy.pdf>, Retrieved on 13 Dec 2013

³² LRS Consultancy (2013), The market for biodiesel production from used cooking oils and fats, oils and greases in London, URL: [http://www.london.gov.uk/sites/default/files/The market for biodiesel production from UCOs and FOGs in London – September 2013.pdf](http://www.london.gov.uk/sites/default/files/The%20market%20for%20biodiesel%20production%20from%20UCOs%20and%20FOGs%20in%20London%20-%20September%202013.pdf), p vi, Retrieved on 17 Dec 2013 [*hereinafter abbreviated as LRS (2013)*]

for UCO under C&SD's Merchandise Trade Statistics. A very rough estimate might be derived using the export figures of HS Code 15180000 / SITC category 43110³³. There was, however, great limitation to using this approach, since there were many other substances included in HS Code 15180000 / SITC category 43110 beside UCO. Nevertheless, using the export figures of HS Code 15180000 / SITC category, we estimated that the exported domestic UCO was no more than 11,000 tonnes in 2012. Moreover, around 3,000 tonnes of materials under SITC category 43110, which might include UCO, was imported into Hong Kong, among which around 1,300 tonnes was re-exported. The difference between the import and re-export amount indicated that 1,700 tonnes of materials under SITC category 43110, which might include UCO, was retained locally. The relevant trade statistics of 2012 is shown in Table 5.2.

TABLE 5.2 Trade Statistics under SITC 43110 in 2012 ^{34,35}

	Total Quantity in 2012 (tonnes)
Import	2,969
Domestic Export	11,292
Re-export	1,276

Currently, three biodiesel manufacturers in Hong Kong gather locally generated UCO as feedstock by direct purchase from restaurants and food businesses or UCO collectors. According to the information provided by trade practitioners, two of these biodiesel manufacturers collect about 5,000 tonnes of UCO per year and have been using it to produce biodiesel. A third manufacturer collect about 6,000-8,000 tonnes of UCO per year. The majority of its collected UCO was exported before its facilities came into operations in 2013.

³³ The full description of SITC 43110 is 'Fats and oils and their fractions, animals or vegetable, boiled, oxidized, dehydrated, sulphurized, blown, polymerized by heat in vacuum or in inert gas or otherwise chemically modified (excluding those of items from 43121 to 43122); Inedible mixtures or preparations of animal or vegetable fats or oils

³⁴ C&SD (2013), Hong Kong Merchandise Trade Statistics – Imports, URL: <http://www.statistics.gov.hk/pub/B10200012013MM10B0100.pdf>, Retrieved on 13 Dec 2013

³⁵ C&SD (2013), Hong Kong Merchandise Trade Statistics - Domestic Exports and Re-exports, URL: <http://www.statistics.gov.hk/pub/B10200032013MM10B0100.pdf>, Retrieved on 13 Dec 2013

Based on the above information, biodiesel manufactures in Hong Kong were estimated to collect around 11,000-13,000 tonnes of UCO per year.

Drawing reference from the biodiesel industry's estimate and HKPC's estimate on annual UCO generation, around 16,000 to 20,000 tonnes of UCO could have been generated in 2012. Since domestic export of UCO was no more than 11,000 tonnes that year and about 5,000 tonnes of UCO was used to produce biodiesel, there might have been 0 to 4,000 tonnes of UCO "unaccounted for". An unknown proportion of this "unaccounted for" quantity was attributable to estimation error in the quantity of UCO generated in the first place. Also, some proportion of the "unaccounted for" UCO might have been mixed (e.g. by restaurants with general waste for disposal, or transported to places outside Hong Kong without formal customs clearance). Some stakeholders said that some of the "unaccounted for" UCO was likely to be sold to places outside Hong Kong for simple purification, and then distributed for human consumption. However, it is beyond the scope of this study to verify this claim. A simplified illustration of the pathway for the collection and distribution of UCO is shown in Figure 5.1. Technologies to recycle UCO are detailed in Appendix 5B.

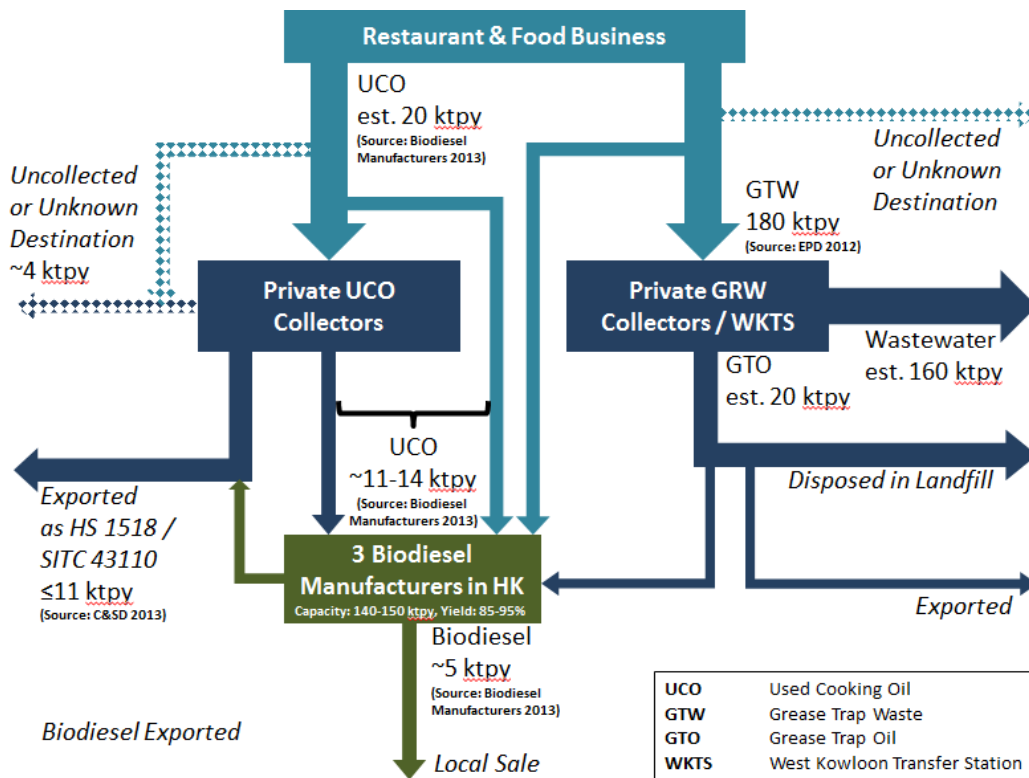


FIGURE 5.1 Collection, Recycle and Disposal Channels of UCO and GTW in Hong Kong

GTW also contains oil. Since oil and grease in wastewater tends to clog the sewers and hamper wastewater treatment process, Hong Kong, as in many other jurisdictions, requires restaurants and food processing factories to install grease trap and separate out the oil and grease before discharging wastewater into the sewer. The separated GTW is required to be transferred to the approved GTW treatment facilities (GTWTF). Currently 69 GTW collectors (with 203 vehicles) are registered to dispose GTW at GTWTF.

Small box grease traps (which are usually installed under individual sinks) are degreased manually and the waste is usually mixed with other kitchen waste for co-disposal at landfills. Large GTW, which are difficult to clean well by hand, are mechanically cleaned by GTW collectors and the waste is delivered to GTWTF. Around 10% (by weight) of grease trap oil (GTO) separated from GTW can be used as feedstock for biodiesel production. Biodiesel manufacturers also acquire GTW directly from restaurants and food businesses.

5.2 Difficulties in Recycling UCO in Hong Kong

Based on the desktop research and stakeholders' engagement, difficulties and obstacles in promoting collection and recycling of UCO are elaborated below. The views and comments from the stakeholders are detailed in Appendix 5C.

5.2.1 Variability in the Operational Conduct of Collectors

During our engagement with stakeholders, it was suggested (although not verified) that some collectors could offer higher prices for UCO than local biodiesel manufacturers could afford because those collectors would likely sell the UCO elsewhere for reprocessing into cooking oil for human consumption. In addition, it was also suggested (although also not verified) that some collectors allowed the skimming off of oil content from GTW prior to the GTW being sent to treatment facilities and that the oil content might be diverted to reprocessing elsewhere. Such allegations are serious if such practices do exist.

5.2.2 Dumping of UCO by Some UCO Producers

Some UCO producers reported that it is not uncommon in the trade to directly dispose of UCO and GTW, particularly for small-sized restaurants. It is, therefore, beneficial to explore ways to encourage UCO producers to segregate UCO for collection and recycling.

5.2.3 Limited Information for UCO Producers to Differentiate Collectors

Some UCO producers, conscious of their social responsibility, expressed their intention to choose UCO collectors with proper recycling processes/outlets. However, currently there is insufficient information or guidance to help UCO producers differentiate proper UCO collectors with and without proper recycling processes/outlets. It would be useful to provide relevant information to UCO producers to minimize the possibility of UCO sources entering improper channels.

5.2.4 Small Local Demand for Biodiesel

The most promising way to recycle UCO is to use it as a feedstock for biodiesel production. Although biodiesel manufacturers can produce biodiesel using imported feedstock and export the biodiesel produced in Hong Kong, a higher local demand for biodiesel is nonetheless beneficial to the development of the local green industry. Local demand for biodiesel is small at present primarily due to the less competitive price of biodiesel as compared to conventional petrodiesel. In addition to financial factors, the shortage of infrastructure for storage and refueling, and lack of environmental incentives to cut carbon emission are other factors for the low local demand for biodiesel. The current local demand mainly comes from the Government's biodiesel trial scheme and some boiler plants. The Hong Kong Airport Authority also has plans to utilize biodiesel for their ground fleet. It is possible to expand the use of biodiesel for transportation and for powering various types of equipment. The details of quantified potential demand is elaborated in Appendix 5D. In addition, in the foreseeable future, more demand for biofuel may come from airlines seeking ways to reduce carbon emission in view of the carbon tax on flights to Europe. It is also reported that Cathay Pacific, a Hong Kong based airline, is interested in using biofuels. There is a case for Hong Kong to look into the wider usage of biofuels.

5.3 Policies on UCO Recycling in Other Jurisdictions

This section elaborates possible ways to encourage UCO recycling from other jurisdictions.

UCO can be recycled as biodiesel, animal feed, and oleochemicals. In some jurisdictions, such as in the U.K., recycling of UCO as animal feed is, in general, forbidden due to the concern of contaminating the food chain³⁶. This indicates there is a real health concern with the uncontrolled use of UCO. Currently, recycling UCO as biodiesel is the most significant recycling channel for UCO. In the UK and Taiwan, UCO is the primary feedstock for

³⁶ Animal Health and Veterinary Laboratories Agency of the U.K. (2012), Use of oils and fats in farm animal feed, URL: <http://www.defra.gov.uk/ahvla-en/disease-control/abp/food-feed-businesses/use-oils-fats-farm-animal-feed/>, Retrieved on 7 Jan 2014

biodiesel production.³⁷ The collection of UCO has become an attractive business because many jurisdictions, including the European Union (EU) have mandated biodiesel blend (EU mandates 10% renewable energy in all transport fuel)³⁸. The mandate in other jurisdictions also boosts the demand for export of UCO from Hong Kong as a biodiesel feedstock.

5.3.1 Regulation of UCO Collection

Regulating the collection of UCO may help address some of the problems identified. Practices elsewhere may be useful for Hong Kong to consider.

a) The United Kingdom

UCO collection and disposal is regulated in the U.K. The UK law imposes a duty of care on both the producer and carrier of UCO. UCO from commercial producers must be kept separate from the general waste in a suitable container and collected by a waste carrier³⁹. UCO collection and disposal must comply with Section 34 of the Environmental Protection Act 1990 and the Environmental Protection Act (Duty of Care) Regulations 1991, and failure to do so is a criminal offence, punishable by a fine of up to £5,000 on summary conviction or unlimited fine on conviction on indictment⁴⁰. The producer of the UCO must ensure that the collector is registered with the Environment Agency as a “registered waste carrier” and keep a record of all collections. The producer of the waste must also be satisfied that the waste is taken to a licensed disposal site⁴¹. UCO carriers must register with the Environmental

³⁷ In large biodiesel production plants, the primary feedstock are rapeseed oil, palm oil and soybean oil, where the issue of using or importing from sustainable sources is an issue.

