

A FOOD WASTE & YARD WASTE PLAN FOR HONG KONG

2014-2022

Environment Bureau



CONTENTS

TITLE	PAGE
Message from the Chief Executive	1
Special Messages from Principal Officials	2
Preface	4
1 Our Vision for Reducing Food Waste	5
2 Our Target and Strategy for Food Waste	8
3 Food Waste Avoidance	10
4 Separation and Collection of Food Waste	13
5 Treatment and Recycling of Food Waste	17
6 The “Leftovers” for Disposal	23
7 Dealing with Yard Waste	24
8 Conclusion	28
Annex	29
Abbreviations	31

Message from the Chief Executive



“Waste Not” is one of my deepest personal beliefs and I try to live by it. Reducing food waste is a subject I feel particularly strongly about. I frequently discuss topics such as avoiding food waste at source and separating out food waste from other waste for recycling. My family and I have considerable hands-on experience on a small scale at our home. This experience has deepened my passion for working with the people of Hong Kong to change our wasteful habits. If we all spend a bit more time and effort, we can significantly reduce food waste in Hong Kong.

My Election Manifesto includes a clear commitment to “promote food waste reduction, encourage the business and industrial sector to undertake sorting of their waste at source, build more organic waste recycling and treatment facilities, and encourage the full use of recycled resources such as compost”.

I congratulate the Environment Bureau on publishing this blueprint on food and yard waste which articulates Hong Kong’s stance with respect to organic waste and how the Government is tackling the issue. To succeed, we require everyone’s support at each step along the way. The journey is complicated, as it involves many aspects and there are many details to be worked out. All this will take time, but there should be no doubting our commitment to reduce food and yard waste.

CY Leung

Chief Executive
Hong Kong Special Administrative Region

Special Messages from Principal Officials

“ One of my responsibilities in this term of Government is to provide steer to the Environment Bureau in the overall mainstreaming of organic waste reduction and treatment. The Steering Committee to Promote Sustainable Development of the Recycling Industry that I chair, among other duties, provides an internal platform to align more effectively the work of Government departments in waste management, including the management of organic waste. ”

Carrie Lam Chief Secretary for Administration

“ Public money and food alike are scarce resources. Consistent with the principle of fiscal prudence, we should avoid and reduce food waste. ”

John C Tsang Financial Secretary

“ Proper handling of waste is a challenging task, including enactment of new legislation and amendment of existing ones. We all share a responsibility to reduce food waste at source. I will give my full support and practise food waste reduction. ”

Rimsky Yuen, SC Secretary for Justice

“ If Hong Kong is truly to deal with our large quantities of food waste, households will need to take on the responsibility to firstly avoid and reduce food waste, and when the food waste recycling system incrementally develops, separate their food waste. Colleagues responsible for public housing management will promote food waste reduction in the coming years to dovetail with the Government’s overall food waste programme. ”

Professor Anthony Cheung Secretary for Transport and Housing

“ As the Chinese saying goes, ‘One should know that every single grain on the plate is the fruit of hard work’. Cherishing food is a traditional Chinese virtue. For urban dwellers living in densely populated cities nowadays, it is all the more necessary to reduce food waste. We support launching the environmental protection projects at district level to promote the ‘Food Wise’ culture and waste reduction. ”

Tsang Tak-sing Secretary for Home Affairs

“ There are issues which we can talk about; yet food waste reduction is beyond negotiation. Let’s work together to achieve our shared goal – to reduce food waste right from this meal! ”

Raymond Tam Secretary for Constitutional and Mainland Affairs

“ Hong Kong, as a bustling city, generates around 9 000 tonnes of municipal solid waste every day. Food waste accounts for about 40% (i.e. 3 900 tonnes) of them, equalling the weight of about 250 double-decker buses. The community has therefore put in large amount of land resources and public money to handle the waste. Let’s join hands to find ways to reduce food waste and save social resources. ”

Professor KC Chan Secretary for Financial Services and the Treasury

Special Messages from Principal Officials

“ I am particularly interested in making the fullest and best use of surplus edible food by redistributing and donating it to people in need. I understand from non-governmental organisations (NGOs) engaged in food donation and poverty alleviation that there should be huge potential in this respect if the supply and demand chains can be better coordinated. I look forward to wider tripartite collaboration involving NGOs, the business sector and the Government in unleashing this potential! ”

Matthew Cheung Kin-chung Secretary for Labour and Welfare

“ The catering and hospitality sector in Hong Kong is highly sophisticated and vibrant. Regardless of whether an establishment caters for budget or luxury customers, food wastage is to be discouraged. Members of the sector participating in the Food Wise Hong Kong Campaign are to be commended for their efforts. ”

Gregory So Secretary for Commerce and Economic Development

“ The disciplinary forces could be at the forefront of changing behaviour in how to deal with food waste. I am encouraged by the early success in one of our correctional institutions, which has the potential to be up-scaled. ”

TK Lai Secretary for Security

“ I am pleased to collaborate with the Secretary for the Environment to see how schools can help further reduce food waste. I noticed that some schools’ effort has borne fruit, and I am very proud of it. ”

Eddie Ng Secretary for Education

“ I will call upon all civil servants to practice food avoidance and reduction. I believe civil servants and their families can play an important role in changing community behavior. ”

Paul Tang Secretary for Civil Service

“ Promoting food donation is worthy of support from different sectors of the community. To facilitate the work of food donation agencies, the Centre for Food Safety has issued the ‘Food Safety Guidelines for Food Recovery’ for their reference. ”

Dr WM Ko Secretary for Food and Health

“ I support the Environment Bureau’s work in handling yard waste. The Development Bureau will assist relevant departments to implement yard waste reduction measures from planting design to maintenance stages. ”

Paul Chan Secretary for Development

Preface

We all know we need to change our habits so that we can live more sustainably. Treasuring our resources is essential to achieving environmental sustainability.

We have set a goal for Hong Kong that by 2022, we will reduce our per capita municipal solid waste disposal rate by 40% using 2011 as the base. This means each one of us must work hard to reduce our daily waste at home, at school, at work and even when we recreate.

One thing that we can all do is to become much more aware of the food we buy and eat, and to treasure our good fortune to have sufficient food to nourish us. By avoiding food waste, we will play our part for the environment to ease further pressure on the world's food system when so many individuals and families still face hunger all over the world, and even in affluent Hong Kong.

Our grandparents and parents were more careful in how they handled food. They did not over-buy or throw away leftovers when Hong Kong was a less wealthy society – now that we have wealth and also knowledge, we should be proud of adopting “Use Less, Waste Less” practices because we know better.

Our *Blueprint for Sustainable Use of Resources 2013-2022* published in May 2013 articulates our strategy on waste management to reduce, recycle, treat and dispose of waste. This document addresses Hong Kong's organic waste – namely food waste and yard waste. This is a companion document to the Blueprint, and articulates the specific strategy for tackling food and yard waste. I urge you to read both of them and join hands with us for this cause.

Just remember that when you leave food in your bowl; when you prepared or ordered too much food; when food is spoiled because you forgot to eat it – these all generally gets thrown away and end up in our landfills. So, take more care not to waste. Don't be a Big Waster.

KS Wong

Secretary for the Environment

February 2014

1 | Our Vision for Reducing Food Waste

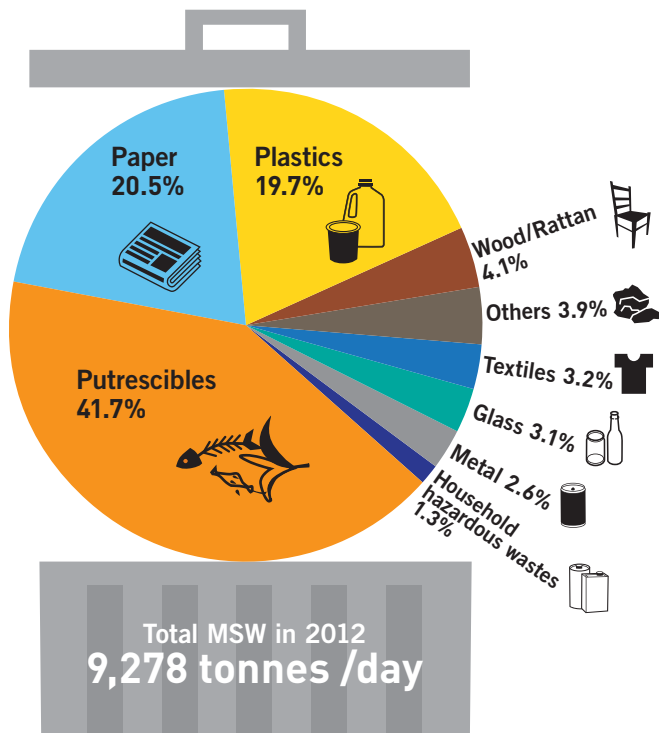
“Use Less, Waste Less”

Our overall vision is to “Use Less” and “Waste Less” of the earth’s resources through instilling an environmentally-sustainable culture into Hong Kong people’s daily lives.

Our *Blueprint for Sustainable Use of Resources 2013-2022* (the Blueprint) published in May 2013 provides a broad picture of our plan and strategy to deal with waste with a view to reducing impact on our environment. As stated in the Blueprint, the starting point of our new policy is to adopt a different attitude to waste in Hong Kong: our waste stream contains a treasure trove of useful resources, much of which can be reused, recycled and recovered.



Figure 1 Composition of MSW in Hong Kong, 2012



Overall Waste Reduction Target

Our target is to reduce the Municipal Solid Waste (MSW) disposal rate to landfill by 40% on a per capita basis by 2022 using 2011 as the base.

Of the approximately 9,000 tonnes of MSW that is thrown away at landfills everyday, some 40% are made up of “putrescibles”,¹ which are various types of organic waste that decompose and create odour. It is mainly made up of food waste (around 90%) but includes some other waste, such as yard waste and personal care cotton products.

