

Appendix A

Municipal Solid Waste Management Policy - Present Situation and Way Forward

(April 2012)

Professional Commons

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The Professional Commons

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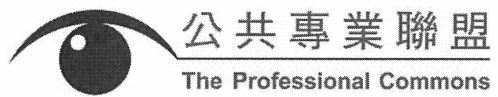
I. Foreword

The public administration of Hong Kong has enjoyed a high reputation in the past. However, the incumbent Administration budes to work on even the “garbage” issue, which is largely an issue significantly with no controversy in modern cities. In recent years, several policy initiatives concerning Municipal Solid Waste (hereafter MSW) have faced serious criticisms and setbacks. Against this background, it is worrying whether the Government of the Hong Kong Special Administrative Region (hereafter the Government) can ensure effective governance over the territory in the long run.

MSW policy measures put forward by the Government in these years, ranging from expansion of the landfills to construction of incinerator, have suffered from lots of backlash. The crux of the issue is that most of these initiatives are by no means optimal, which would result in reduction of country-park size, undertaking of large-scale reclamation, etc. With regards to the consultation on waste charging which is still underway, members of the public in general do not understand its necessity as well as remain skeptical about its practicality.

If taking holistic point of view of the policy into account, the “Policy Framework for the Municipal Solid Waste Management ”(hereinafter referred to as the “Policy Framework”) was released by the Government in 2005, which put in place a set of policy initiatives and respective action agenda up to 2014. Given that the overarching policy framework suggested in this document can serve as a useful reference, The Professional Commons (hereafter The ProCommons) will make use of this framework to assess the effectiveness of existing MSW policy, which serves as the background for in-depth analysis of the proposed waste charging mechanism.

Based on our past experience on public policy analysis and deliberation, the mode of consultation on waste charging is largely a repeat of previous practices, i.e. segregating a complex policy issue and presenting to the public a single faceted one. Hence, many of the responses might be so distorted to address the issue accurately, therefore probably damaging the quality in decision making accordingly. In response to the consultation, The ProCommons has first proposed the future direction of MSW policy from a more macro



perspective, followed by concrete policy recommendations before our response to the proposal of waste charge has been made.

II. Problem on Municipal Solid Waste Management

A. Implementation of the “Policy Framework for the Municipal Solid Waste Management”

Three policy targets as well as respective policy measures have been specified in the “Policy Framework” as follows:

Policy targets	Policy measures and facilities
Avoidance and Minimization of waste	Waste charging, Producer Responsibility Schemes
Reuse, recovery and recycling	Waste charging, Producer Responsibility Schemes, source separation of waste, short-term lease of land for waste recyclers , EcoPark, green procurement
Bulk Reduction and Disposal	Application of mechanical and biological treatment technologies, landfills disposal ban, incinerators

1. Imposition of Charges on Municipal Solid Waste

Policy measures

Pre-paid waste disposal bags will come in different sizes. The prices of the bags should be set at a rate high enough to recover the cost of treatment and encourage a change in behavior. (Ch. 4, para. 72. Unless specified, the policy measures listed below are from the “Policy Framework”; the same rule applies below)

Present Situation

Only in January this year did the Government start to conduct a public consultation over the possible imposition of levies over municipal solid waste.

2. Producer Responsibility System

a. Plastic bags

Policy measures

Through a Producer Responsibility Scheme (hereafter “PRS”) based charge that will be administered by retailers, the Government aims to drastically cut back the number of bags used. (Ch. 4, para. 73)

Target Date: 2007. (Ch. 4, para. 82, Table 5)

Present Situation

First phase of the plastic shopping bags levy was implemented in July 2009 that started with chain-stores, in which each hand-carry plastic bag was charged with a levy of 50 cents. It is proposed that the second phase of the plastic bag tax levy will be extended to over 60 000 retail outlets throughout Hong Kong. However, these retail outlets will be allowed to retain the fees and need not turn over the levy to the Government. A three-month public consultation on these proposals had been completed in mid-2011 but no specific timetable for their implementation has been suggested to date.

b. Polystyrene lunch boxes

Policy measures

In collaboration with green groups, the Government has organized a series of forums at dozens of primary and secondary schools to promote the idea of using fewer disposable lunchboxes. It is hoped that this would help to spread the message of waste reduction to the younger generation and the community. (Ch. 4, para. 73)

Present situation

As of March 2012, the Environment and Conservation Fund has approved a total of 80 applications for funding, amounting to HK\$100 million that helps

schools retrofit central distribution points for meal distribution, therefore reducing disposable lunch boxes and food waste.¹

The amount of polystyrene utensils in a midst of municipal solid waste is on a declining trend, reducing from 330 000 tonnes in 2009 to 320 000 tonnes in 2010.²

c. Packaging

Policy measures

PRS levies will be introduced subject to consultation with the trade. (Ch. 4, para. 73)

Present situation

The Government is yet to launch the relevant consultation exercise.

d. Electrical and electronic equipment

Policy measures

A pilot centre has been set up at the Kowloon Bay Transfer Station by 2006 to gain more experience on the PRSs for electrical and electronic equipment. (Ch. 4, para. 76)

Target Date: 2007. (Ch. 4, para. 82, Table 5)

Present situation

The public consultation was completed in April 2010. However, the authorities concerned have not yet submitted to the Legislative Council any legislative proposals.