³⁸ Global Renewable Fuels Alliance (2013), Global biofuel mandates, URL: <http://globalrfa.org/biofuels-map/>, Retrieved on 17 Dec 2013 [Note: Taiwan has replaced B1 with B2 mandate which is not yet updated in this source]

³⁹ Environmental Agency of the U.K. (2013), Disposing used cooking oil, URL: <http://www.environment-agency.gov.uk/business/topics/waste/123038.aspx>, Retrieved on 16 Dec 2013

⁴⁰ Dept. for Environment, Food and Rural Affairs of the U.K. (1996), Environmental Protection Act 1990 Section 34 - The duty of care: A code of practice, URL: <http://archive.defra.gov.uk/environment/waste/controls/documents/waste-man-duty-code.pdf>, p40, 43 , Retrieved on 16 Dec 2013 [hereinafter abbreviated as Defra (1996)]

⁴¹ Water UK, Best management practice for catering outlets: Disposal of fats, oils, grease and food waste, URL: <http://www.water.org.uk/home/policy/publications/archive/recycling/fogbrochure/fog-best-practice.pdf>, p8, Retrieved on 16 Dec 2013

Agency^{42 43}. When UCO is transferred from producer to carrier, it must be transferred only to an authorized person (who is registered or exempted from registration)⁴⁴. A complete transfer note, which contains information about the parties to the transfer, must be cosigned and kept as record⁴⁵.

b) Italy

The collection and treatment of UCO is regulated in Italy. The National Waste Framework Law (Decree 152/06) establishes a specific national consortium for proper collection and treatment of spent vegetables and animal oils and fats⁴⁶. The National Consortium for mandatory collection and procession of waste vegetable and animal oils and fats (CONOE) provides the collection, transportation, storage, treatment, recovery, reuse and disposal of vegetable and animal oils and fats^{47 48}.

The estimated amount of UCO collected is 60,000 cubic metres per year⁴⁹ (that is around 55,000 tonnes per year). Following EU's directive, Italy also has a blend mandate. As EU's fourth largest biodiesel producer producing 479,000 tonnes of biodiesel per year⁵⁰, Italy has 95% of the biodiesel feedstock from rapeseed, soybean, and palm oil, while UCO contributes less than 5%⁵¹. The small proportion of UCO as feedstock is largely due to the comparatively small amount of UCO versus biodiesel production (55,000 tonnes of UCO per year versus 479,000 tonnes of biodiesel per year).

⁴² Environmental Agency of the U.K. (2013), Waste carriers, brokers and dealers, URL:

<http://www.environment-agency.gov.uk/business/sectors/wastecarriers.aspx>, Retrieved on 16 Dec 2013

⁴³ Defra (1996), p56, Retrieved on 16 Dec 2013

⁴⁴ Defra (1996), p57, Retrieved on 16 Dec 2013

⁴⁵ Defra (1996), p52, Retrieved on 16 Dec 2013

⁴⁶ European Topic Centre on Sustainable Consumption and Production (2011), Country fact sheets on waste policies - 2011 edition - Factsheet for Italy, URL: http://scp.eionet.europa.eu/facts/factsheets_waste/2011_edition/factsheet?country=IT, Retrieved on 2 Jan 2014

⁴⁷ RecOil, CONOE, URL: <http://www.recoveringoil.eu/partners/conoe>, Retrieved on 2 Jan 2014

⁴⁸ Consorzio Obbligatorio Nazionale di raccolta e trattamento Oli e grassi vegetali e animali Esausti, Statuto, URL: <http://www.conoe.it/index.php/statuto>, Retrieved on 2 Jan 2014

⁴⁹ Anderssen et al (2007), Localised production and supply of biodiesel from used cooking oils, p27, URL: http://www.vestforsk.no/filearchive/rapport12-07-biodienet_wp2_rpt_v12.pdf, Retrieved on 2 Jan 2014

⁵⁰ European biodiesel board (2012), Statistics – the EU biodiesel industry, URL: <http://www.ebb-eu.org/stats.php>, Retrieved on 2 Jan 2014

⁵¹ United States Dept. of Agriculture (2011), Italian Biofuel 2011, URL:

http://gain.fas.usda.gov/Recent%20GAIN%20Publications/Italian%20Biofuels%202011_Rome_Italy_12-29-2011.pdf, p5, Retrieved on 2 Jan 2014

c) New York and California, United States^{52,53}

In New York, the transport of grease from commercial establishments must be performed by a trade waste hauler licensed by the Business Integrity Council (BIC), a law enforcement and regulatory agency charged with the oversight of the private catering industry. In 2012, there were 29 BIC-licensed grease haulers in the city that serviced approximately 17,000 commercial and institutional establishments. In 2011, nearly 8.3 million gallons (that is 31.4 million litres or around 29,000 tonnes) of UCO were collected by licensed haulers.

California has been implementing a programme called Inedible Kitchen Grease Program (IKGP) to regulate UCO transport since 1995. The regulation covers the renderers, the collectors, and the transporters of UCO. It is unlawful to engage in the transportation of UCO without being registered with the California Department of Food and Agriculture. It is also unlawful to take possession of UCO from an unregistered transporter. Even selling UCO to an unlicensed person or entity is also unlawful. Any person who is found guilty of violation is subject to imprisonment, or a fine of not more than US\$ 5,000 (equivalent to HK\$39,000), or both imprisonment and fine. If the conviction is a second or subsequent conviction of a violation or the violation is committed with intent to defraud or mislead, the person is subject to imprisonment, or a fine of not more than US\$ 15,000 (equivalent to HK\$116,000), or both imprisonment and fine.

d) Shanghai, Mainland China^{54,55}

In Shanghai, UCO is allowed to be collected and transported by the entity that generates UCO or by a qualified collector designated by the authority. However, only chain restaurants and

⁵² Dept. of Environmental Protection of New York (2012), New York City Business Integrity Commission, Department of Environmental Protection, and Mayor's Office of policy and strategic planning launch comprehensive strategy to help businesses comply with grease disposal regulations, URL: http://www.nyc.gov/html/bic/downloads/pdf/pr/nyc_bic_dep_mayoroff_policy_10_18_12.pdf, p2, Retrieved on 9 Jan 2014

⁵³ California Dept. of Food and Agriculture, Inedible kitchen grease program, URL: http://www.cdffa.ca.gov/ahfss/mpes/IKG_Program.html, Retrieved on 9 Jan 2013

⁵⁴ 中國上海市政府 (2006), 上海市廢棄食用油脂管理實施細則, URL: <http://www.shanghai.gov.cn/shanghai/node2314/node2319/node12344/userobject26ai9348.html>, Retrieved on 24 Feb 2014

⁵⁵ 中國上海市政府 (2012), 上海市餐廚廢棄油脂處理管理辦法, URL: <http://www.shanghai.gov.cn/shanghai/node2314/node2319/node2407/n29400/u26ai34423.html>, Retrieved on 24 Feb 2014

entities generating a large amount of UCO can be approved by the authority to collect and transport UCO by themselves. There are 18 qualified / designated collectors in Shanghai responsible for collecting and transporting UCO. The authority requires the vehicle used for transporting UCO to be equipped with video surveillance devices and the collector must have an information system to monitor the collection and transport of UCO. The final disposal, however, must be carried out by a qualified disposer.

e) Taiwan

The annual generation of UCO in Taiwan is approximately 70,000 to 85,000 tonnes, in which 72% to 80% comes from fast food business, food factories, etc. Starting from 2007, Taiwan mandates a total of 588 large scale fast food businesses and food factories to submit a plan for handling UCO and to collect UCO for recycling⁵⁶. The mandate is applicable to western-style fast food businesses with a capital of more than TW\$ 50 million and UCO-producing food factories with a capital of more than TW\$ 5 million⁵⁷. It was reported that 50% to 60% of UCO was recycled as biodiesel, and the remainder was recycled as soap, animal feed, industrial raw materials, etc.⁵⁸

5.3.2 Considerations by Other Jurisdictions to Control UCO

Different jurisdictions advocate different reasons to implement policies to control UCO. The U.K. classifies UCO as waste so UCO falls under the legislative requirement of duty of care. The U.S. controls UCO collection and disposal to mitigate the clogging of sewers. Shanghai regulates UCO to ensure food safety. Taiwan demands collection of UCO from fast food business and food factories in view of resource recycling. There is no single dominating reason for different jurisdictions to implement UCO control.

⁵⁶ 台灣行政院環境保護署 (2007), 廢食用油蛻變成生質柴油之原料, URL:

http://ivy5.epa.gov.tw/enews/fact_Newsdetail.asp?InputTime=0960821105356, Retrieved on 17 Dec 2013

⁵⁷ 國立聯合大學理工學院 (2012), 以廢食用油製造生質柴油之物質流分析, URL: <http://rep.nuu.edu.tw/retrieve/1815/01.pdf>, p8, Retrieved on

18 Dec 2013 [*hereinafter abbreviated as 國立聯合大學理工學院 (2012)*]

⁵⁸ 國立聯合大學理工學院 (2012), p12, Retrieved on 18 Dec 2013

5.3.3 Certification and Audit Required to Export UCO to European Union

The EU is a major market for UCO, since it has a EU directive that favours the use of waste-based feedstock for biodiesel production. In order to export UCO to the EU, all stakeholders in the UCO supply chain for biodiesel production, starting from the UCO collector to the end user, have to be certified under one of the existing certification schemes (ISCC EU and ISCC DE) as of 1 of January 2013⁵⁹. The procedures for UCO supplier to get ISCC certified can be referred to Figure 5.2 below.

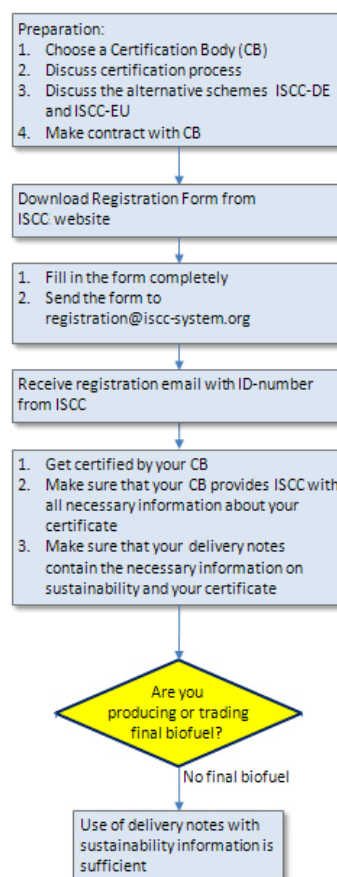


FIGURE 5.2 Procedure for UCO Supplier to Get ISCC-Certified⁶⁰

⁵⁹ Fabien H., Certification ISCC mandatory for UCO collectors in 2013 to sell/export in Germany/EU, URL: <http://www.linkedin.com/groups/Certification-ISCC-mandatory-UCO-collectors-4232424.S.197921734>, Retrieved on 24 Feb 2014

⁶⁰ International Sustainability & Carbon Certification, Your way from registration to use ISCC certificates, URL: <http://www.iscc-system.org/en/certification-process/the-right-way/>, Retrieved on 24 Feb 2014

5.3.4 Boosting Local Demand for Biodiesel

A higher local demand for biodiesel can help the development of the local biodiesel industry, which can in turn facilitate local UCO collection which generally would mean a smaller carbon footprint than importing other feedstock. However, the current local demand for biodiesel is small. The following section explains how other jurisdictions boost the local demand for biodiesel.

a) The United Kingdom

The Renewable Transport Fuel Obligation (RTFO) obligates fossil fuel suppliers to produce evidence showing that 4.75% of fuels for road transport supplied in the U.K. come from renewable sources and are sustainable, or that a substitute amount of money is paid. All fuel suppliers who supply at least 450,000 litres of fuel a year are obligated. In practice, the RTFO is mostly achieved by blending biofuel (including biodiesel) and biogas with fossil fuel. A Renewable Transport Fuel Certificate (RTFC) is awarded for every litre of biodiesel supplied on top of the obligation amount⁶¹. The RTFC has a robust trading market where price is settled by an auction mechanism. Figure 5.3 shows the monthly Average Prices of RTFC (Period 5) from July 2012 to September 2013. It was reported that at £0.12 (equivalent to HK\$1.53) per RTFC (i.e. per litre), the increased cost of biodiesel over diesel is offset⁶².