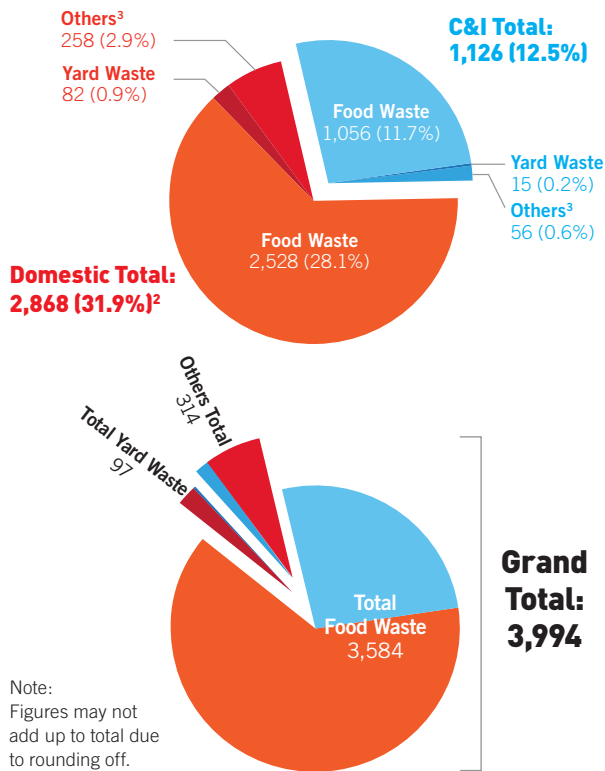
Food Waste

Among organic waste in Hong Kong, food waste constitutes the majority of putrescible waste. Food waste is any waste, whether raw, cooked, edible and associated with inedible parts generated during food production, distribution, storage, meal preparation or consumption of meals.

1. “Monitoring of Solid Waste in Hong Kong – Waste Statistics for 2011”, <https://www.wastereduction.gov.hk/en/materials/info/msw2011.pdf>.

1 | Our Vision for Reducing Food Waste

Figure 2 Breakdown of Putrescible Waste in 2011
tonnes/day (% of MSW)²



Hong Kong's food waste

In 2011, our base year, Hong Kong people threw away about 3,600 tonnes of food waste every day – two-thirds came from households (around 2,500 tonnes) and one-third from food-related commercial and industrial (C&I) sources (around 1,100 tonnes).

Our food waste disposal is equivalent to throwing away the weight of approximately 250 double-decker buses every 24 hours or nearly 100,000 double-decker buses every year. Reducing the quantity of food waste is critical to Hong Kong achieving our overall waste reduction target by 2022.

Hong Kong is not alone in producing large quantities of food waste. Figure 4 shows other cities with developed

economies also generate significant quantities of food waste. Thankfully, there is a growing realization that food waste prevention and reduction should be high on the policy priorities of municipal authorities.

Everyone a Recycler

Everyone consumes food – at home, at work or dining out – so each one of us can play an active role to reduce food waste at source. Hong Kong also has many C&I enterprises involved in the food business, such as food factories, operators of restaurants, fast food outlets, cafes, canteens, hotels, supermarkets, food markets, bakeries, groceries, fruit stalls, butcheries and all types of food producers and retailers. Institutions that provide food, including hotels, restaurants, schools and colleges providing meals to students, hospitals providing meals to patients and airlines to passengers, as well as companies that provide staff meals, could play an active part to reduce food waste.

What is food waste?

Rotten fruit and vegetables
Fish and poultry organs and intestine, meat trimmings and residues
Fruit and vegetable peelings, cores, pips, garnishes
Meat, fish, shellfish shells, bones
Food fats, sauces, condiments
Soup pulp, Chinese medicinal pulp
Egg shells, cheeses, ice cream, yogurts
Tea leaves, teabags, coffee grounds
Bread, cakes, biscuits, desserts, jam
Cereals of all types e.g. rice, noodles, oats
Plate scrapings and leftover of cooked food
BBQ raw or cooked leftovers
Food past its use-by-date
Pet food



2. Average MSW disposed of in 2011 was 8,996 tonnes per day.
3. Other putrescible waste includes personal care cotton products, such as diapers.

1 | Our Vision for Reducing Food Waste

Figure 3 Average daily disposal quantity of food waste in Hong Kong (2003-2012)

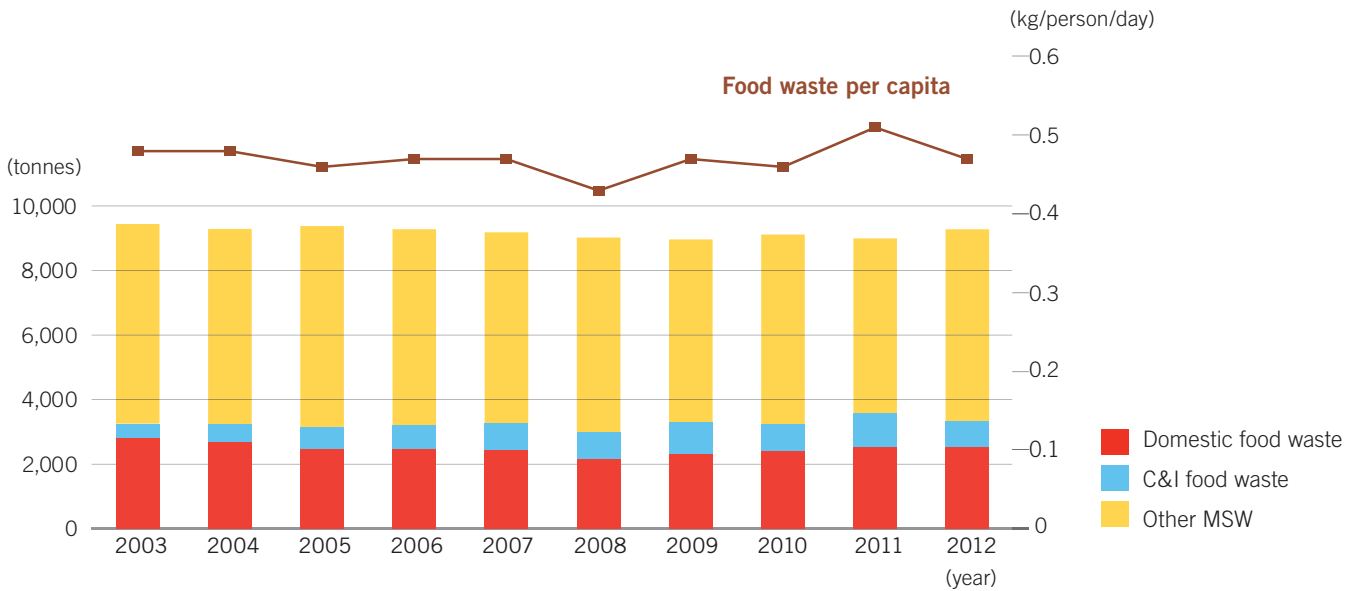
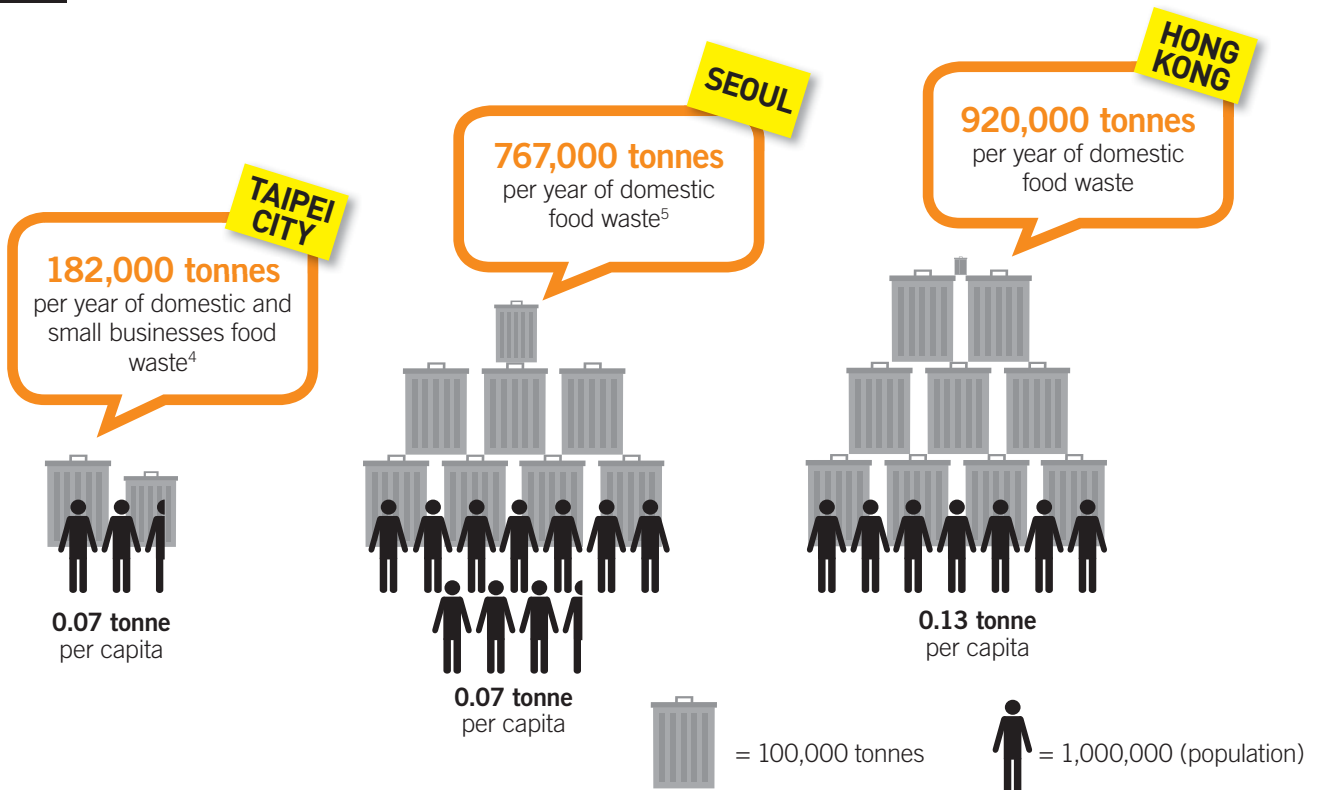


Figure 4 Food waste of Hong Kong and other cities from domestic sources (per year)



4. Taiwan environmental authority, 2011; the tonnages includes food waste from small businesses. The population in Taipei is about 2.6 million.