¹ The Environment and Conservation Fund website, <<http://www.ecf.gov.hk/en/approved/ompps.html>>.

² Environmental Protection Department, "Monitoring of Solid Waste in Hong Kong," Statistics in 2009 and 2010, "Plate 2.9: Composition of municipal solid waste – Breakdown of major components".

e. Supply Chain

Policy measures

As Hong Kong is no longer a major manufacturing base, the promotion of PRSs should put more emphasis on the shared responsibility of all parties along the supply chain, from importers and distributors to retailers and consumers. (Ch. 4, para. 81)

Present situation

No targeted activities from the Government have been initiated.

f. Other products

Policy measures

The schedule for implementation of the PRSs on several major types of municipal solid waste is as follows: electrical and electronic equipment, vehicle tyres, and plastic shopping bags by 2007; packaging materials and beverage containers by 2008, and rechargeable batteries by 2009. (Ch. 4, para. 82, Table 5)

Present situation

Most of the above-mentioned items, other than electrical and electronic equipment and plastic shopping bags, do not have an action agenda on implementation of the PRSs.

3. Source Separation of Waste

Policy measures

Setting targets for the domestic waste recovery rate, the participation rate for the overall population, as well as the number of public rental housing estates participating in the programmes. (Ch. 4, para. 88)

Present situation

The Programme on Source Separation of Domestic Waste has been implemented since 2005. As of the end of 2011, there were 1,791 housing estates/ buildings to participate in the domestic waste source separation programme.³ In October 2007, a similar scheme was extended to commercial and industrial buildings. In August 2011, over 700 buildings have participated in the programme⁴.

Source separation of glass bottles is still at experimental stage although several pilot programmes have been implemented for a couple of years. By the end of 2010, the Glass Container Recycling Programme, which lasted for 12 months, was implemented in six public housing estates in Kowloon East.⁵

4. Regional and district-based recycling center / short-term lease of land

Policy measures

The Government is identifying public spaces dedicated to recycling activities such as idle corners of land below flyovers (Ch. 4, para. 83) and will lease suitable Short-term Tenancy (“STT”) sites exclusively to waste recyclers. (Ch. 4, para. 95).

Present situation

The STT sites granted for waste recovery and recycling purposes have experienced serious contraction in recent years, with the number of corresponding use of land has decreased from 36 in 2007 to 32 in early 2012, and the total area reduced from 7.37 hectares to 4.83 hectares.⁶

³ The Government’s domestic waste source separation programme website:

<https://www.wastereduction.gov.hk/en/household/source_achievements.htm>.

⁴ “Source Separation of Waste Programme receives good response”, Press Release of the Hong Kong SAR Government, 17 August, 2011, <<http://www.info.gov.hk/gia/general/201108/17/P201108170207.htm>>.

⁵ Pilot Programme on Source Separation of Glass Bottles, Environmental Protection Department (EPD) website: <http://www.epd.gov.hk/epd/english/environmentinhk/waste/eco_responsibility/gcrp_pilot_ssp_ha.html>.

⁶ Annex to “LCQ20: Short-term tenancy (STT) sites for recycling industry: Short Term Tenancy Sites for

As for the idea of a recycling center network at the regional or district level, the Government has not put forward any action plans.

The Kwun Tong and Cha Kwo Ling Public Cargo Working Areas were closed at the end of 2011, which is bound to affect the transfer and export of recyclable materials in the vicinity.

5. EcoPark

Policy measures

The Government will establish the EcoPark to provide long-term land for environmental and recycling businesses. Phase I of the EcoPark will be available for occupation by the end of 2006. (Ch. 4, paras. 95)

Present situation

The repeated delays of full operation of the EcoPark not only have negative impact on development of local recycling industry, but also adversely affect the formulation of recovery system at district level. As the tendering process of land during Phase I had been delayed more than once, all 8 recycling plants could not formally put into operation until the second or third quarter in 2010. Moreover, the leasing rights of six other sites at Phase II of the EcoPark had not been granted until September 2011.

The quantified outputs on waste recovery and recycling amongst the EcoPark tenants have not been made public. From the published account regarding individual tenants, it merely publicized the targeted amount of recycling on a quarterly basis⁷. We are therefore difficult to assess their performance at this stage.