⁶¹ Dept. for Transport of the U.K. (2012), Renewable Transport Fuels Obligation, URL: <https://www.gov.uk/renewable-transport-fuels-obligation>, Retrieved on 17 Dec 2013 [*hereinafter abbreviated as DfT (2012)*]

⁶² LRS (2013), p2, Retrieved on 17 Dec 2013

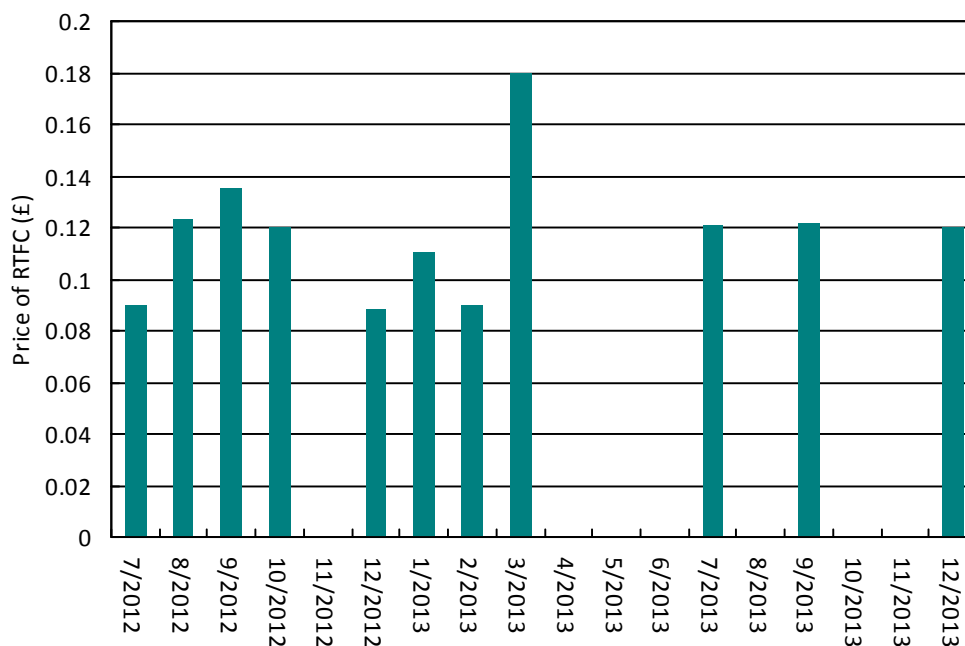


FIGURE 5.3 Monthly Average Prices of RTFC (Period 5) from Jul 2012 to Dec 2013 (no available market price for 11/2012, 4-6/2013, 8/2013, and 10-11/2013)⁶³

In 2011, following the EU framework, an amendment was made to introduce double rewards (double amount of RTFC) for some fuel types, including those made from UCO, and a requirement to have data on the carbon and sustainability performance of fuels to be independently verified before RTFCs are awarded⁶⁴. Therefore, with reference to the market price of RTFC reported in Figure 5.3, manufacturers can have an additional revenue of £0.12~0.18 (equivalent to HK\$1.53-2.3) per litre of biodiesel produced from UCO. Such policy provides great incentive in recycling UCO as biodiesel, as such, higher quality UCO can be sold to biodiesel manufacturers by collectors for around £0.45-0.60 (equivalent to HK\$5.76-7.67) per litre and lower quality for £0.25 (equivalent to HK\$3.2) per litre⁶⁵. The UCO producers (e.g. food and catering business) can sell the UCO to the collectors for £0.1-0.2 (equivalent to HK\$1.28-2.56) per litre⁶⁶. The policy results in an active recycling

⁶³ NFPAS Auctions (2013), Online RTFOC auction service, URL: <http://www.nfpas-auctions.co.uk/etoc/trackrecord.html>, Retrieved on 17 Dec 2013

⁶⁴ DfT (2012), Retrieved on 17 Dec 2013

⁶⁵ LRS (2013), p vi, Retrieved on 31 Dec 2013

⁶⁶ LRS (2013), p18, Retrieved on 31 Dec 2013

of UCO as biodiesel and over 70% of the biodiesel in the U.K. was produced from UCO, and around 40% of the UCO feedstock came from local (i.e. U.K.) sources⁶⁷. The feedstock distribution is shown in Figures 5.4 and 5.5.

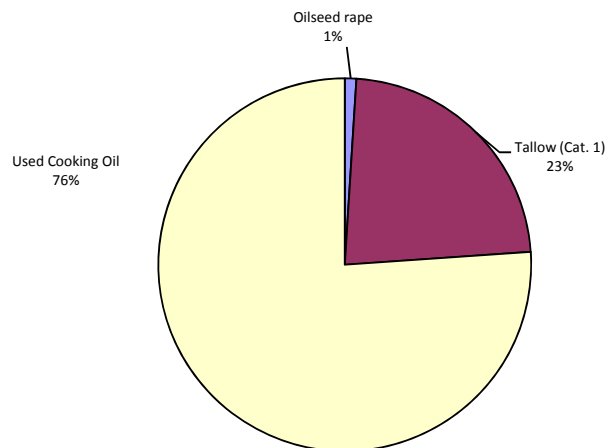


FIGURE 5.4 Biodiesel Feedstock in the U.K.⁶⁸

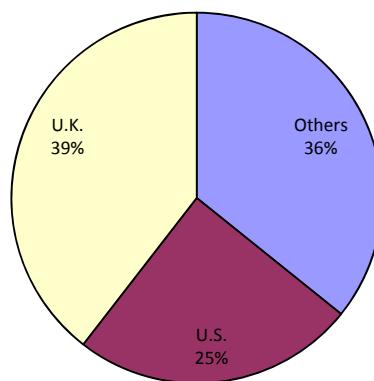


FIGURE 5.5 Origins of UCO in Biodiesel Feedstock in the U.K.⁶⁹

⁶⁷ Dept. for Transport of the U.K. (2013), Renewable Transport Fuel Obligation statistics: obligation period 4, 2011/12, report 6 data tables (Tab: RTFO 05 C&S data), URL: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/137658/rtfo-2011-12-yr-4-report-6.xls, Retrieved on 17 Dec 2013 [hereinafter abbreviated as DfT (2013)]

⁶⁸ DfT (2013), Retrieved on 17 Dec 2013

⁶⁹ DfT (2013), Retrieved on 17 Dec 2013

b) Taiwan

In July 2008, Taiwan started to implement a 1% biodiesel usage policy that mandated all fuel stations in Taiwan to supply B1 biodiesel for motor fuel⁷⁰. In 2010, Taiwan further tightened the biodiesel blend mandate to B2⁷¹. The B1 and B2 mandate policy indirectly promoted the recycle of UCO as biodiesel. Currently, Taiwan mainly uses UCO to produce biodiesel⁷².

5.3.5 Summary of Policies in Other Jurisdictions

The following table summarizes the policies of other jurisdictions to standardize UCO recollection and to promote biodiesel usage.

TABLE 5.3 Summary of Policies in Other Jurisdictions

Policies to Standardize Collection of UCO	
U.K.	Registered waste carrier system
Italy	Dedicated statutory body to provide the collection, transportation, storage, treatment, recovery, reuse and disposal of vegetable and animal oils and fats
New York and California , U.S.	Registered waste carrier system
Shanghai, Mainland China	Registered waste carrier system
Taiwan	Mandatory UCO recollection in selected UCO producers
Policies to Boost Local Demand for Biodiesel	
U.K.	Blend mandate and financial incentive for UCO-based Biodiesel
Taiwan	Blend mandate

⁷⁰ United States Dept. of Agriculture (2009), Taiwan Biofuel Annual, URL: [http://gain.fas.usda.gov/Recent%20GAIN%20Publications/General Report_Taipei_Taiwan_5-19-2009.pdf](http://gain.fas.usda.gov/Recent%20GAIN%20Publications/General%20Report_Taipei_Taiwan_5-19-2009.pdf), p1, Retrieved on 18 Dec 2013 [*hereinafter abbreviated as USDA (2009)*]

⁷¹ 台灣經濟部公告 (2010), 修正「石油煉製業與輸入業銷售國內車用柴油摻配酯類之比率實施期程範圍及方式」, URL: http://gazette.nat.gov.tw/EG_FileManager/eguploadpub/eg016112/ch04/type1/gov31/num5/Eg.htm, Retrieved on 18 Dec 2013

⁷² USDA (2009), p3, Retrieved on 18 Dec 2013

5.4 Possible Points and Means of Intervention on Enhancing UCO Recycling

Taking into account the views and findings from the previous sections, the following recommendations are presented.

5.4.1 Short-term Measures

a) Launch a Voluntary Certification Scheme for UCO Collectors First

A voluntary certification scheme for UCO collectors can be established to help set standards of good practices in the trade and aid UCO producers in choosing responsible collectors. The trade is generally receptive to such a scheme. To develop the certification scheme, an independent professional agency would be engaged to serve as the certifying body. To become and remain certified, UCO collectors should adopt reliable systems/processes to channel their collected UCO to legitimate use, such as biofuel production in and outside of Hong Kong, and comply with requirements on safety, hygiene and record-keeping, etc. Once this is in place, a mandatory system may be considered.

5.4.2 Medium-term Measures

b) Commission a Study on Encouraging Use of Biofuels

Biofuels are going to be an increasingly important fuel source globally in the years to come primarily due to the policies of many other jurisdictions such as the EU. The driving factors of these policies include international treaties / protocol in carbon reduction, conservation of resources and concerns on energy security. The Government could conduct further studies on possible ways to promote the use of biodiesel and to evaluate the impact and implications of its larger scale usage in Hong Kong. The study should take note of the situation of local production and consumption of biodiesel in assessing whether there are justifications to mandate the use of biodiesel in the future. In addition, the study might also look into ways to cover the slightly higher cost of biodiesel, and the possible impacts on stakeholders including the transportation trade and the fuel suppliers and dispensers. Indeed, there is a case for Hong Kong to consider wider use of biofuels in light of opportunities arising from transportation demands, such as in aviation (with Hong Kong being an aviation hub).

c) Wider Use of Biodiesel

In the light of results from the study on promoting the use of biodiesel suggested in part (b) above and subject to consultation with stakeholders, the Government could consider whether to mandate the use of biodiesel territory-wide or in selected sectors / machine types in future. Increasing the demand for biodiesel would increase the demand for UCO and provide economic incentives for proper segregation and treatment of the recyclable resource. The increased use of biodiesel could also help reduce carbon emission at the global level and increase the percentage of renewable energy usage in Hong Kong. The relevant policy should take into account the perspectives of air quality management and climate change/carbon reduction.

- End of Report -

APPENDIX 2A - DETAIL METHODOLOGY

(i) Desktop Review

For the purpose of assessing and evaluating the current situation and practices of the local recycling industry and in neighbouring jurisdictions in the management of the identified types of waste (plastic, paper and used cooking oil), a desktop research was conducted using sources from the internet and authoritative published materials in an attempt to obtain the overall and unbiased picture of the situation.

Specifically, the following information of the identified types of waste for local sectors were collected, consolidated and summarized via the desktop research:

- Generation quantities and sources;
- Collection channels and/or disposal/management practices;
- Recycling technologies;
- Government funding schemes;
- Types of governmental support or needs desired; and
- Problems faced and difficulties encountered in managing and recycling the wastes.

The following information of other jurisdictions in regards to the recycling industry were also collected, consolidated and summarized via the desktop research:

- Government policies and supporting measures e.g. recycling programmes / funding schemes.