5. Ministry of Environment, South Korea, 2011. The population in Seoul is about 10.5 million.

2 | Our Target and Strategy for Food Waste

Diverting food waste from landfills

Our target is to cut down the amount of food waste that goes to landfills by at least 40% by 2022. This means our goal is to reduce our food waste to landfills from around 3,600 tonnes a day to around 2,160 tonnes a day (a reduction of about 500,000 tonnes per year) over the course of about eight years. This is an ambitious goal and it can only be achieved with public support and active participation.

The prevention and reduction of food waste to landfill has multiple direct and indirect benefits. It will help to reduce various resource use associated with food production, cut greenhouse gas (GHG) emissions, recover useful resources from food waste, reduce the social cost of handling and treating food waste, and better utilize the capacity of landfill and waste-to-energy facilities.

Strategy to achieve our target

Our strategy for food waste has FOUR main components:

- **Mobilize the community**
 - Prevent and reduce food waste at source (i.e. before food become waste)
 - Donate surplus food to people
- **Promote food waste separation**
 - Incentivize separation
- **Recycle and treat separated food waste**
 - Turn food waste into renewable energy
 - Convert food waste residue to compost to create a soil supplement
- **Treat non-separated food waste and final disposal**
 - Provide MSW waste-to-energy treatment that includes non-separated food waste for recovery of energy
 - Disposal as last resort at landfills

Direct and indirect benefits of food waste prevention and reduction

Preventing and reducing food waste saves resources and cut environmental impacts. According to UNEP, roughly a third of the food produced in the world for human consumption is wasted or lost every year, amount to 1.3 billion tonnes annually. This amounts to a major squandering of resources, including land, water, energy, labour and capital that had gone into producing the food, and needlessly produced GHG, expediting climate change.⁶



6. UNEP, "Food Waste Facts", <http://www.unep.org/wed/quickfacts/>.

Emphasis on food waste-to-energy

Our plan is to recycle food waste mainly into renewable energy because Hong Kong can use large quantities of energy either in the form of biogas or electricity. Food waste could also be treated to recover nutrients in the form of compost as side product for landscaping or agricultural applications but Hong Kong has limited capacity for such uses.

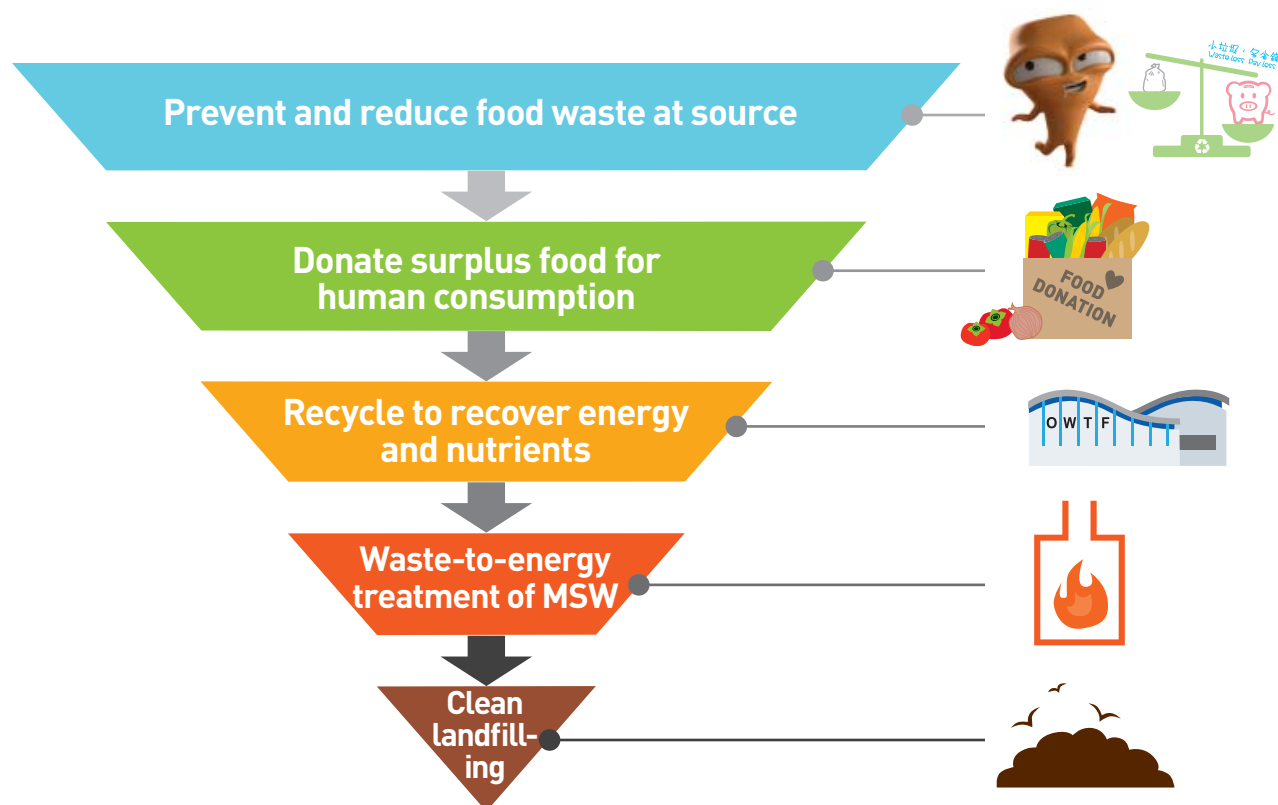


2 | Our Target and Strategy for Food Waste

Figure 5 provides a picture of food waste management options according to a hierarchy of their importance. Chapter 3 deals with the prevention and reduction of food waste, as well as donation of surplus food; Chapter 4 deals with separation and collection of food waste;

Chapter 5 addresses recycling of food waste; and Chapter 6 deals with the treatment and disposal of MSW where food waste has not been separated, collected and recycled. Chapter 7 deals with yard waste.

Figure 5 Food waste management hierarchy



3 | Food Waste Avoidance

The most important step in reducing food waste is to avoid creating it in the first place.

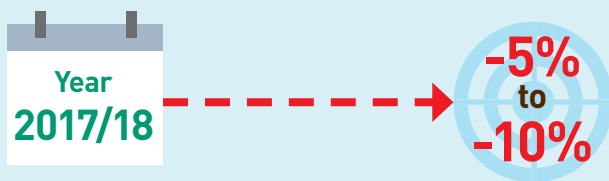
Rethink and Community Mobilization

Hong Kong people need to rethink our relationship with food. By focusing on our real need for nutrition, we can choose to avoid over-buying, over-ordering and over-preparing food that is then dumped because we cannot use or consume it all. Once we rethink our habits as

individuals, households and businesses, we can change and not waste precious food.

Our main social mobilization campaign is the Food Wise Hong Kong Campaign. It is designed to galvanise the community, from individuals to households to C&I operators, to avoid and reduce food waste at source. Using overseas experience as a guide, we anticipate this campaign may help Hong Kong to avoid about 5% to 10% of food waste by 2017/18.⁷

Food Wise Hong Kong Campaign



On 3 December 2012, we set up the Food Wise Hong Kong Steering Committee to drive leadership in food waste avoidance and reduction through working with leaders in this field in order to formulate and oversee the implementation of the Food Wise Hong Kong Campaign. The campaign was formally launched on 18 May 2013.

The campaign has a variety of activities, ranging from articulating and disseminating

best practices in the C&I sector to working with government departments, schools and non-governmental organisations (NGOs) in order to expand participation. The campaign is also facilitating food donation for dual purposes of caring for the disadvantaged and waste reduction.

Food Wise Ambassadors from the community and organization have been recruited since the launch of the

Campaign. Training will be provided to help Ambassadors to spread the key messages and practical tips about food waste reduction across the community. By end 2013, over 450 Ambassadors have been recruited. A Food Wise Charter has also been established. By end 2013, over 320 organisations, including various trades, non-governmental organisations and government departments have signed the Charter to show their support for the Campaign and to commit to reducing food waste.

Based on the actual effect of the campaign, we would keep in view the need for any further policy measures to incentivize the reduction of food waste generation.



7. The estimate of 5% to 10% from avoidance is derived from the British experience, where the national average reduction achieved after a period of intense public education was 2% but in the best districts 14% was achieved. We are using 5% to 10% as a possible estimated outcome.



Disney/Foodlink event



Ma On Shan Ling Liang Primary School



Sing Yin Secondary School

Food waste reduction successes

The Environment Bureau and Education Bureau jointly launched the Green Lunch Charter in February 2010 to encourage schools to reduce food waste and the use of disposable lunch boxes. The Environment and Conservation Fund (ECF) has also reserved \$150 million to support existing schools to retrofit facilities in order to portion meals on site, while new school premises will be designed to enable on-site meal portioning as a standard feature.

A good example is **Ma On Shan Ling Liang Primary School**, which involves daily volunteer parent helpers. About 720 participating students join the programme, while 170 students bring their own packed lunch. The school has also set up a small on-site composter to convert food waste into fertilizer which is used for their own school organic farming. The programme results in substantial reduction in disposable lunch boxes and utensils, with 90% waste reduction from lunch. After the implementation of the scheme, the school generates about 4.5 – 6 kg of food waste per day, or about 0.006 – 0.008 kg per student.

Sing Yin Secondary School set up its own environmental policy and introduced knowledge and skills for practising a wide range of measures by students and staff. As regards food waste reduction, the school has set up food waste recycling facility and other green initiatives, such as working with the school's food kiosk operator to avoid and reduce food waste. In the past, the operator would prepare extra lunch boxes every day to meet contingent needs but that often resulted in a surplus that ended up having to be dumped. The new practice offers soup noodles and other snacks to meet extra demands as they arose, thus avoiding food waste.

In September 2013, **The Chinese University of Hong Kong** launched a two-year “Love Food Hate Waste @CUHK”, which is a food waste education campaign. The university envisages the campus becoming a ‘living laboratory’ for food waste reduction and recycling. The campaign takes a multi-pronged approach and initiatives included the operation of food waste composters and other food waste recycling methods, micro film production and distribution of food and beverage coupons to students who have finished all their food.

The Lo Wu Correctional Institution has an average of 75% of its inmates participating in the Waste No Food Scheme since April 2013. The project enhanced environmental awareness and encouraged the reduction of leftover food. Upon enrolment to the scheme, the persons in custody volunteer to receive a reduced portion of their staple food (rice, chapatti or potatoes). The scheme has avoided 500 bowls of rice having to be dumped every day (i.e. around 100 kg). The institution also installed an on-site food waste composting system with a daily capacity of 100 kg which turns fruit peels, vegetable leaves and meal leftover into organic compost for greening purposes.

Since September 2011, **the Health Care Food Service Team at the Pamela Youde Nethersole Eastern Hospital** has reduced patients' meal portions by 20% and prepare meals according to actual demand. This initiative has resulted in 42 tonnes of food waste reduction (i.e. around 115 kg per day) and a saving of several hundred thousands per year. This team won the Hospital Authority's Outstanding Team Award in 2013.

The MTR Corporation Limited has launched an incentive scheme that is expected to achieve a 15% reduction in food waste by participating food and beverage tenants in 18 months' time.

A New Core Value

Early results show there is sympathy within the community to avoid food waste. With strong and sustained public communication, and with the commitment of the C&I sector, we can make food waste avoidance a core Hong Kong value – that is, it

becomes a fundamental aspect of our lifestyle and a value we are proud to practise and display. It is not too hard to imagine that by encouraging a new “Food Matters” culture that it can help Hong Kong’s catering and hospitality C&I sector, as well as the community as a whole, to innovate.

Food Donation

Surplus edible food could be redistributed for human consumption. Throwing food away deprives someone else from being nourished by it and is a sheer waste of resources. Momentum of food donation is building up in Hong Kong. NGOs operate food banks, redistribute dry foodstuffs, as well as take cooked food from eateries to community centres. There are also NGOs that use surplus produce from fresh food markets either for distribution or for preparing hot meals in community kitchens for the needy.

Hong Kong’s food donation NGOs are becoming increasingly adept at observing

good hygiene practices. Furthermore, in August 2013, the Government’s Centre of Food Safety issued a set of food safety guidelines for food recovery, where it sets out food safety principles that should be applied to food donated to charity, regardless of the types and sources of food. Some NGOs have also entered into food donation agreements with their donors to deal with food safety liability issues.

We wish to strengthen our support of the work of NGOs to increase the collection of surplus food from the C&I sector, such as supermarkets, fresh food markets,

restaurants, clubs and hotels. NGOs may consider applying for the ECF to support food donation projects that could help reduce waste to landfill.



4 | Separation and Collection of Food Waste

In the long run, food waste that cannot be avoided should be recycled as far as possible. Successful food waste recycling requires the waste to first be separated from other types of MSW and then collected for delivery to recycling facilities. Food waste that has been mixed with other types of waste is contaminated and cannot be recycled. The separation and collection of food waste is therefore a critical aspect of any food waste recycling system.

Waste Charging

Our intention is to implement a quantity-based MSW charging scheme by 2016/17. With quantity-based waste charging, people will seriously rethink their consumption and disposal behaviour and become much more conscious about the environmental consequences. We can pay less by throwing away less. Experience from other parts of the world, including Taipei City and Seoul, shows that implementation of quantity-based waste charging provide powerful economic incentive for people and various trades to reduce avoidable waste and to separate recyclables from the waste stream.

With waste charging, Hong Kong's overall MSW should drop by a good margin over the course of several years.⁸ We estimate that MSW charging could further reduce the quantity of food waste by a further estimated 10% to 15% between 2017 and 2022. Together with reduction at source by the Food Wise Hong Kong Campaign, as well as the establishment of Organic Waste Treatment Facilities (OWTFs – see Chapter 5), we expect Hong Kong could achieve some 40% food waste reduction by 2022.

Public consultation in 2012 showed Hong Kong people support the concept of quantity-based MSW charging. On 24 January 2014, the Council for Sustainable Development (SDC) completed a four-month public engagement and will draw up recommendations on how quantity-based MSW charging may be implemented in Hong Kong, which will help us to take the initiative forward. We will carefully consider the SDC's recommendations and draft the necessary legislative proposals as soon as possible for the Legislative Council's scrutiny.

Source separation of food waste

There are TWO categories of food waste in general:

Pre-consumer food waste

Waste from industrial food processing (vegetative and animal food waste)

Vegetative food waste (vegetable and fruit trimmings, spoiled produce)

Animal food waste (fish, meat, dairy)

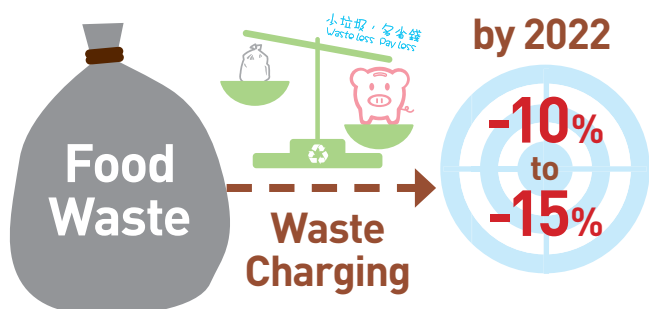
Post-consumer food waste

Served food that has been left uneaten (plate scraping, uneaten buffet/salad bar food etc.)

The food manufacturing and cooking process often requires the use of cooking oils. This is a separate form of waste derived from food but it is not counted as part of our food waste statistics (see below).

Often found among food waste are soiled food packaging and food service ware (e.g. plastic eating utensils, plastic containers and wooden chopsticks). Removing them first would be most helpful.

To recycle food waste requires a THREE-step strategy – **separation, collection and recycling**. Each step is a major operation in itself and then each of the steps needs to be properly aligned for good results. This chapter deals with the first two steps and the next chapter with the third step.



8. In Taipei City and Seoul, about 20% reduction in waste generation was achieved after several years of imposing quantity-based MSW charging and publicity. We are assuming a similar level of reduction could be achieved in Hong Kong through the Food Wise Hong Kong campaign and quantity-based MSW charging.



Food waste source separation

Source separation is the pre-requisite for effective recycling of waste into useful resources.

Waste generators should be responsible for separating their food waste. Thus, a food processing business, such as a factory making cakes or food sauces should put in place a system whereby the pre-consumer food waste arising from its business is separated out for subsequent collection. Likewise, a restaurant can have a system whereby its pre-consumer and post-consumer food waste is also separated from other waste for collection.

Both the food processing factory and the restaurant can also separate out the oils and fats it produces.

C&I food waste

In preparation for recycling food waste on a large scale, we have gained experience on food waste source separation with the C&I sector over the past few years through the operation of the Kowloon Bay Pilot Food Waste Composting Plant and the Food Waste Recycling Partnership Scheme. The plant was initially used in 2008 to treat food waste from the venues hosting the Olympic and Paralympic Equestrian Games, after which EPD started the Partnership Scheme with C&I participants to collect source-separated food waste for delivery to the Kowloon Bay plant. Today, the scheme has over 120 participants. From 40 tonnes in

2008, the plant treated 283 tonnes in 2012. While this is a useful pilot scheme to help us gain knowledge, it is recycling less than 0.1% of Hong Kong's total C&I food waste.

The compost produced from the plant is being used by the Leisure and Cultural Services Department (LCSD) for the many community gardens it cares for. So far, 24 tonnes of compost has been provided for its use.

Household food waste

The Housing Authority has conducted food waste recycling trial schemes at 14 public housing estates by phases since 2011, involving nearly 1,000 families to encourage the cultivation of food waste separation habits and food waste recycling.



In addition, in 2011, EPD launched the Food Waste Recycling Projects in Housing Estates to raise awareness on food waste reduction and to install composters. As of December 2013, 37 of them have received funding under the ECF to install composters at the estates. Education programmes organised by these estates would cover about 81,500 households, of which about 4,100 would participate in food waste source separation and recycling. It is expected that a total of 1,300 tonnes of food waste (i.e. 3-4 tonnes per day) would be recycled each year and 260 tonnes of compost would be produced annually, which can be used as fertilizers by the estates for their plants and gardens. From data collected, the Project has created an impact on changing behaviour, as reflected by the notable reduction in food waste generation by participating households.

District food waste schemes

We also have district-based programmes at Kwun Tong, Tsuen Wan, Tuen Mun and Wong Tai Sin. In the first case, we started the Food Waste Reduction Programme in 2011 in collaboration with the Kwun Tong District Council and the property management of a shopping mall, whereby customers at eateries are encouraged to minimize and separate food waste, which is then recycled at an on-site composter.

As at June 2013, about 108 tonnes of food waste (i.e. over 0.1 tonne per day on average) has been recycled, and about 20 tonnes of compost produced for gardens in the district.

In March 2012, the Islands Food Waste Recycling Scheme was launched on Cheung Chau and at Yung Shue Wan on Lamma Island. It aims to educate and motivate restaurants, food premises and hostels for the elderly to reduce, separate and recycle food waste by means of composting. Up to the end of 2013, about 194 tonnes of food waste (i.e. about 0.3 tonne per day on average) had been recycled, and about 21 tonnes of compost produced for local use.

Up-scaling on quantity

We are gathering data and reflecting on experience from all the C&I participants, housing estates and districts so as to assess the effectiveness of all the abovementioned schemes. This will help us identify how to broaden the implementation of food waste separation in Hong Kong. In addition, we would initiate a study on the appropriate means of organic waste collection and delivery in Hong Kong in 2015.

By 2018-19, our aim is for about 50% of our C&I food waste to be recycled, rising to 60% by 2022 for the C&I sector, assuming that we can keep to the schedule of building OWTFs as per the schedule in Chapter 5. We hope households will also start to separate food waste in increasing numbers and that by 2022, we may have

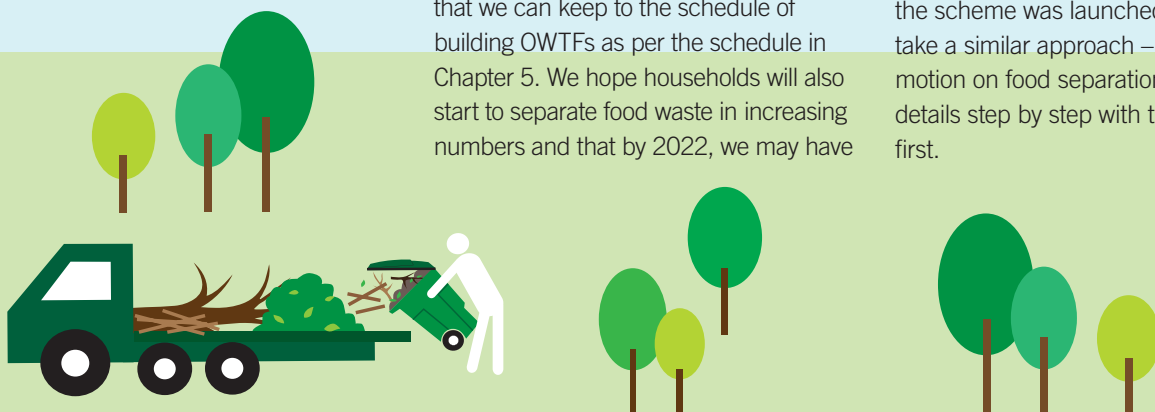
250,000 households (i.e. around 11% of all households in Hong Kong) participating.