(ii) Stakeholder Engagement

To encourage the interviewees to express their views freely and unhindered, interviews with different stakeholders covering waste producers, collectors and/or recyclers, technology providers, non-governmental organizations and other interested bodies as appropriate of these three types of waste were conducted on a one-on-one basis, i.e. each interview/meeting was conducted with one stakeholder, as meetings/sessions with more than one company at the same time may deter some stakeholders from divulging certain views or sensitive

information.

a) Meeting with Waste Producers

Around 25 interviews with the relevant waste producers were planned, covering some of the major producers and trade associations of the identified types of waste. The target respondents were major waste producers such as the catering sectors, e.g. restaurants for used cooking oil, beverage manufacturers using Tetra Pak for food and drink and plastic product manufacturers for plastic wastes, e.g. plastic scrap waste. The topics/questions covered in the interviews encompassed the following:

- Profiles of the establishments e.g. business activity, nature, etc.;
- Type of waste generated;
- Quantities of waste generated, recycled and disposed of;
- Financial arrangement for waste disposal;
- Means of disposal of the wastes; and
- Factors affecting the disposal arrangement.

b) Meeting with Waste Collectors/Recyclers

Around 30 interviews with the waste collectors/recyclers were planned. The target respondents were some of the major collectors/recyclers of the identified types of waste such as biodiesel manufacturers, plastic recyclers, NGOs, etc., and their relevant trade associations. The topics/questions covered in the interviews encompassed the following:

- Profiles of the establishments e.g. business activity, nature, etc.;
- Type of waste collected/recycled;
- Quantities of waste collected and/or recycled;
- Means of collection of the wastes;
- Recycling means/technologies utilized and/or to be developed (recyclers only);
- Factors affecting the choice of recycling waste and method;
- Problems and/or difficulties encountered; and

- Types of governmental support or needs desired.

c) Meeting with Waste Recycling Technology Providers

Around 5 interviews with the relevant waste recycling technology providers were planned, covering some of the major technology providers for recycling paper, plastic and used cooking oil. The topics/questions covered in the interviews encompassed the following:

- Profiles of the establishments e.g. business activity, nature, etc.;
- Types of waste recycling technology provided;
- Capacity of waste treatment and recycling of the technology;
- Capital cost for introducing waste recycling technology;
- Problems and/or difficulties encountered; and
- Types of governmental support or needs desired.

APPENDIX 2B - LIST OF ENGAGED STAKEHOLDERS

	Stakeholders	Status	Waste Type	Category
Waste Producers / Manufacturers & Waste Collectors, Recyclers & Technology Providers Interviewed				
1	Bright World Enterprise Limited 津世企業有限公司	Interviewed	Plastic	Collector & Recycler
2	Buddhist Compassion Relief Tzu Chi Foundation Hong Kong 佛教慈濟基金會香港分會	Interviewed	Plastic	Collector & Recycler
3	Central & Western Mid-Levels Owners Association 中西區半山業主聯會 (環境及自然保育基金社區回收中心)	Interviewed	Plastic	Association
4	Chiho-Tiande Group Ltd 齊合天地集團有限公司	Interviewed	Plastic	Collector & Recycler
5	Fukutomi Company Ltd. 卜高通美有限公司	Interviewed	Plastic	Collector & Recycler
6	General (International) Machine Equipment Co., Ltd 通用(國際)塑膠機械設備有限公司	Interviewed	Plastic	Technology Provider
7	Hong Kong Telford Envirotech Group Ltd. 香港德福環保科技集團有限公司	Interviewed	Plastic	Collector & Recycler
8	Kyowa Industrial Company Limited 喬奧華有限公司	Interviewed	Plastic	Manufacturer
9	Lubao Recycle Limited 綠寶再生回收有限公司	Interviewed	Plastic	Collector & Recycler
10	Moon Sing Plastics Recycling	Interviewed	Plastic	Technology Provider
11	UNM International Limited	Interviewed	Plastic	Collector & Recycler
12	Wingbest Machinery Ltd. 永恆環保機械有限公司	Interviewed	Plastic	Technology Provider
13	Yan Oi Tong 仁愛堂	Interviewed	Plastic	Collector & Recycler
14	新機有限公司 (環境及自然保育基金社區回收中心)	Interviewed	Plastic	Collector & Recycler
15	Asia Environmental Protection Recycle Limited 亞洲環保發展有限公司	Interviewed	Paper & Plastic	Collector & Recycler
16	Baguio Waste Management & Recycling Ltd. 碧瑤廢物處理及回收有限公司	Interviewed	Paper & Plastic	Collector & Recycler
17	Environmental Association Ltd 環保協進會有限公司	Interviewed	Paper & Plastic	Association

	Stakeholders	Status	Waste Type	Category
18	E-Tech Management(HK) Limited 億達再生資源有限公司	Interviewed	Paper & Plastic	Collector & Recycler
19	Federation of Hong Kong Recycle 香港回收再生資源總會	Interviewed	Paper & Plastic	Association
20	Hong Kong Association of Property Management Companies 香港物業管理公司協會	Interviewed	Paper & Plastic	Association
21	Hong Kong General Association of Re-cycling Business 香港環保回收業總商會	Interviewed	Paper & Plastic	Collector & Recycler
22	Hong Kong Recycle Materials & Re-production Business General Association Ltd. 香港環保廢料再造業總會有限公司	Interviewed	Paper & Plastic	Collector & Recycler
23	Hong Kong Waste Disposal Industry Association 香港廢物處理業協會	Interviewed	Paper & Plastic	Collector & Recycler
24	IWS Group Holdings Limited Company 綜合環保集團有限公司	Interviewed	Paper & Plastic	Collector & Recycler
25	Lau Choi Kee Papers Co. Ltd. 劉財記紙業有限公司	Interviewed	Paper & Plastic	Collector & Recycler
26	St. James' Settlement 聖雅各福群會	Interviewed	Paper & Plastic	Collector & Recycler
27	The Federation of Environmental And Hygienic Services 中港澳環衛總商會	Interviewed	Paper & Plastic	Collector & Recycler
28	The Hong Kong Federation of Youth Groups 香港青年協會	Interviewed	Paper & Plastic	Collector & Recycler
29	Wai Yeung Environment Protection Industry Development Ltd. 衛揚環保業發展有限公司	Interviewed	Paper & Plastic	Collector & Recycler
30	WSS Infocard Systems	Interviewed	Paper & Plastic	Technology Provider
31	Fat Kee Environmental Recycling Co. Ltd. 發記環保回收有限公司	Interviewed	Paper	Collector & Recycler
32	Sailing Boat Catering Management Ltd. 帆船飲食管理有限公司	Interviewed	Paper	Manufacturer
33	SingTao Daily & ST Headline 星島日報 & 頭條日報	Interviewed	Paper	Manufacturer
34	Tetra Pak China Ltd. 利樂中國有限公司	Interviewed	Paper	Producer
35	ASB Biodiesel ASB 生物柴油(香港)有限公司(奧地利環保公司)	Interviewed	UCO	Collector & Recycler

	Stakeholders	Status	Waste Type	Category
36	Asia Biodiesel Recycle Limited 亞洲生物柴油回收有限公司	Interviewed	UCO	Collector & Recycler
37	Association of Restaurant Managers 現代管理(飲食)專業協會	Interviewed	UCO	Association
38	Best China (H.K.) Ltd. 中佳豬油廠	Interviewed	UCO	Manufacturer
39	Budaoweng Hotpot Cuisine 不倒翁中日火鍋料理	Interviewed	UCO	Producer
40	Café de Coral Group 大家樂集團	Interviewed	UCO	Producer
41	Champway Technology Limited 倡威科技有限公司	Interviewed	UCO	Collector & Recycler
42	Choi Fook Enterprises 彩福企業	Interviewed	UCO	Producer
43	Hong Kong Federation of Restaurants & Related Trades 香港餐飲聯業協會	Interviewed	UCO	Association
44	Institution of Dining Art 稻苗學會	Interviewed	UCO	Association
45	Kun Fung Lard Limited 權豐豬油有限公司	Interviewed	UCO	Manufacturer
46	LHGroup 叙福樓集團	Interviewed	UCO	Producer
47	McDonald's Corporation 麥當勞香港	Provided a written submission	UCO	Producer
48	Ngan Lung Catering Group 銀龍粉麵茶餐廳	Provided a written submission	UCO	Producer
49	Satay King 沙嗲王(集團)有限公司	Interviewed	UCO	Producer
50	Super Star Group 鴻星集團	Interviewed	UCO	Producer
51	The Association for Hong Kong Catering Services Management Ltd. 香港餐務管理協會	Interviewed	UCO	Association
52	Tommy Cheung (張宇人) - Legislative Councillor for Catering Functional Constituency	Provided a written submission	UCO	Collector & Recycler
53	Wedding Banquet Specialist 煌府婚宴專門店	Interviewed	UCO	Producer
54	Friends of the Earth 香港地球之友	Interviewed	All types	Association
55	On Kee (HK) Environmental Recycling Ltd. 安記(香港)環保回收有限公司	Interviewed	All types	Collector & Recycler
56	Sita Waste Services Ltd. 昇達廢料處理有限公司	Interviewed	All types	Collector & Recycler

Stakeholders		Status	Waste Type	Category
57	The Airport Authority Hong Kong 香港機場管理局	Interviewed	All types	Producer
58	The Link Management Limited 領匯管理有限公司	Interviewed	All types	Producer
59	Waylung Waste Services Limited 衛龍廢料處理有限公司	Interviewed	All types	Collector & Recycler
60	合興油廠	Interviewed	All types	Manufacturer

APPENDIX 2C - LIST OF STAKEHOLDERS WHO DECLINED TO PARTICIPATE THE INTERVIEW, DID NOT REPLY OR COULD NOT BE CONTACTED

Stakeholders		Status
<i>Waste Producers / Manufacturers & Waste Collectors, Recyclers & Technology Providers that Declined to Participate</i>		
61	Dynamic Progress International Limited 泰榮環保科技國際有限公司	Declined to participate
62	ECOtech Recycling Social Enterprise Ltd. 香港環亞風險管理有限公司	Declined to participate
63	Hong Kong Confederation of Trade Unions 職工盟回收中心	Declined to participate
64	KFC Corporation 香港肯德基	Declined to participate
65	National Polyfoam Factory Limited 國際發泡膠廠有限公司	Declined to participate
66	Tsui Wah Restaurant 翠華餐廳	Declined to participate
67	金裝嫩奶佬	Declined to participate
68	Apple Daily 蘋果日報	No reply
69	Burger King Corporation	No reply
70	Environmental Contractors Management Association	No reply
71	Environmental Management Association of Hong Kong	No reply
72	Fairwood Fast Food Ltd 大快活集團有限公司	No reply
73	Greeners Action 綠領行動	No reply
74	HK Recycler	No reply
75	Lik Sang Machinery Manufacture Ltd. 力生機械製造有限公司	No reply
76	Maxim's Group 美心集團	No reply
77	Nestle Hong Kong Limited 雀巢產品有限公司	No reply
78	Ngai Hing Hong 毅興行	No reply
79	Oriental Daily News 東方日報	No reply
80	Po Leung Kuk 保良局	No reply
81	Star Industrial Co., Ltd. 星光實業有限公司	No reply

Stakeholders		Status
82	Swire Properties Ltd. 太古地產有限公司	No reply
83	The Conservancy Association 長春社	No reply
84	The Coronet Paper Co., Ltd. 加冕紙業有限公司	No reply
85	The Hong Kong and China Gas Company Limited 香港中華煤氣有限公司	No reply
86	Vitasoy International Holdings Ltd. 維他奶國際集團有限公司	No reply
87	Yuen Cheong Plastic Industrial Limited 源昌塑膠工業有限公司	No reply
88	三禾膠袋快餐用品公司	No reply
89	安達塑膠原料	No reply
90	海港廢紙五金公司/ 海港(國際)集團有限公司	No reply
91	源通膠袋實業公司	No reply
92	環保工程商會	No reply
93	Hong Kong and Kowloon Lard Association 港九豬油業商會	Could not be contacted