To achieve this magnitude of increase from where we are today requires massive social mobilization, as well as collaboration with food-related businesses and estate managers. *The Food Wise Hong Kong Campaign* will work hard to mobilize all stakeholders and the public. We are ready to support more programmes and we expect food separation to increase progressively in scale when MSW charging is in place.

Needless to say, Hong Kong must make long term plans to involve the community to reduce and separate food waste so that a very large number of households will be involved beyond 2022.

Voluntary or mandatory separation?

Examples from overseas show there are successful cases in adopting the voluntary and mandatory approach. Some jurisdictions, such as South Korea, first adopted the voluntary approach to get society used to a new way to deal with food waste and to learn from the process before mandating food waste separation. After all, to be able to draft the appropriate legislation, it is necessary to articulate how it is to be done. In the case of South Korea, legislation only came about 7 years after the scheme was launched. Our view is to take a similar approach – get the wheel in motion on food separation and iron out the details step by step with the community first.



Collection and delivery of food waste



Transporting food waste requires special attention. Food waste collection vehicles are needed to ensure there is no leakage or odour. In future the vehicles will likely be different from the ones operating in Hong Kong today transporting MSW. Thus, a new fleet of food waste vehicles will need to be used or the existing fleet will need to be upgraded.



Once food waste has been separated from other MSW, it can be collected and delivered to the food waste recycling facilities. Our plan is for C&I establishments to be responsible for separating their food waste from their other MSW and deliver the separated food waste to the recycling facilities discussed below.⁹

The collection of food waste from domestic sources is more challenging than for C&I establishments because there are many types of residential dwellings. We will initiate a study on the food waste collection and delivery to consider the different types of circumstances in Hong Kong, including dwellings with/without storage space for separated food waste and C&I establishments, the collection and delivery arrangement, the suitable types of vehicles, appropriate ancillary and supporting facilities for any on-site interim storage, the appropriate arrangement for prioritization in the collection and delivery of food waste as well as the social, institutional and resource implications.

Separation and Collection of Used Cooking Oil and Grease Trap Waste

Separation and collection of used cooking oil (UCO) and grease trap waste (GTW) has become an established practice in the C&I sector as there is value in the UCO itself and the GTW is required to meet the effluent discharge standards under the Water Pollution Control Ordinance¹⁰ and also because of the growth of Hong Kong's burgeoning biodiesel industry. Hong Kong's 20,000 plus eateries and food businesses generate an estimated 20,000 tonnes of UCO each year and about 175,000 tons of GTW. These quantities of waste are not

counted as part of our food waste, so they are in addition to it.

In the case of UCO, many restaurants separate it from other forms of kitchen waste and sell it to collectors. The collectors range in size from traditional small waste collectors covering a small geographical area, to large collectors, which collect from more than 10,000 outlets every month. The waste oil is aggregated for use as a raw material for local biodiesel production or export for production overseas.

In the case of GTW (oil and grease in wastewater), it is collected by specialised collectors from the grease traps which all commercial kitchens are required to install. Before GTW can be used as a raw material, it must first be treated in one of Hong Kong's two GTW separation facilities where the oil is extracted for use as a raw material for biodiesel production and the residual wastewater treated to the required environmental standards. The first separation facility was built by the Government at the West Kowloon Transfer Station in 2006, and the second facility is built by one of the biodiesel producers. Together, Hong Kong has the capacity to treat about 1,000 tonnes of GTW a day.



9. Currently, C&I establishments are responsible for delivering their waste either to reduce transfer stations (RTS) or landfills.
10. Grease and oil that is allowed to enter the sewer system causes problems by separating from the wastewater and accumulating on the inside of sewer pipes. Over time, these deposits get larger as more grease and other solid material builds up. Grease deposits reduce the capacity of sewer pipes and cause sewage overflows, offensive odour and an unhealthy environment. The cleaning of grease deposits from sewers is difficult and can be dangerous and is carried out at considerable cost. Therefore, in many areas of Hong Kong there are limits set by the Water Pollution Control Ordinance on the amount of grease and oil that can be allowed to pass to sewer.

5 | Treatment and Recycling of Food Waste

OWTF Network

In light of the fact that Hong Kong generates a very large amount of food waste each day, and that food waste in general decomposes quickly and is unsuited to compaction at RTS for long-haul transport, the most suitable method to recycle food waste is to create a network of recycling plants. This approach enables food waste to be transported quickly from population centres to the facilities that are not too far away thereby reducing potential nuisance.

Preferred technology

We have reviewed many types of technology for treating food waste to assess their suitability for Hong Kong (see Annex). As Hong Kong has a large need for energy, our policy is to treat the city's collected food waste to produce energy using anaerobic digestion as the core technology. This process also produces residue that could be processed to become compost or fertilizer as side-products but our goal is to turn waste into energy and maximize energy production since Hong Kong has limited use for compost and fertilizer but can use large amounts of energy.

Social mobilization

Hong Kong people are becoming more and more conscious about reducing food waste. We expect this trend to gather strength with the spread of awareness raising programmes promoted by us and also by community groups in the coming two years, as well as after MSW charging is in place. The key is to get food-

related C&I operators and householders to separate their food waste from other MSW.

As noted in the previous chapter, we have been promoting food waste separation for some time, where the collected food waste has been recycled into compost. Apart from the Kowloon Bay Pilot Food Waste Composting Plant and collaborating with the C&I sector, we also launched a number of schemes for households and other sectors. In the case of our household schemes for on-site composting, the daily capacity for individual estates is in the range of around 50 kg to 100 kg. Schools and some institutions have also installed small on-site composters, most of which have daily capacities of 5 kg to 100 kg. While the pilot plant and on-site composters handle very small quantities, the goal is to get people used to separating food waste. More organizations, schools and residential establishments are interested to start their own on-site programmes.

Expectation and Capacity Mismatch

Going forward, our challenge is to continue to promote food waste reduction at source as our priority, while increasing the social momentum to separate waste as we start to build the network of OWTFs, although the first one will only be ready in 2016. Indeed, it will take some years before Hong Kong has the recycling capability to deal with approximately 50% of the city's food waste. There could well be a mismatch between public expectation to participate in food waste separation schemes and the availability of treatment capacity, especially for households.

Anaerobic digestion technology

Anaerobic digestion is a process where micro-organisms are used to breakdown organic matter in the absence of oxygen.¹¹ Recycling food waste using this method is low carbon and produces biogas (a source of renewable energy similar to

natural gas) as well as a residue that can be processed for use as compost or fertilizer. The energy produced can be used to run the facility and for the surplus energy to be exported. For example, we estimate OWTF1 can produce up to 14

million kWh of surplus electricity, which is equivalent to the electricity used by some 3,000 households.

This technology is now mature and the optimal capacity for an OWTF is in the range of 100 to 300 tonnes per day.

11. There are other technologies to treat food waste, such as composting, waste decomposing into waste water, dehydration and the Bokashi method, but they cannot compare with the advantages of large-scale anaerobic digestion facilities.

Network of Organic Waste Treatment Facilities (OWTFs)

We envisage Hong Kong needs to build a network of around five to six OWTFs between 2014 and 2024 with a total recycling capacity of about 1,300-1,500 tonnes per day. The first facility (OWTF1) at Siu Ho Wan (North Lantau) is already under tender and will cater for 200 tonnes of food waste per day. It is a government-funded Design-Build-Operate (DBO) project and is expected to become operational in 2016.¹²

There are currently two other possible sites for OWTFs to be built. The Environmental Impact Assessment (EIA) for OWTF2 has been done and it needs to be taken forward expeditiously using the established DBO arrangement.

The EIA for OWTF3 will also be taken forward as quickly as possible. As for further facilities, suitable locations still need to be identified.

We welcome the private sector to participate in the development of further OWTFs. We are open to options and proposals from the private sector either on sites identified by the Government or other sites proposed by the private sector.



12. The contractor is engaged through open tender to conduct detailed design, carry out the construction works and operate the facility upon completion for 15 years.

5 | Treatment and Recycling of Food Waste

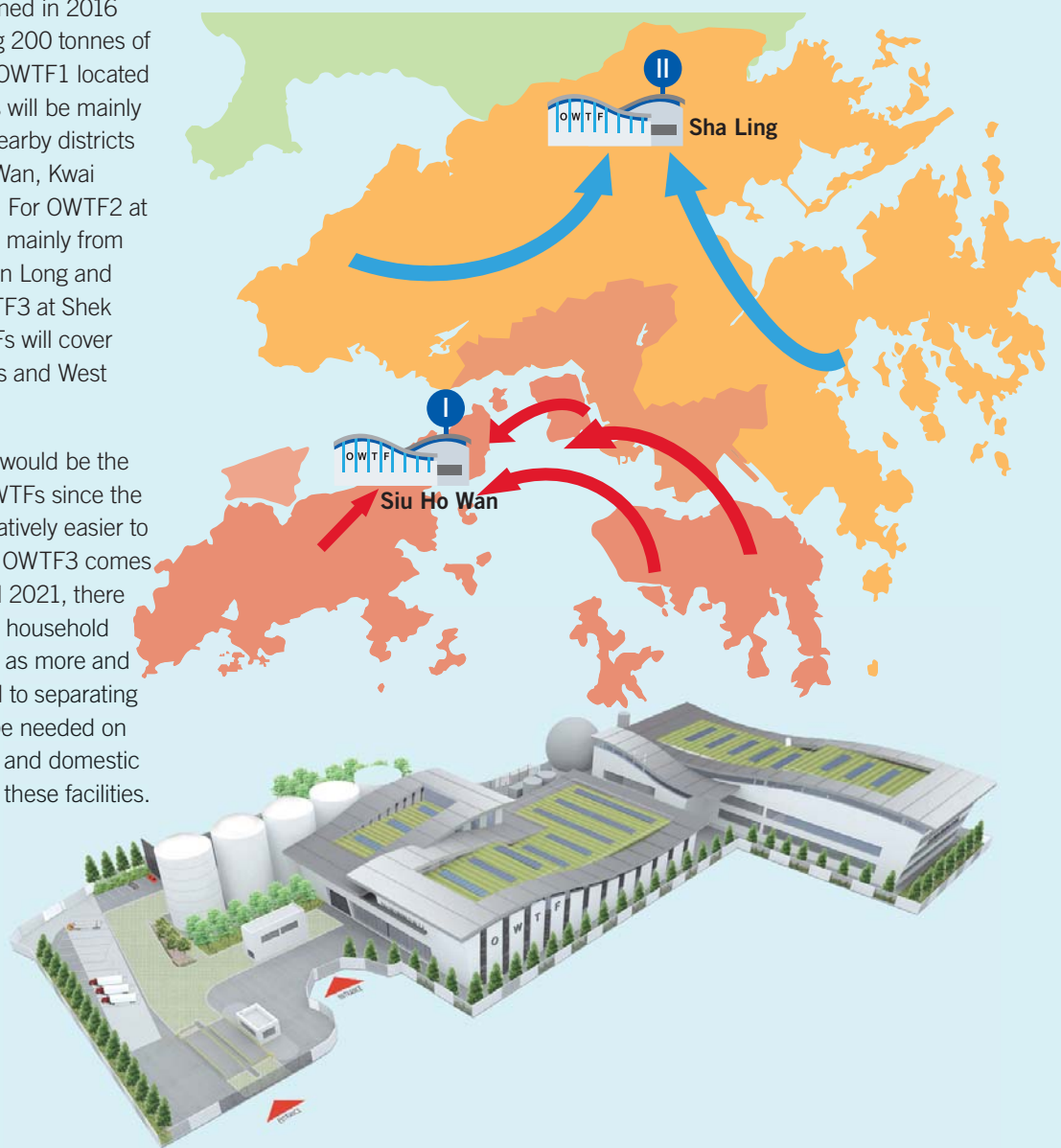
One possible measure is to continue to encourage, facilitate and subsidise households to do small scale on-site or off-site composting (or other off-site treatment) so that residents continue food waste separation practices. As for on-site composting, since most estates have limited space, such an arrangement will have limited potentials however. Off-site composting may have

better potentials, such as for the collected food waste to be taken to sites like the Kowloon Bay pilot plant as a stop-gap arrangement. While it is not easy to find suitable sites for this purpose, we are open to ideas from the community. What we need is for the network of OWTFs to be built as quickly as possible. It is often not appreciated that weight for weight, on-site composting is much more expensive than OWTFs.

C&I sector before households?

OWTF1 will be commissioned in 2016 with a capability of treating 200 tonnes of food waste a day. For the OWTF1 located in North Lantau, the users will be mainly from Lantau Island, and nearby districts including Tsing Yi, Tsuen Wan, Kwai Chung and West Kowloon. For OWTF2 at Sha Ling, the users will be mainly from Sheung Shui, Fanling, Yuen Long and Shatin. Together with OWTF3 at Shek Kong, the first three OWTFs will cover most of the New Territories and West Kowloon.

We expect the C&I sector would be the first to use the first two OWTFs since the food waste from C&I is relatively easier to be separated. By the time OWTF3 comes on stream possibly around 2021, there will be greater demand for household food waste to be recycled, as more and more households get used to separating waste. Adjustments may be needed on how best to distribute C&I and domestic food waste for recycling at these facilities.



Participation by Private Sector and Universities

Hong Kong needs to build urgently a network of OWTFs with due speed in order to meet our disposal at landfill reduction target by 2022. Moreover, we also wish to ensure that the public would not become discouraged if in future their separated food waste could not be recycled due to a lack of OWTF capacity.

In order to build up Hong Kong's ability to separate and recycle food waste, we welcome private sector

participation. OWTF1 and 2 will be taken forward using the established DBO arrangement. We are open to adopting different types of private sector participation mode for future OWTFs with a view to building them as soon as practicable while maintaining high technological and operational standards. For future OWTFs, we are open to proposals from the private sector either on sites identified by the Government or on sites proposed by the private sector.



On-site composting – several challenges

Doing on-site recycling of food waste into compost is not the most suitable solution in Hong Kong because of our dense urban environment and operational challenges.

Space constraint

Not every housing estate has the space to put one or more composter on-site (see below on scale). In terms of treatment capacity, on-site composting is not the best solution for Hong Kong.

Expertise and quality

Proper operational expertise is required to keep the composter working optimally, and professional managers may be necessary. The lack of expertise will affect the quality of the compost output, which will in turn affect whether users will be willing to use the compost.

Potential nuisance

Potential hygiene and odour issues may create nuisance and complaints, especially if the food waste handling process is not up to scratch. The composting operation should better be carried out away from residents.

Cost efficiency

The operating cost per tonne of treating food waste by on-site composters is far from cheap. Indeed, it could be ten times more than operating an OWTF due to scale and the constant need to sustain good management. It can cost from around HK\$10,000 to even HK\$20,000 to treat one tonne of food waste taking a small 100 kg composter as example. The cost comparisons on page 21 are derived from local measures experimenting with composters.





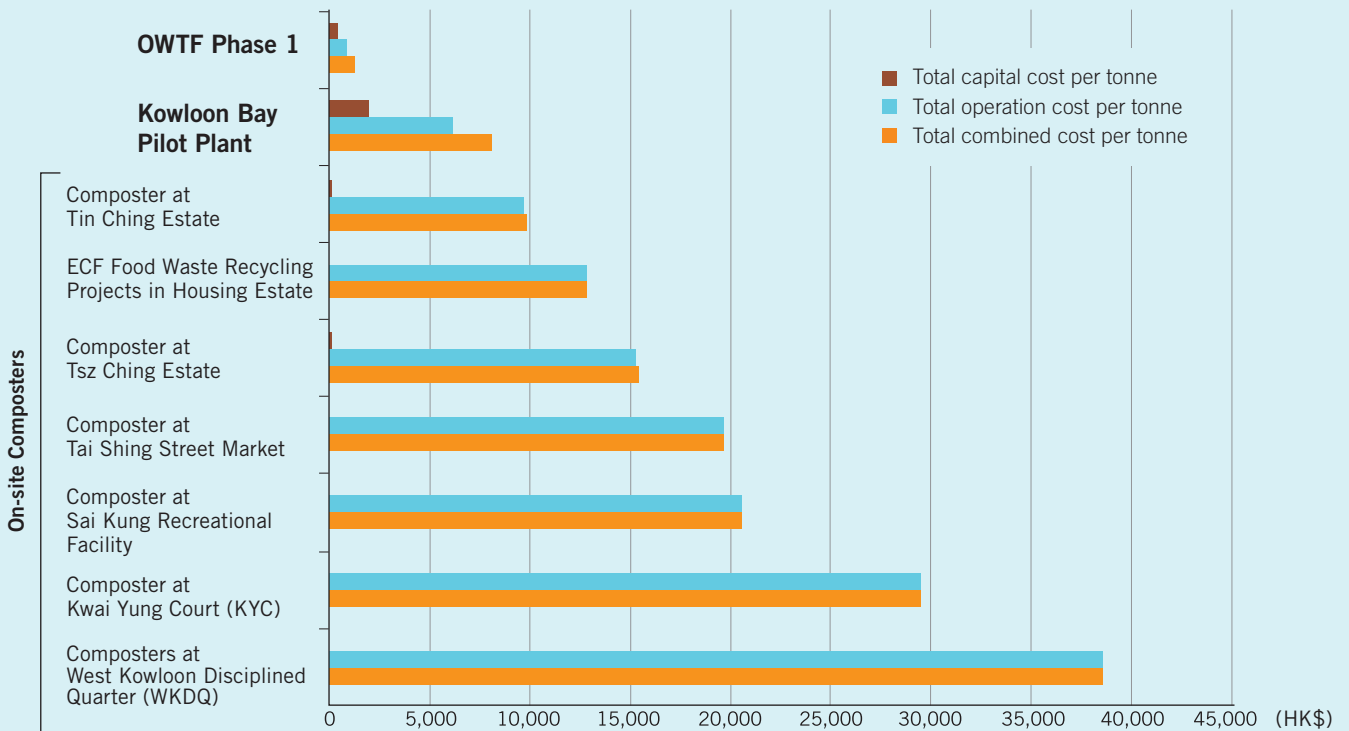
Issue of scale

Buildings and estates

A typical Hong Kong household produces just over 1 kg of food waste per day. Thus, a typical residential block of 50 floors with 8 households per floor produces about 400 kg of food waste per day. Let's say 50% of the households separate their waste, including food waste, which means there is 200 kg of food waste to recycle each day. Approximately 15 sq m will be needed for one composter with a capacity of 100 kg that also allows room for operation. Many standalone buildings will not have sufficient space to do on-site composting. Even large estates may not be able to find sufficient or suitable space. That said, for new building, efforts are being made to encourage a more facilitating design for food waste recycling (e.g. through BEAM Plus).

Outlying Islands and remote communities

Take Cheung Chau as an example. Its residence produces about 6 tonnes of food waste per day. There are currently two composting facilities there capable of handling 200 kg and 100 kg each day per day. Assuming a 50% recycling rate, there is a need to find suitable space for 15 to 30 composters on the island, which is difficult. As Cheung Chau is now served by an outlying island RTS, food waste generated in Cheung Chau can be transported to one of the future OWTFs nearby for recycling and treatment. Thus, for outlying islands with RTS or remote areas with road access, food waste could still be transferred to one of the OWTFs for recycling and treatment.