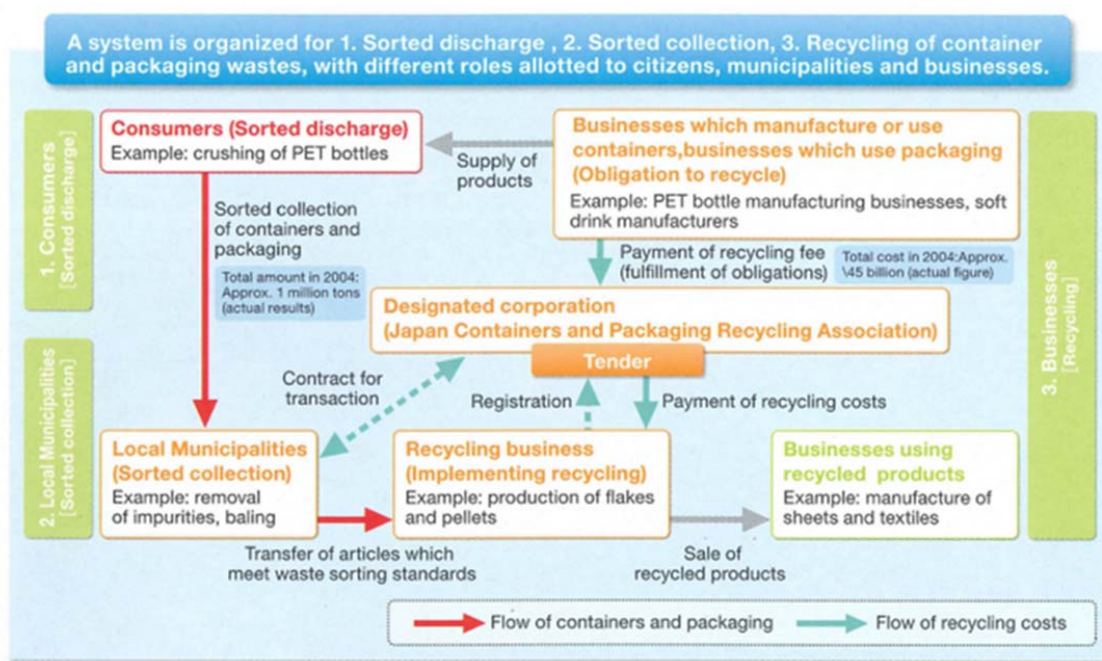
APPENDIX 3A - POLICIES IN OTHER JURISDICTIONS TO REGULATE PLASTIC WASTE DISPOSAL AND PROMOTE PLASTIC RECYCLING

Similar to Hong Kong, commercial recyclers in other countries also face the same problems of plastic recycling including high operational cost and low or negative profit margin. In order to ensure a plastic collection and recovery system exists and to sustain the industry, many jurisdictions have established PRS for recyclables and the revenue accumulated is used to fund and offset the operation of the recyclers. There is no regulation in other jurisdictions specifically provide direct subsidy to plastic recyclers. Typically plastic recycling is usually included under the same producer responsibility scheme (PRS) as other types of recyclables like paper and metals. Though under the same scheme, plastic usually commands higher charge in PRSs paid by the producers, so as to cover its higher operational cost required. Some relatively indirect regulations like landfill ban and mandatory green procurement would also be used as incentives and political tool to motivate citizens, trades and manufacturers to participate in recycling. Hong Kong can consider extending the current PRS to cover plastic so as to provide a long term funding support to boost up plastic recycling.

a) Japan

Collection and Recycling of Plastic - Plastic containers and packaging collection and recycling are regulated by Containers and Packaging Recycling Law in Japan. Containers and wrapping including glass containers, PET bottles, paper containers and wrapping, and plastic containers, wrapping and styrene foam trays are designated to specified business entities to recycle. Business entities with a certain business size and scale which use containers or wrapping in manufacturing merchandise and containers, retail, wholesale or importing businesses, restaurants with take-out service, etc. are obligated to recycle under the Law. Consumers are required to follow sorting guidelines to facilitate source separation and collection of recyclables.

Policy Framework to Facilitate Plastic Recycling - The Japan Containers and Packaging Recycling Association (JCPRA) is an organization appointed by 5 competent ministries of the Japanese government (Finance; Health, Labor and Welfare; Agriculture, Forestry and Fisheries; Economy, Trade and Industry; and the Environment) to promote smooth and appropriate recycling of items meeting sorting standards. The policy framework is summarized as shown in Figure A3A.1. The specified manufacturers and business entities have to pay a recycling fee to the JCPRA according to their amount of recyclables output and recycling unit cost, corrected by a coefficient classified by types of materials and business sectors as indicated in Figure A3A.2.



Scheme under the Containers and Packaging Recycling Law
 (Source: "Japan's 3R Initiatives" published by the Ministry of the Environment of Japan)

FIGURE A3A.1 Policy Framework of Plastic Waste Recycling Scheme under the Containers and Packaging Recycling Law⁷³

⁷³ Laws and Support Systems for Promoting Waste Recycling in Japan (2012), URL: <http://nett21.gec.jp/Ecotowns/LawSupportSystems.pdf>

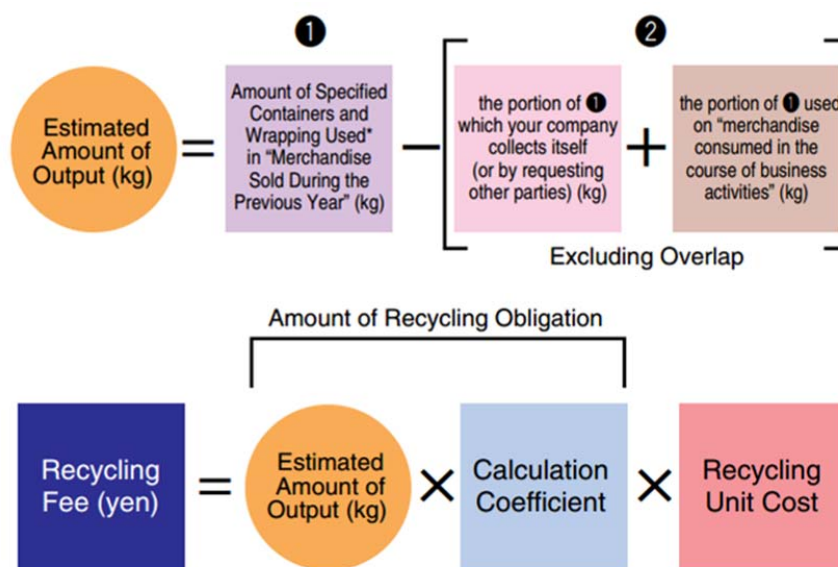


FIGURE A3A.2 Recycling Fee Calculation⁷⁴

These values would be reviewed each year by the government and JCPRA to ensure the recycling cost could be covered. The recycling unit cost for plastic is distinctively higher than other types of recyclables as shown in Table A3A.1 to cover the higher operational cost of plastic recycling.

TABLE A3A.1 Recycling Unit Cost⁷⁵

Packaging	Glass Bottles			PET Bottle	Paper Packaging	Plastic Packaging
	Colorless	Amber	Other Colors			
Unit Cost	4.0yen/kg	5.5yen/kg	8.0yen/kg	4.5yen/kg	12.0yen/kg	48.0yen/kg

After receiving payments of recycling fee from the specified business entities, the JCPRA would contract out and pay the local collection companies to collect, clean and bale the recyclables. The JCPRA would also pay for the recycling costs of recovery and regeneration of recyclable materials by tender invitation and registration system of recycling companies.

⁷⁴ Japan - The Containers and Packaging Recycling Law, URL: http://www.meti.go.jp/policy/recycle/main/data/pamphlet/pdf/e_all.pdf

⁷⁵ Japan - Recycling Unit Cost and Coefficient, URL: <http://www.jcpa.or.jp/Portals/0/resource/eng/2013.pdf>

The recyclers are authorized to sell the recycled materials. By this arrangement, the recycling is financed by the producers, users or business which use packaging and hence ensure material collection and recovery.

b) South Korea

Incentives to Reduce Disposal of Plastics - To resolve the problem of waste, the South Korean government introduced several waste management measures in the past two decades to reduce waste generation at the source, and then to recycle as much of the waste as possible as shown in Table A3A.2. Volume-based waste charging and disposable products ban serve as socio-economic tools to reduce plastics disposal at source. The national and local governments and government-related public institutions are also mandated to purchase environmentally-friendly products (including recycled products) in order to increase the market demand of recycled products.

TABLE A3A.2 Waste Management Measures Introduced by South Korea⁷⁶

Year	Measures
1992	Waste Deposit-Refund System
1995	Volume-based waste charging system (per bag charging)
1999	Banning or restricting the use of disposable products (by promoting saving and re-use of resources)
2003	Extended Producer Responsibility (EPR) Scheme

⁷⁶ Waste Treatment Policy and Measures in South Korea, URL:
http://www.legco.gov.hk/yr12-13/english/panels/ea/duty_v/eavp1304-3-e.pdf

Extended Producer Responsibility System⁷⁷ - Mandatory recycling is required for producers and importers of 19 types of items and packaging materials, including plastic packaging materials and packaging film under the Extended Producer Responsibility System. Only those reached a certain business scale are obligated to the EPR Scheme. Producers obligated under the EPR system can directly meet the recycling obligations or contract a recycling business to do so. Also, they can join the Recycling Mutual Aid Association and make financial contributions to meet their recycling obligations.

The Ministry of Environment (MOE) is the implementation body of the Scheme. Each year, the MOE announces the total recycling obligations per EPR item that were set by taking into consideration the waste quantity in the market, the amount of recycling collection, and the previous recycling records, as well as the processing capacity of recycling, for each product or packaging material. Each producer under the EPR system receives specific mandatory recycling obligations according to the proportion of each producer's share in the market and must submit their annual recycling plan to the MOE for approval. Once their recycling plan is approved, producers must fulfill their recycling obligations during that particular year. Producers must then submit their progress report with the outcomes by the end of the fiscal year and receive confirmation that they met their recycling obligations from the MOE. The MOE would impose a charge of less than 130% of the actual recycling cost on producers that fail to meet their recycling obligations.

The payment received would be utilized for increasing the recycling capacity and expanding infrastructures, such as plastic (including refuse paper and plastic fuel and oil paints) recycling centres and conducting recycling of difficult-to recycle or untreated items like used plastic sheets from greenhouses.

Further Support to Recycling⁷⁸ - The MOE provides long-term low interest loans to small recycling businesses for the development of recycling facilities and technologies. It also

⁷⁷ Korea - Extended Producer Responsibility (EPR) System, URL:
[http://www.rrrkh.ait.ac.th/3r%20related%20policies/Korea\(30-55\)/52.pdf](http://www.rrrkh.ait.ac.th/3r%20related%20policies/Korea(30-55)/52.pdf)

⁷⁸ Korea - Extended Producer Responsibility (EPR) System, URL:
[http://www.rrrkh.ait.ac.th/3r%20related%20policies/Korea\(30-55\)/52.pdf](http://www.rrrkh.ait.ac.th/3r%20related%20policies/Korea(30-55)/52.pdf)

provides consultations for new recycling companies to establish their businesses. The government allocated a total of 930 billion Korean Won (HK\$6.6 billion) for investment in recycling waste projects from 2009 to 2012, which estimated to be able to create about 16,000 new jobs in the industry⁷⁹. All these measures could strengthen the foundation for recycling.

c) The European Union

Plastic and paper waste is not specifically addressed by European Union (EU) legislation. It is under control by the Waste Framework Directive 2008/98/EC that sets a general recycling target⁸⁰ for household waste which covers, among other materials, plastic and paper waste, while the Packaging Directive 94/62/EC has a specific recycling target for plastic and paper packaging⁸¹. The Waste Framework Directive establishes extended producer responsibility as a key principle in waste management, and sets out the waste management hierarchy. The legislative requirements and actual waste management practice in different member states of the EU vary a lot.

Since plastic waste is categorized as non-hazardous, it can be exported to non-OECD countries following the procedure of the Waste Shipment Regulation (WSR), mostly to Asia. Some would also be illegally shipped overseas⁸².

Producers of waste materials that stay within the EU countries, which the waste was generated and recycled locally or shipped from nearby EU states, would be regulated by the Directive and national laws of individual states. Since 31 December 2008, the minimum recycling targets for paper and plastics materials contained in packaging waste are 60% and

⁷⁹ LEGCO information note (2012) South Korea's waste management policies, URL: <http://www.legco.gov.hk/yr12-13/english/sec/library/1213inc04-e.pdf>

⁸⁰ EU (2008) Waste Framework Directive 2008/98/EC, URL: <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2008:312:0003:0030:en:PDF>

⁸¹ EU (1994) Packaging Directive 94/62/EC, URL: <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CONSLEG:1994L0062:20050405:EN:PDF>

⁸² EU (2013) GREEN PAPER On a European Strategy on Plastic Waste in the Environment, URL: http://ec.europa.eu/environment/waste/pdf/green_paper/green_paper_en.pdf

22.5% by weight respectively, as stated in the Packaging Directive⁸³. Manufacturers essentially have two options for complying with the Directive. They can join a pan-European compliance scheme such as Green Dot or choose to come up with their own packaging recovery programme that complies with the packaging waste recovery targets set forth in the national laws.

Green Dot⁸⁴ is one of the most recognizable registered trademarks of PRO EUROPE and is protected in 170 countries. PRO EUROPE has sublicensed the Green Dot trademark to numerous European countries plus Canada and Turkey. It is not a recycling logo but merely shows that the manufacturer has signed an agreement with a packaging recovery organisation in that country and the appropriate fees are being paid. By doing so, they are absolved of their responsibility to recover their own packaging. The fees themselves vary by country and differ based on the type of material (e.g. paper, plastic or metal). The fees paid help fund recovery and recycling efforts by that packaging recovery organisation. The system takes into account the varying costs of collection, sorting and recycling of various packaging materials. It encourages waste reduction since manufacturers that cut down on packaging waste ultimately pay less in fees. In general, there are several fees that the producers possibly need to pay, including annual licence fee and variable waste generation fee.



FIGURE A3A.3 The Green Dot Symbol

⁸³ EU (1994) Packaging Directive 94/62/EC, URL:

<http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CONSLEG:1994L0062:20050405:EN:PDF>

⁸⁴ Emergo Group (2007) Green Dot & Packaging Waste Directive Compliance in Europe, URL:

<http://www.emergogroup.com/resources/articles/packaging-waste-directive-compliance-europe>

Participation in the Green Dot recovery scheme or any other compliance schemes is not mandatory. A company may choose to carry out the obligation to comply on its own, and report the amount of packaging waste that it recovers. The following introduces the Green Dot implementation details of United Kingdom and Sweden in order to demonstrate the diversity of Green Dot scheme structures in different countries.

d) The United Kingdom

The Producer Responsibility Obligations (Packaging Waste) Regulations were introduced in 1997 in the United Kingdom. Packaging waste recovery and recycling targets have been set for recyclables such as paper and plastics as shown in Table A3A.3. Packaging waste producers reaching a certain annual turnover and packaging handling amount are obligated in the producer responsibility scheme. The obligated companies must prove that they have paid for the requisite amount of tonnes to be recovered each year by buying the appropriate quantity of Packaging Recovery Notes (PRN) for different types of materials. The scheme itself is an open-market-driven mechanism. Obligated companies can choose to participate in the UK's Green Dot scheme provided by consultancy companies like Valpak to comply with the Regulations⁸⁵, or purchase the Packaging Recovery Notes directly from recyclers.

TABLE A3A.3 UK Packaging Waste Recovery and Recycling Targets for 2012 & 2013⁸⁶

Material	2012 (%)	2013 (%)
Paper/card	69.5	69.5
Glass	81	81
Aluminum	40	43
Steel	71	72
Plastic	32	37
Wood	22	22

⁸⁵ Valpak (2013), URL:

<http://www.valpak.co.uk/compliance-services/packaging>

⁸⁶ GovUK - Packaging waste - producer responsibility regimes, URL:

<https://www.gov.uk/government/policies/reducing-and-managing-waste/supporting-pages/packaging-waste-producer-responsibility-regimes>

Packaging Waste Recovery Notes⁸⁷ - PRNs are certificates of recycling evidence purchased to show that a company has met their obligations to fund the recycling and recovery of packaging waste as required by the UK Packaging Waste Regulations. PRN fee is the cost of getting the recycling evidence notes needed to meet the obligation. PRNs are sold on an open market which means prices are dependent on supply and demand. The system works as shown in Figure A3A.4 and Figure A3A.5.

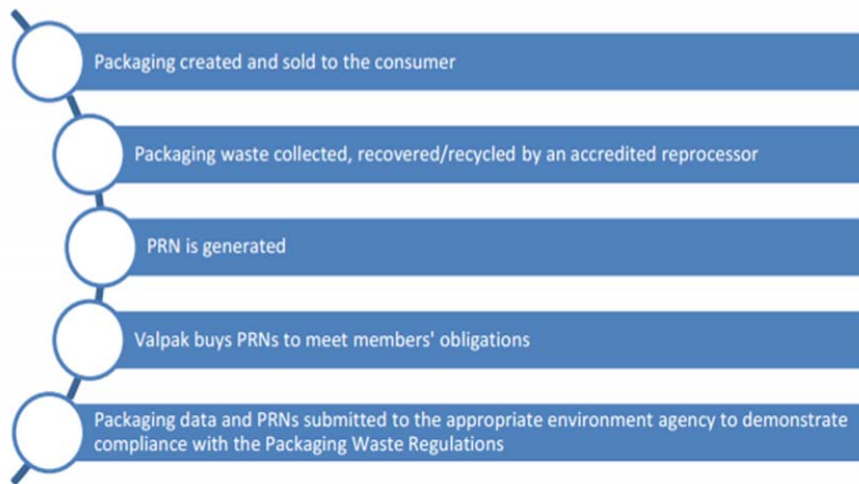


FIGURE A3A.4 The UK system of packaging recovery



FIGURE A3A.5 The Mechanism of PRN Price Determination⁸⁸

⁸⁷ Emergo Group (2007) Green Dot & Packaging Waste Directive Compliance in Europe, URL: <http://www.emergogroup.com/resources/articles/packaging-waste-directive-compliance-europe>

⁸⁸ UK – Valpak - PRN fee, URL: <http://www.valpak.co.uk/docs/default-source/packaging-compliance/an-overview-of-the-prn-system.pdf?sfvrsn=2>

A licensing system is established to accredit reprocessors and exporters to issue a PRN for local recycling, and Packaging Export Recovery Note (PERN) for exported packaging respectively. For a percentage of each tonne of packaging waste generated, a PRN or PERN is required as proof of a tonne of that material (paper, glass, plastic, aluminum, steel or wood) has been recycled. The price of PRNs and PERNs is set by the reprocessors according to the availability of materials being recycled, thus PRNs have joined the commodities marketplace.

For those manufacturers joining Valpak in compliance with the Regulations, there are two more sets of fees that the producers have to pay, including agency fees (registration fees and subsidiary fees) and annual membership fees besides the packaging waste recovery notes (PRN) fees as shown in Table A3A.4 and Table A3A.5. The agency fees are a relatively fixed fee according to the agency the manufacturer chooses and the number of subsidiaries they have. The annual membership fee covers the administration costs of checking and verifying the data and hence varies according to the obligated quantity of packaging waste produced⁸⁹. Valpak's packaging compliance scheme will purchase PRNs throughout the year and will charge members the average price at the end of the year. A forecast of what Valpak expects as the final year price will be provided and the forecast will be adjusted throughout the year as Valpak buy the PRNs and knows the actual price. Depending on how the market acts throughout the year, Valpak will charge the members the final price at the end of the year (December).

⁸⁹ UK - Packaging Compliance Fees, URL:
<http://www.valpak.co.uk/docs/default-source/packaging-compliance/packaging-compliance-fees.pdf?sfvrsn=2>

TABLE A3A.4 Agency Fee of the UK's Scheme in 2013

Registration Fees

Agency	SME Fee	Full Submission
EA	£345	£564
SEPA	£345	£564
NIEA	£564	£776

Subsidiary Fees

Number of Subsidiaries	Fee Per Subsidiary
1 - 4	£180
5 - 20	£90
>21	£45

TABLE A3A.5 Annual Membership Fee of the UK's Scheme in 2013

Obligation	Annual Membership Fee
SME membership	£400
0 – 400 tonnes	£500
401 – 1,000 tonnes	£750
1,001 – 2,000 tonnes	£1,000
2,001 – 4,000 tonnes	£1,500
>4,000 tonnes	£2,500

*Price of Plastic Waste under the PRN System*⁹⁰ - As the PRNs are sold on an open market, the prices are dependent on the supply and demand of PRNs. The price of sorted plastics with its natural colour is higher than those mixed and coloured ones. The price of natural high-density polyethylene (HDPE) is higher than polyethylene terephthalate (PET), followed by mixed colour HDPE, mixed HDPE and PET plastic bottles, and coloured PET as shown in Figure A3A.6 For plastic films from business and industry sector, clear and natural

⁹⁰ LetsRecycle (2013) UK Plastics, URL:
<http://www.letsrecycle.com/prices/plastics>

polyethylene (PE) or polypropylene (PP) has higher price than the mixed and printed ones as shown in Figure A3A.7. Comparing to the price of plastics in Hong Kong, prices of plastics in the UK is distinctively higher as the accredited reprocessors and exporters would compete with each other to collect and recycle the packaging materials in order to make revenue by generating PRNs. The change in supply and demand of PRN or PERN would lead to self-adjustment of the free market, making the system sustainable in the long run.

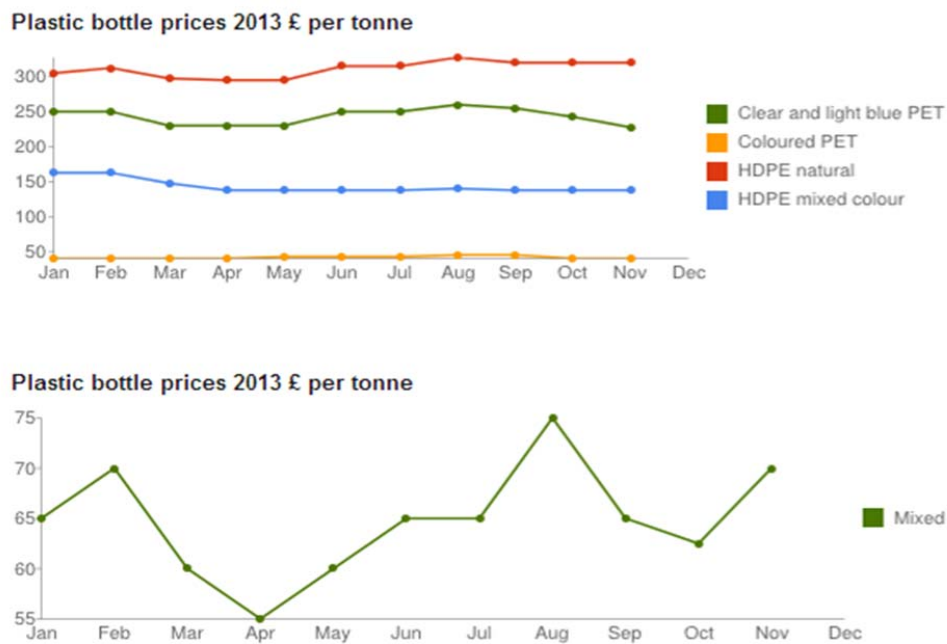


FIGURE A3A.6 Plastic Bottle Prices in the UK in 2013

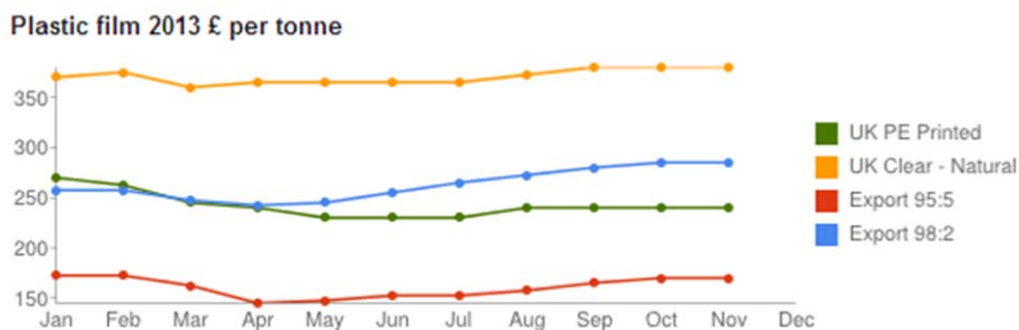


FIGURE A3A.7 Plastic Films Prices in the UK in 2013

e) The United States

There is no national law that mandates recycling. The state and local governments often introduce their own recycling requirements and targets. In general, there are several types of policies to be adopted, including deposits/ refund values on beverage containers, mandatory recycling, landfill bans of recyclable materials, recycling goals, and voluntary programmes to increase recycling rate.