Biodiesel

an encouraging example of private sector-led food waste recycling



Biodiesel made from UCO is known as a second-generation biofuel. In the past several years, Hong Kong has seen the establishment of three factories to convert UCO or GTW to biodiesel. This represents private-sector led capital investment totalling about HK\$1.5 billion. Their combined production capacity is about 150,000 tons per annum of biodiesel. This end product can be exported and also used in Hong Kong. Biodiesel can be blended with diesel to reduce pollutant emissions from vehicles, ships and machinery.

Local Technology

innovation in biological treatment of food wastes

We are paying close attention to local research and experimentation with food waste treatment technologies, some of which are supported by ECF funding. For example, university researchers are looking at how to increase the energy potential of food waste using anaerobic digestion, as well as developing composting techniques to reduce odour and nitrogen loss that can also improve the quality of the end product. Experiments are also on-going on how to reduce composting time. We will keep in view the progress of local research and consider incorporating successful experience into our food waste management projects.



6 | The “Leftovers” for Disposal

Despite everyone’s efforts, there will still be a considerable amount of food waste that are not separated and mixed with other waste that will be treated with other MSW. Using overseas experience as a guide, even with sustained efforts, there will likely still be over 50% of our food waste that will be mixed in with the city’s MSW.¹³ By 2022, about 3,000 tonnes of our MSW will be treated at a new Integrated Waste Management Facility (IWMF) each day, assuming it can be built in time. The rest will still have to be landfilled.

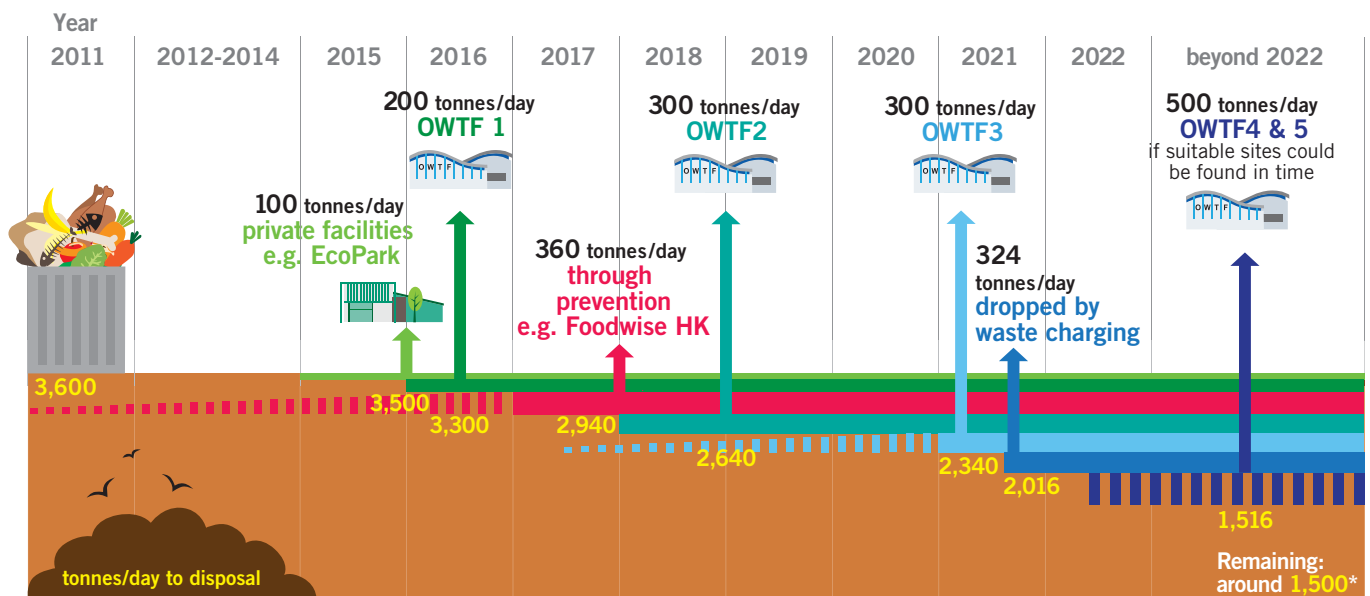
Assuming a relatively constant local population and keeping the same food waste disposal rate, even if we can achieve roughly 5% to 10% reduction through food waste prevention, and another 10% to 15% reduction from waste charging, plus having a network of several OWTFs with the capacity to recycle about 1,300 tonnes of food waste, Hong Kong will still have about 1,500 tonnes of food waste mixed in with the city MSW to deal with.¹⁴ This remaining portion represents un-separated, contaminated food waste.

The assumptions in Figure 6 are ambitious and optimistic but highly dependent on the successful mobilization of the community to separate waste, implementation of quantity-based MSW charging by 2016/17, development of an effective collection and delivery system for source-separated food waste, and the continuous adding of OWTFs. Any change will increase the quantity of “leftover”.

Achieving Our Food Waste Reduction Target

The above presents a reasonable plan to achieve the target of at least 40% reduction of food waste to landfills by 2022 using 2011 as the base. However, community support of the programme of action is as important as our commitment to the target. The success of achieving the target hinges upon the measures highlighted in Chapters 3, 4 and 5 so that citizens, organisations and the Government can each play their part to reduce, separate and recycle food waste.

Figure 6 Projected Reduction in Food Waste Volume



* About 2,000 tonnes of food waste still to be dealt with if OWTF4 and 5 cannot be built in time.

- In Taipei, even with pay per bag system implemented since early 2000, food waste recycling programme and having pig feed as an outlet for food waste, the food waste recovery rate achieved is about 44%, less than 50%. Other cities in Taiwan have achieved much less than that, with some cities only achieved less than 20% food waste recovery rate.
- As can be seen in other countries, any further reduction of the “leftover” food waste would require much stronger policy measures such as a sufficiently high level of waste charge to incentivize further behaviour changes or a total ban of food waste at landfills. Implementation of such measures in Hong Kong would need much longer time for the community to discuss and achieve consensus and would also depend on the initial operational experience of the waste charging scheme.

7 | Dealing with Yard Waste

Our Yard Waste Strategy

Yard waste is also known as green waste or garden waste, which consists of all types of vegetation waste matters. This type of waste decomposes gradually in nature. Woody material is also combustible.

Hong Kong has not focused on yard waste up until recently. While we are designing an overall waste-to-resources programme for all types of waste, in the area of yard waste, we still have information gaps although we are already working on filling them.

Our strategy to deal with yard waste is to collect data, promote reduction at source, encourage separation and collection, and find the best ways to treat the unavoidable portion.

We are taking a coordinated approach within the Government to collect data and promote best practices through an inter-departmental working committee led by Environment Bureau. We will introduce best practices to the public sector and major generators of yard waste in the C&I sector in due course. We will provide periodic updates on progress.

Types of yard waste



Amount Going to Landfills

About 127 tonnes¹⁵ of yard waste is disposed of at our landfills each day, which make up about 1.5% of Hong Kong's total MSW going to landfills.

The major generators of yard waste are various government departments and commercial establishments with extensive plantings and landscaping. These government departments include Leisure and Cultural Services Department, which manages public parks and gardens as well as maintains roadside trees and landscaped areas along non-expressway public roads outside country parks; Housing Department (HD), which manages public areas in housing estates; Highways Department (HyD), which is involved in road construction, improvement and maintenance works, as

well as the associated vegetation maintenance within the boundary of expressways and roadside slopes under its purview; and Architectural Services Department (ArchSD), which is involved in building projects and vegetation maintenance on slopes under its purview.

The Agriculture, Fisheries and Conservation Department's (AFCD) total annual yard waste tonnage is 1,400 tonnes of which only 80 tonnes (i.e. 5%) have to end up in landfills since much of the yard waste can be dealt with within the country parks it manages.

Yard waste reduction

We are calling upon government departments to contribute to yard waste reduction at source through two key measures:

- Minimizing using plants that are just displayed during festivals (e.g. Christmas and Chinese New Year). Replanting plants are also encouraged. For example, the Food and Environmental Hygiene Department (FEHD) has been doing so with unsold flowers and plants from the Lunar New Year Fair; and
- When designing landscaping areas to consider how to minimize yard waste generation, such as through reducing the use of annuals. We will publish Practice Notes on Yard Waste Reduction to help improve how Hong Kong deals with this type of waste.

Collection and Replanting of Potted New Year Citrus Plants To Reduce Domestic Waste



To boost environmental awareness of reducing and recycling domestic waste at source among the public rental housing (PRH) tenants, the Hong Kong Housing Authority (HA) launched a pilot scheme to collect and replant disposed citrus plants after Chinese New Year. The pilot

scheme was well received by over 30 participating estates and more than 1,000 pots of citrus plants were collected. To keep up the momentum in reducing waste, the scheme would be extended to all some 160 PRH estates.



Yard waste separation and collection

Separation of yard waste is straight forward. We need to develop the habit of doing it, and collection needs to be organized systematically so that the waste can be properly treated. The practice of separate collection of yard waste should of course be promoted in tandem with the development of facilities capable of treating yard waste properly (see below).

15. The figure is based on the relevant data in the "Monitoring of Solid Waste in Hong Kong – Waste Statistics for 2011" plus further estimated amounts from various government departments.

7 | Dealing with Yard Waste

Households: As most households do not have gardens in Hong Kong, the amount of yard waste generated by individual households is very small. A typical household may occasionally dispose of cut flowers and leaves from indoor potted plants. As we will have major programmes to urge householders to separate food waste, their yard waste can be separated with the food waste for collection. The larger quantities of yard waste may arise from landscaping and gardens of private housing estates.

C&I: Since there are relatively few privately managed commercial establishments with extensive gardens, plantings and landscaping (such as Ocean Park, Hong Kong Jockey Club and Disneyland), source separation and collection for them should not present a major problem. For general commercial buildings, they can also better source separate their yard waste and organize for its collection. As the job in commercial buildings is normally carried out by cleansing or gardening contractors, commercial property management may introduce relevant requirements in their contracts with them. It just needs to be organized and the Government will help raise public awareness.

Public sector: Government departments will lead the way in developing best practices in yard waste separation and collection. The best practices can then be shared with the community.

Yard waste treatment

There are various treatment methods for treating yard waste, some of which are more suitable for Hong Kong than others:

Natural degradation: Space permitting, yard waste can be left in situ or taken to a place where it can be left to degrade over time. While a natural decomposition process is appropriate for yard waste arising from country

parks to degrade within country parks, it is much more difficult to do this elsewhere as the decomposition process takes considerable time.¹⁶ However, government departments are looking at where there may be space for natural degradation but we expect only limited capacities to be available. Where there is space, we support natural degradation in situ.

Peach Blossom Tree Recycling Campaign



In 2014, the Environmental Protection Department (EPD) and the Hong Kong Environmental Protection Association have jointly organised the Peach Blossom Tree Recycling Campaign. The EPD and Food and Environmental Hygiene Department set up a network

of 50 collection points in all the districts of the territory to expand the Campaign to cover individuals and households. All the peach blossom trees collected were delivered to the waste wood recycler in the EcoPark, Tuen Mun for recycling into wood fuel pellets (a useful type of renewable energy) and composting materials with a view to raising the public's awareness in waste reduction and relieving the pressure on landfill disposal.



16. AFCD is unlikely to be able to accommodate more yard waste apart from its own in country parks. There are also concerns on the likely impact on biodiversity and invasion of unwanted species and disease if yard waste came from other sources.

17. Care should be exercised for excluding diseased plants for reusing as mulch or compost. In particular for plants affected by Brown Root Rot disease, they should be properly treated according to the guidelines promulgated by the Tree Management Office of the Development Bureau, which are available from the Trees website (www.trees.gov.hk).

Composting: Space permitting, composting is also a viable means to treat yard waste. It is environmentally friendly and cost effective if composters can be located near larger sources of yard waste, such as some of the bigger sites managed by LCSD, large housing estates, and the large commercial establishments. Where the waste has to be collected and transported, the Government currently has two sites with limited composting capacities – EPD’s Kowloon Bay Pilot Composting Plant noted in Chapter 4 and EPD’s Animal Waste Composting Plant at Ngau Tam Mei (with a maximum design capacity of 40 tonnes/day). There may be a possibility to increase capacities, which we will examine. The capacities of these plants may be combined with that for the OWTFs (see below). Yet, it should be noted that this method takes time and it becomes inefficient for large volumes of yard waste especially where land space is a major constraint.

Anaerobic digestion: The OWTFs noted in Chapter 5 can also have some capacity dedicated to deal with yard waste. We will assess whether and how this may be done as part of our overall plan for building the OWTF network. Together with the two composting plants noted above, it should be possible for about 35 tonnes of yard waste to be treated per day.

Reuse and Recycling: Wood waste and plants displayed during festive seasons (e.g. Christmas trees and peach blossom trees) may be sorted and recycled as a fuel material, such as being turned into wood pellets or wood fuel. Wood waste may also be reused as mulch after proper treatment.¹⁷ A tenant at the EcoPark is able to operate such a process with a capacity of 2 tonnes per day currently, which may be increased to about 10 tonnes in the future.

8 | Conclusion

Together, the Government, the people and businesses of Hong Kong has the opportunity to significantly reduce the amount of food we waste each day. Our success will mitigate the environmental and economic impacts of the MSW management system. To be successful, however, we all need to change our daily behaviour by reducing food waste at source. Through committed and sustained individual and corporate actions, and through complementary government policies and programmes to incentivize food waste reduction, and in time separation and collection, as well as to provide the necessary infrastructure for recycling and treatment, we believe Hong Kong can achieve the target of reducing food waste to landfill by 40% by 2022.

We cannot emphasize enough the very tight timetable we have set for dealing with a large variety of actions that needs to be successfully accomplished in order to achieve our target. Any changes will set us all back in our timeline. The journey will not be easy because success depends on public acceptance and large-scale community mobilization to participate in waste separation. Studies and trials are necessary to examine what will work in Hong Kong. There will no doubt be many views and suggestions about how to do it well and debates over the institutionalisation of methods and systems for different types of circumstances, such as low-rise and high-rise households, urban and rural areas, as well as factors relevant to the C&I sector. Beyond everyone's effort to reduce waste, we need the community to work through many challenges with us in the spirit of collaboration if Hong Kong is to be successful in transforming how we deal with food waste.

Furthermore, a critical step is the implementation of MSW charging in 2016/17, as well as the speedy construction of the OWTF network. We recognize we

still need to present the public with Hong Kong's MSW charging plan and that the political process to bring it to fruition must be gone through, where there could well be a diversity of views. At this stage, we are heartened by the public's acceptance of the concept of waste charging. As for creating the OWTF network, we have tendered OWTF1 and will make a decision on selecting the operator soon. In order to stay with our timetable, we need to move ahead expeditiously with OWTF2. To proceed with the other ones, we re-emphasize our desire to work with the private sector to explore how we may be able to speed-up the construction of more plants, and also to find available sites for them.

“Through committed and sustained individual and corporate actions, and through complementary government policies and programmes to incentivize food waste reduction, separation and collection, as well as to provide the necessary infrastructure for recycling and treatment, we believe Hong Kong can achieve the target of reducing food waste to landfill by 40% by 2022.”

This document represents the start of a new journey for Hong Kong. At Environment Bureau, we wish to see Hong Kong people taking pride in “Everyone being a Recycler” and in adopting a “Food Matters” culture that will spread through our society and become one of our core values. Hong Kong is famous for our good food. Yes, we can eat well but we must not waste. Let us all adopt these practices as a part of how we wish to live. Hong Kong's catering sector can be well-known for not only providing good food but also how they minimize and recycle food waste. With infrastructure established and the culture of Food Wise taking root in the community, the coming 10 years will lay a solid foundation for us to plan ahead for the future.

Annex

Evaluation of Food Waste Treatment Methods

Option	Strengths	Weaknesses	Remarks
Anaerobic Digestion	<ul style="list-style-type: none"> Highly suitable for wet biodegradable organic waste Possible energy recovery in the form of biogas Useful end product in the form of compost 	<ul style="list-style-type: none"> Longer start-up time to develop high biomass inventory Relatively slow process rate Only limited to biodegradable waste 	<ul style="list-style-type: none"> A promising biological treatment technologies with wide applications worldwide Great demand in HK for the biogas or energy as product of the treatment
Aerobic Composting	<ul style="list-style-type: none"> Suitable for various types of biodegradable organic waste Useful end product in the form of compost 	<ul style="list-style-type: none"> Longer start-up time to develop high biomass inventory Relatively slow process rate Limited to biodegradable waste Relatively large area requirement Difficult in odour control 	<ul style="list-style-type: none"> Biological treatment technologies with wide applications worldwide Likely limited demand in HK for the compost product
Conversion to solid biofuel	<ul style="list-style-type: none"> Energy and resource recovery Can be employed as a supplementary fuel in conventional boilers 	<ul style="list-style-type: none"> High operation cost Not cost effective for source separated biodegradable organic waste No markets identified for Refuse Derived Fuel 	<ul style="list-style-type: none"> Treatment by mechanical sorting and drying Excessive drying required as organic waste has a high moisture content Demand for the solid biofuel in HK is uncertain
Conversion to liquid biofuel	<ul style="list-style-type: none"> Sustainable use of resources Replacement for fossil transport fuels or used to generate heat and power on site 	<ul style="list-style-type: none"> High operation cost Not cost effective for mixed food waste Advanced / complex technologies required, some of which are still experimental 	<ul style="list-style-type: none"> Thermochemical/ Biochemical/Mechanical process Production of liquid biofuel is largely concentrated on the agricultural industry, with ongoing research using waste biomass as feedstock While there are existing facilities producing biofuel from pre-segregated oil in Hong Kong, the technology for mixed food waste is potentially complicated and unproven
Conversion to Fish Feed	<ul style="list-style-type: none"> Useful end product in the form of fish feed 	<ul style="list-style-type: none"> Nutritional needs vary between fish species Inconsistent feedstock and difficulty in managing quality control Limited market in HK 	<ul style="list-style-type: none"> Involve sorting and sterilization treatments Offensive Trade License might be required Not a prevalent practice in other countries

Annex

Option	Strengths	Weaknesses	Remarks
Conversion to Animal Feed	<ul style="list-style-type: none"> Useful end product in the form of animal feed 	<ul style="list-style-type: none"> Potential spreading of infectious animal diseases Inconsistent feedstock and difficulty in managing quality control May contain excessive amounts of trace minerals or substances which may be harmful to animal health e.g. excessive amounts of preservatives and salt Only limited to food waste with known sources and compositions Limited and declining market in HK 	<ul style="list-style-type: none"> Involve sorting and sterilization treatment All feed provided to the animals must fulfill the Public Health (Animals and Birds)(Chemical Residues) Regulation, Cap.139(N) In Europe, the Animal By-product Regulations (ABR, EC 1774/2002) identified catering waste as potential risk materials that is not suitable for processing animal feed. Some other countries such as Canada and Australia also ban recycling food waste to feed farmed animal
Miscellaneous methods	<ul style="list-style-type: none"> Some volume reduction; Some useful end products if treatment is completed 	<ul style="list-style-type: none"> Usually for small scale operation Usually require second stage treatment or involve high operational cost 	<p>Including the following :</p> <ul style="list-style-type: none"> Bokashi: fermented food waste required to be buried within soil for second stage fermentation Dehydration: dehydrated food waste still need to go through decomposition before usage as compost. High energy demand for dehydration Biological (e.g. earthworm, black soldier fly, etc.): under trial or relatively small scale operation. Potential ecological concerns if foreign species are introduced Grinding up food waste and disposing of it via the sewerage system: it would have adverse impact on the sewers and sewage treatment works. Large scale practical experience especially for multi-storey buildings is lacking and inconclusive internationally. Some cities have banned such practice

Abbreviations

AFCD	Agriculture, Fisheries and Conservation Department
ArchSD	Architectural Services Department
BDO	Build Design and Operate
C&I	commercial and industrial
ECF	Environmental and Conservation Fund
EIA	environmental impact assessment
EPD	Environmental Protection Department
FEHD	Food and Environmental Hygiene Department
GHG	greenhouse gases
GTW	grease trap waste
HyD	Highways Department
HD	Housing Department
IWMF	Integrated Waste Management Facility
LCSD	Leisure and Cultural Services Department
MSW	municipal solid waste
NGOs	non-government organizations
OWTFs	Organic Waste Treatment Facilities
UCO	used cooking oil
SDC	Council for Sustainable Development