Some cities like Seattle have mandatory recycling. While the business sector is currently mandated to recycle paper and cardboard, residential customers have been required to recycle cardboard, paper, glass, plastic, tin and aluminum since 2005. All recyclables are prohibited from Seattle's household, apartment and business garbage.

For households, fines would not be applied for failing to segregate and recycle waste. However, if too many mixed recyclables are found in the garbage, a tag will be left to request the producer to sort the recyclables out. The garbage collector from Seattle Public Utilities will collect the garbage bin during the next visit, i.e. the next week. It could motivate the waste producers to separate recyclables out by continuous education. For businesses, if more than 10 percent of the garbage container is found to be filled with recyclables, a tag will be imposed. On the third tag a USD \$50 fine would be left. It works the same way on apartments⁹¹.

⁹¹ Seattlepi (2006) Mandatory recycling program working well, URL:
<http://www.seattlepi.com/local/article/Mandatory-recycling-program-working-well-1198413.php>

APPENDIX 3B - VIEWS & COMMENTS COLLECTED FROM STAKEHOLDERS - WASTE PLASTIC

a) Need to Provide Assistance to Waste Plastics Collectors and Recyclers

- The market value of the recovery wastes will determine the quantities collected for recycling. Therefore, the Government should provide subsidies as an incentive to the recycling industry to collect lower value wastes such as waste plastics. The subsidy level can be determined with reference to global prices such as those on the “世界廢料網” and “中國廢料網” (worldscrap website).
- The Government should facilitate the industry in purchasing insurance for their work as some recyclers cannot obtain insurance cover at the moment due to the lack of regulation and recognition.
- The Government can help by planning and allocation of land resources required for the development of the plastic waste collection and recycling industry.
- Either a subsidy to waste collectors to increase plastic waste collection rate, or a land provision to plastic waste recyclers should be offered by the government.
- The plastic sorting process is the most costly part of the recycling process and the Government should provide a subsidy for this process.
- The Government is now leasing land to recyclers in 3 or 5 years term. When the contract expires, the Government should assess the existing tenant. If the tenant is performing well, the Government should extend the contract instead of taking back the land and releasing it for tender. Otherwise, the recyclers will not make large investments on the existing business. The land should be released by the Environment Bureau instead of Lands Department because Lands Department will focus less on technical criteria.

b) Suggestion about Source Separation and Waste Plastic Collection

- Contracts of waste collection from residential area should not be bundled to include all three types of recyclables together (paper, metal and plastics) as it would reduce the collection rate of plastics waste.
- The Government can contract out the waste collection and recycling of each type of recyclables according to districts so that collectors can better coordinate the transportation and logistics of moving the recyclables, instead of individual contracts with property management companies.
- In addition to community recycling centres, there should be more mobile waste plastics collection points/stations being established, to encourage more citizens to recycle their waste. These mobile points/stations can also be used to promote the proper segregation and recycling of plastic waste such as cleaning beverage bottles, sorting of different plastics, etc.
- Some collectors have expressed that the collection of waste plastics is greatly affected by the ultimate use of the collected plastics. When there are no end uses for a certain type of plastic, it would not be properly collected and, therefore, would end up in landfills instead.

c) Difficulties Encountered within the Waste Plastic Recycling Trade

- Some collectors as well as recyclers have shown interests in developing their own plastic waste recycling facilities in Hong Kong, however, the high cost of renting land is preventing them from doing so.
- Hampered by the “Green Fence” policy at the moment, many of the waste plastic collectors only collect and trade Polyethylene terephthalate (PET) because it has the highest commercial value.
- NGOs mentioned that more support on recycling activities would be beneficial to reduce their operation costs. Many of the waste collection activities spanned long working hours

(e.g. 7 pm onwards) when people were off work. Therefore, the NGOs or collectors would need to store the waste plastics and deliver them the next day, thereby increasing the operation costs.

- Some NGOs encountered difficulties in renting or applying for venues from property management companies or the Lands Department to set up mobile waste collection points. It has, therefore, been suggested by some NGOs that the Lands Department and Housing Department could allocate certain areas for NGOs to apply, under simplified procedures as waste collection points. Currently, setting up mobile collection points on streets requires approval from the Lands Department, which is only open for application on a monthly basis.
- Some waste collectors mentioned that some NGOs at present receive funding from the Government to collect and recycle wastes. This is viewed as an indirect form of subsidizing waste collection and is preventing the development of waste recycling because the quantities collected by private companies are reduced.

d) Need to Enhance Promotion and Education on Waste Plastics Recycling and Other Supporting Activities

- A recognition scheme of qualifying experienced workers in plastic waste sorting procedures should be established.
- There is an opinion that NGOs may not have the waste collection capabilities and capacities and distribution channels of private companies, therefore, are not effective waste collectors and recyclers. NGOs should focus on the education and promotion aspects. They could focus on the promotion and education of recycling, and not on running a recycling business. The Government's resource may not be cost-effectively spent to subsidize them while the actual recycling rate in Hong Kong would not be improved.
- Some NGOs have revealed that many of the waste plastic containers collected were not clean or contaminated. They suggested that the Government could step up efforts in

educating and promoting the benefits of source separation of waste and cleaning the separated plastics such as organizing an “Environment Protection Day” or “Green Day”.

APPENDIX 4A - VIEWS & SPECIFIC COMMENTS COLLECTED FROM STAKEHOLDERS REGARDING RECYCLING PAPER

a) General Views Collected

- A recycler mentioned that existing paper recycling is already very mature and doesn't need Government support.
- Tissue cannot or is very difficult to recycle because of hygiene issues.
- It is difficult to carry out actual paper recycling activities in Hong Kong because chemicals are used in the deinking process in paper recycling and the wastewater generated needs to be further treated before discharge to meet the regulatory requirements. Extra cost, land and expertise would be required for paper recycling.
- A free newspaper producer tried to recover more newspaper by allocating some temporary newspaper recycling bins at roadside every morning. However, due to the allegation about the obstruction of public space, they had to terminate the newspaper collection plan.
- A free newspaper producer expressed the concern that some of the readers passed the newspaper to the elderly for recycling instead of returning it to the collection bins provided for redistribution. They may have to print more to maintain circulation.

b) Provide Assistance to Waste Paper Collectors

- The Government can be more flexible in its enforcement of certain land use for waste paper recycling.
- The Government could extend the scope of recycling to cover Tetra Pak containers. Some recyclers showed interest in treating Tetra Pak containers if Government assistance / subsidy are provided e.g. a PRS for Tetra Pak beverage containers. In fact, a recycler mentioned that Tetra Pak containers can be recycled more easily than plastics. The collected waste Tetra Pak container can be washed then separated into its components. It

is estimated that the market value for the aluminum component from Tetra Pak containers is around HK\$20,000 per tonne. However, it is estimated that for a Tetra Pak recycling plant to be economically viable, at least 25 tonnes per day of Tetra Pak must be collected.

- The Government should allocate more recycling bins in public area, especially areas with crowd of people (e.g. Mong Kok, Tsim Sha Tsui etc.) so as to increase the newspaper recycling rate. Moreover, the volume of waste paper recycling bins should be increased.
- The Government should increase the education or awareness of source segregation of waste paper.

APPENDIX 5A - COMPARISON OF ESTIMATES OF UCO GENERATION QUANTITY

Since UCO is mostly generated from food outlets (including restaurants, fast food stores, etc.) and food factories, this Study attempted to provide a different perspective on assessing the estimated arising figure based on, benchmarking with typical average UCO generation figures from food outlet/factory in other jurisdictions as shown in Table A5A.1. Based on the data from Taiwan and the U.K., the UCO generation in Hong Kong is estimated to be around 15,000 tonnes per year and 11,000 – 22,000 tonnes per year (average 16,500 tonnes) respectively, while the estimate based on the data from New York are 27,000 tonnes per year. The estimate based on New York is expected to be higher than the actual generation in Hong Kong due to prevalence of deep-fried fast-food in the U.S. Nonetheless, the cuisine in Hong Kong is a wide combination of many different styles that direct reference is hardly possible. The annual UCO generation estimate of 16,000 tonnes agreed reasonably well with the referenced figures from other jurisdictions.

FIGURE A5A.1 Comparison of Estimates of UCO Generation Quantity

	Taiwan Data ⁹²	U.K. Data	New York Data ⁹³	Estimates by local biodiesel manufacturers
(i) Reported estimates of UCO generation [tonnes per year]	44,429 ⁹⁴	75,000 - 150,000 ⁹⁵	29,000	
(ii) Number of corresponding UCO producers	47,602	107,739 ⁹⁶	17,000	
(iii) Number of food and catering business in Hong Kong	15,557 ⁹⁷			
(iv) Estimates of UCO generation in Hong Kong [tonnes per year]	14,520	10,830 - 21,659	26,538	Roughly 20,000

Calculation Remarks: (iv) = (i) / (ii) x (iii)

⁹² 國立聯合大學理工學院 (2012), p5, Retrieved on 17 Dec 2013

⁹³ Dept. of Environmental Protection of New York (2012), New York City Business Integrity Commission, Department of Environmental Protection, and Mayor's Office of policy and strategic planning launch comprehensive strategy to help businesses comply with grease disposal regulations, URL: http://www.nyc.gov/html/bic/downloads/pdf/pr/nyc_bic_dep_mayoroff_policy_10_18_12.pdf, p2, Retrieved on 9 Jan 2014

⁹⁴ UCO from food and catering business

⁹⁵ The Royal Society of Chemistry (2012), Food waste as a valuable resource for the production of chemicals, materials and fuels. Current situation and global perspective, Energy and Environmental Science, p11, URL: http://home.ust.hk/~keclin/publication_update/2012_Food_waste_as_a_valuable_resource_for_the_production_of_chemicals_materials_and_fuels.pdf, Retrieved on 31 Dec 2013

⁹⁶ Eurostat (2012), Annual detailed enterprise statistics on services (NACE Rev. 1.1 H-K), H553-H555 Restaurants; bars; canteens and catering, URL: http://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=sbs_na_1a_se&lang=en, Retrieved on 31 Dec 2013

⁹⁷ C&SD (2012), Subscribed F&B Data

APPENDIX 5B - TECHNOLOGIES TO RECYCLE UCO

UCO can be recycled to biodiesel, animal feed, and oleochemicals. Biodiesel and animal feeds are the two major recycled products from UCO. However, in some jurisdictions, such as in the U.K., recycle of UCO as animal feed is, in general, forbidden due to concerns in contaminating the food chain. In this section, the technical aspects of recycling UCO to biodiesel are studied.

UCO Recycled as Biodiesel

Filtered UCO is combined with methyl alcohol and catalyst in a reactor and agitated for about an hour at 60°C. Batch reactors are often adopted in smaller plants, while continuous flow processes involving continuous stirred-tank reactors (CSTR) or plug flow reactors is utilized by most larger plants (> 4 million liters per year). Figure A5B.1 illustrated the process flow for biodiesel production⁹⁸.

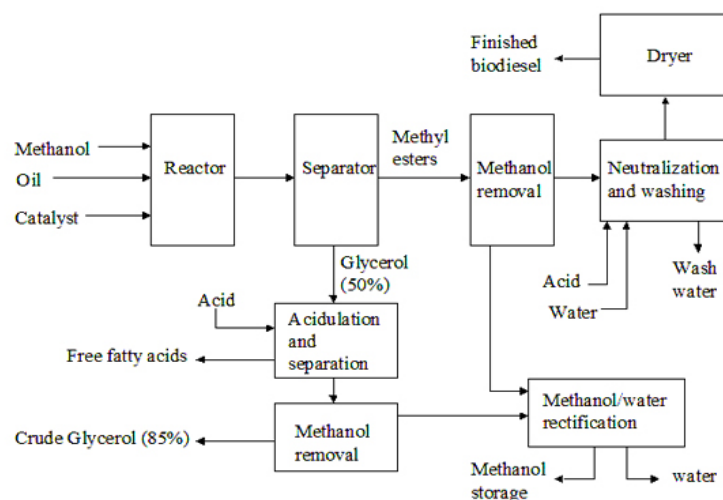


FIGURE A5B.1 Process Flow Schematic for Biodiesel Production

⁹⁸ eXtension (2012), Commercial and Large Scale Biodiesel Production Systems, URL: <http://www.extension.org/pages/27537/commercial-and-large-scale-biodiesel-production-systems#.Ust5EPQW33k>, Retrieved on 7 Jan 2014

Following the reaction in the reactor, glycerol is removed from the methyl esters (primary molecules in biodiesel) by a separator (a settling tank or a centrifuge). After separation from the glycerol, the methyl esters pass through a methanol stripper which is often a vacuum flash process or a falling film evaporator. The methyl esters then enter a neutralization step and water washing. In this step, acid is added to the biodiesel to neutralize any residual catalyst and to split any soap that may have formed during the reaction. Soaps will react with the acid to form water-soluble salts and free fatty acids. The salts will be removed during the subsequent water washing step and the free fatty acids will stay in the biodiesel. The water washing step aims to remove any remaining catalyst, soap, salts, methanol or free glycerol from the biodiesel. The previous neutralization before washing reduces the water required and minimizes the potential for emulsions to form when the wash water is added to the biodiesel. Following the wash process, any remaining water is removed from the biodiesel by a vacuum flash process. In recent years, so-called waterless wash processes have been developed that minimize the need for waste water treatment and disposal.

Lard oil as Biodiesel Feedstock

Lard oil, in technological principle, can be used as biodiesel feedstock. According to the Hong Kong & Kowloon Lard Association, the daily production capacity of lard in Hong Kong is around 48,000 kg, the majority of which is exported to mainland China and the rest are exported to Japan, Taiwan and other countries. The domestic export of lard oil in HK is 6,804 tonnes in 2012, showing that the lard producers in HK are running at around half of their maximum capacity. According to the trade, the lowest grade of lard oil or residual can be sold at RMB 5 per litre (equivalent to HKD 6.4 per litre), which corresponds to HKD 6,400 per tonne. Such price is well above the price range of UCO. As such, lard oil as biodiesel feedstock is unattractive to both lard oil producer and biodiesel manufacturers, and therefore it is expected that there is no lard oil being used as feedstock for biodiesel plants in HK.

APPENDIX 5C - VIEWS & COMMENTS COLLECTED FROM STAKEHOLDERS

a) Need to Further Promote Wider Use of Biodiesel

- The Government could consider mandating a biodiesel blend for the diesel fuel. A blending ratio of B20 is claimed to be the most suitable blending composition as it would not affect the mileage performance but yet have a significant emission reduction.
- The Government should take lead in using biodiesel blend at reasonable or market prices and give higher priority in procuring biodiesel blend from local biodiesel producers and not solely pick a supplier who offers the lowest price.
- The Government or public bodies could require contractors to use fuel blended with biodiesel by specifying this in tender and procurement documents, for example, in construction projects.
- The Government could consider allocating funding and financial support for users of biodiesel fuel.
- It was also expressed that incentive systems to support local biodiesel producers could be set up. It can be similar to an incentive system in the U.S. called RINs (Renewable Identification Numbers) whereupon any renewable energy produced can be subsidized by a certain amount of subsidies ranging from USD 0.6 to 1 per gallon.
- The EPD / University of Hong Kong (2003) Study regarding the vehicle compatibility to biodiesel is outdated and need to be reviewed in light of technological advancement.

b) License and Regulate UCO and GTW Collection and Recycling

- In parallel with the control over chemical waste or clinical waste on waste producers and collectors, the Government could set up a licensing system to prevent inappropriate reuse or recycling of UCO and GTW. In such a control scheme, restaurants are required to engage a licensed UCO and GTW collector as a requirement of obtaining and renewing their license, and to report the amount of UCO and GTW they produced and how they

disposed of it and who collected it. These reports could be verified with the records of the licensed collectors and disposers. All the UCO producers interviewed supported the policy on implementation of the mandatory UCO/ GTW registration scheme, so that they will only engage registered collector to collect/ dispose of UCO/ GTW in order to safeguard the proper end use of the UCO/ GTW. Some of them also expressed that the scheme should be regularly monitored by the Government.

- If the registration of UCO/GTW collectors is only a voluntary scheme, some of the UCO producers claimed that they will still support this scheme by engaging the registered collectors only. Nevertheless, some others indicated that they will only support it if the collection fee and service quality of the registered collectors are similar to the non-registered service providers.
- The Government could consider requiring the licensed collectors to sell UCO and GTW to companies with a disposal license. The Government would only issue disposal licences to local companies with genuine disposal or conversion facilities in Hong Kong (e.g. export or biodiesel plant). In addition, disposal licence may also permit exporting UCO for biodiesel production in other jurisdictions for the proper functioning of the UCO collection market in Hong Kong.
- All the UCO producers supported the policy on keeping copies of the transaction record for a period of time. However, one of them expressed that the transaction records should be kept by the collector only, otherwise it would cause burden to their business. In fact, most of them have been keeping copies of the transaction record for their business operation.
- Some of the UCO collectors supported implementing a mandatory UCO registration scheme / licensing system. However, one of the UCO collectors raised concern that the mandatory UCO registration scheme may not be too effective because it would be difficult to chase whether the UCO / GTW collector is really selling their UCO / GTW to qualified local recyclers or companies who export the UCO.
- Some stakeholders opined that a licensing system is not necessary for UCO collectors but is suitable for large UCO recyclers. However, if the licensing system is required for

UCO collectors; the entry requirement should be low. Issuing permits through a licensing system will help the trade, in particular small scale waste collection companies, to buy insurance because it demonstrated that this is a professional business.

- The Government should make it clear that interfering with a cargo of GTW by skimming the oil off it would be an offence.

c) Difficulties Encountered within the Trade in Disposing of UCO and GTW

- In the course of separating UCO for recycling, most of the UCO producers expressed that the storage area of UCO is a major concern because of the lack of space in their outlets; while one of them pointed out that they generally lack the manpower resources for the separation of UCO. However, some of the stakeholders did not encounter any difficulties as they have gained considerable experience already.
- It is not uncommon to dispose of the UCO/ GTW together with the kitchen refuse in the restaurants, particularly for those small-sized restaurants. Also, it is not uncommon to dispose of the UCO/ GTW into the sewer or drains, especially for those not managed by shopping malls and do not have a Water Pollution Control Ordinance (WPCO) license.
- Regarding the possible assistance/ support provided by the Government, some of the UCO producers expressed that the Government should provide collecting contractor for UCO and GTW to them and monitor their service quality; while one of them expressed that the Government should provide funding support for the separation of UCO.
- Some of the collected UCO is likely to be sold to places outside Hong Kong for simple purification, which is then distributed for human consumption.
- Currently, part of the UCO collection is implemented either by “small collection companies” or “individuals” who ultimately sell the UCO to “larger UCO collectors”. So it may be difficult to register these small / individual first hand collectors who collected UCO from the food and beverage outlets.

APPENDIX 5D - POTENTIAL OF USING LOCAL UCO TO MEET LOCAL DEMAND

a) *Potential of using Local UCO to Meet the local Biodiesel Demand in Road Transport*

The UCO after conversion into biodiesel can be used to power the diesel driven vehicles in Hong Kong.

At present, the goods vehicles and buses in Hong Kong run predominantly on diesel. According to Electrical and Mechanical Services Department (EMSD), the energy consumption by goods vehicles and buses were 29,456 and 16,887 terajoules respectively as reported in Table A5D.1.

In order to determine how much biodiesel is required to meet the energy demand of local road transport which burns diesel, and to determine whether biodiesel produced from local UCO can fully meet the demand, the energy density of biodiesel blend is derived. If the end-use biodiesel blend is 5% (B5) that has 5% biodiesel and 95% conventional diesel by volume, the energy density of B5 is therefore:

Energy density of B5 (MJ/L)

$$\begin{aligned} &= 0.05 \times \text{Energy density of B100 (MJ/L)} + 0.95 \times \text{Energy density of conventional diesel (MJ/L)} \\ &= 0.05 \times 33 \text{ (MJ/L)} + 0.95 \times 36 \text{ (MJ/L)} \\ &= \underline{35.85 \text{ (MJ/L)}} \end{aligned}$$

As a result, the volume of B100 required for B5 blend for goods vehicles and buses is 41,082 and 23,552 cubic metres (or 37,796 and 21,668 tonnes in weight) respectively, as shown in Table A5D.1.

TABLE A5D.1 Energy End-use of Goods Vehicles and Buses in 2011 ⁹⁹

	Energy Consumption (TJ)	B100 required for B5 Blend (m ³)
Goods Vehicles	29,456	41,082
Buses	16,887	23,552
Sum	46,343	64,635

b) Potential of using Local UCO to Meet the local Biodiesel Demand in Industrial Machinery

The UCO after conversion into biodiesel can be used to power the industrial machinery in Hong Kong.

According to EMSD, the oil & coal product energy end-uses by industrial process and equipment (excluding electricity generation and town gas generation) was 6,752 terajoules as shown in Table A5D.2. In Hong Kong, as industrial machinery seldom runs on coal and petrol, it is therefore reasonable to assume that consumption is contributed by diesel.

In order to determine how much biodiesel is required to meet the energy demand of local industrial machinery which burns diesel, and to determine whether biodiesel produced from local UCO can fully meet the demand, the energy density of biodiesel blend is derived. If the end-use biodiesel blend is 50% (B50) that has 50% biodiesel and 50% conventional diesel by volume, the energy density of B50 is therefore:

$$\begin{aligned}
 & \text{Energy density of B50 (MJ/L)} \\
 &= 0.5 \times \text{Energy density of B100 (MJ/L)} + 0.5 \times \text{Energy density of conventional diesel (MJ/L)} \\
 &= 0.5 \times 33 \text{ (MJ/L)} + 0.5 \times 36 \text{ (MJ/L)} \\
 &= \underline{34.5 \text{ (MJ/L)}}
 \end{aligned}$$

As a result, the volume of B100 required for B50 blend for industrial machinery is 97,855 cubic metres (or 90,027 tonnes in weight) respectively, as shown in Table A5D.2.

⁹⁹ EMSD (2013), Hong Kong Energy End-use Data 2013, URL: http://www.emsd.gov.hk/emsd/e_download/pee/HKEEUD2013.pdf, p47, Retrieved on 13 Dec 2013

TABLE A5D.2 Energy End-use of Goods Vehicles and Buses in 2011¹⁰⁰

	Energy Consumption (TJ)	B100 required for B50 Blend (m ³)
Industrial Machinery	6,752	97,855

Assuming all the locally produced 16,000 tonnes per year of UCO is used for biodiesel production at a very high yield of up to 95% yield, the biodiesel produced from local UCO could be fully consumed in Hong Kong. In fact, additional import of biodiesel or UCO is needed to compensate for the deficit in order to satisfy the demand of trade-wide B5. However, as Hong Kong is a Freeport, there is no guarantee that local UCO will be recycled and used locally since the biodiesel manufacturers may import UCO or the fuel supplier may import biodiesel for blending.

In conclusion, depending on the quantity of foreign UCO and biodiesel imported by biodiesel manufacturers and fuel suppliers, the biodiesel produced from the local UCO could possibly be fully consumed locally when a biodiesel blending into diesel fuel is trade-wide in Hong Kong.

- End of Appendices -

¹⁰⁰ EMSD (2013), Hong Kong Energy End-use Data 2013, URL: http://www.emsd.gov.hk/emsd/e_download/pee/HKEEUD2013.pdf, p47, Retrieved on 13 Dec 2013