Waste Recovery/Recycling/Reprocessing Operation (as at June 2007)” Press Release of the Hong Kong SAR Government, July 11, 2007,
<<http://www.info.gov.hk/gia/general/200707/11/P200707110178.htm>>; “Short Term Tenancy Sites for Waste Recovery / Recycling / Reprocessing Operation (as at January 2012) ,”
<https://www.wastereduction.gov.hk/en/workplace/stt_sites_region.htm>

⁷ “Tenant Close-up”, Website of the Hong Kong EcoPark,
< <http://www.ecopark.com.hk/en/tenant-close-up.aspx>>.

6. Green Procurement

Policy measures

The Government will adopt a green procurement policy to boost the demand for recycled products (Ch. 4, para. 95)

Present situation

Since 2000, the Government has developed green specifications for products commonly used by government departments, in which it requires all procured products should be in compliance with relevant specifications. The products that comply with the environmental standards in the procurement list have increased to 103 to date. However, the Government has not yet released the proportion of environmentally-friendly products out of the total amount of procurement.

The Government has also committed to promoting green procurement at community level, in which "Hong Kong Green Purchasing Charter" was established on October 2007. However, the effectiveness of the promotion is quite of limited scale. Besides the 11 founding members, the Hong Kong Green Purchasing Charter has only 13 fellow members, 44 ordinary members and 31 Associate Members at present.⁸ Total memberships amongst all membership categories are merely 109 in a four and a half years span since its inauguration.

7. Landfill disposal bans

Policy measures

When appropriate technologies such as composting or anaerobic digestion come online, landfill disposal bans will, in the longer term, be extended to cover biodegradable waste, such as food waste (Ch. 4, para. 105).

⁸ See the Hong Kong Green Purchasing Charter website, membership lists, < <http://www.hkgpc.org/html/eng/member.aspx>>.

Present situation

The incumbent Administration is indecisive over the construction of organic waste treatment plants. Hence, it should be beyond any doubt that the proposed ban fails to make any real progress.

8. Food waste recycling

Policy measures

Biodegradable materials such as food waste from commercial and industrial establishments can be separately collected at source for biological treatment such as composting and anaerobic digestion.... Exporting compost to the Mainland is not practicable due to the strict import control on the quality of compost produced from municipal solid waste. Hong Kong is able to take up soil conditioners produced from about 500 tonnes of biodegradable waster per day. (Ch. 4, para. 108)

Present situation

There has been said more than done concerning the organic waste treatment plants in the Siu Ho Wan and Sha Ling. The former is still during the tendering stage, while as for the latter, feasibility studies and environmental impact assessment have not been completed. It is anticipated that the only facilities of the first phase will put into production during the mid-2010s.

9. Incinerator / Modern Integrated Waste Management Facilities

Policy measures

After the various measures on avoidance, recovery and recycling of waste are introduced, the Integrated Waste Management Facilities will be established in two phases. (Ch. 8. para. 112)

Present situation

Recently, the application for the establishment of the Integrated Waste Management Facilities in Shek Kwu Chau was unfortunately turned down by the Food Safety and Environmental Hygiene Panel of the Legislative Council. The funding application to the Legislative Council has then been withdrawn for the time being.

10. Summary

Regarding the implementation of the existing municipal solid waste management policy, it was characterized that the Government failed to take determined actions. It had rather spent time on empty talk, therefore incapable of putting forward even soft options, not to mention possible fulfillment of difficult tasks.

Generally speaking, it is considered that the execution of the three policy targets proposed in the “Policy Framework” are far from satisfactory, in particular on installation of relevant facilities. Below are our summary remarks:

a. Avoidance and minimization of waste:

There is a general impression that the departments concerned are merely keen on waste reduction programmes on a voluntary basis, including various “source separation programmes”. Despite somewhat impressive results in terms of participation of buildings, it is still far from satisfactory that these programmes are yet to reach the level of full community participation. As a crux, only a portion of individual households and businesses have been engaging in voluntary source separation.

Levies on municipal solid waste and producer responsibility systems require forceful administrative and legislative means, as well as involvement of lobbying and campaigning of considerable strength. But it is obvious that the Government failed to pluck up with necessary political determination to put relevant policy measures in place. Therefore, waste reduction is far from satisfactory and there exists considerable room for further improvement.

b. Reuse, recovery and recycling

As for effect, reuse, recovery and recycling are steps that were intimately intertwined. Failure of any single part will adversely affect the other in the chain for sure.

Given that levy on municipal solid waste and most producer responsibility schemes have not been in place, lack of legal and administrative tools plus lack of incentives are regarded as additional factors that obstruct any possible improvement of recovery. It in turn badly affects the “supply” of recyclable materials and no adequate private investment has been injected into the development of recycling industry.

In the face of such adverse business environment, the Government still strictly adheres itself to market-driven policy without provision of significant support to the privately-run recycling industry. As a result, the development of regional recycling centres, EcoPark, food waste treatment plants and green procurement remains stagnant, therefore failing to create synergistic effect for the whole supply chain of the industry.

As an issue that we have attached equal importance, the local recycling industries are far from reaching adequate economies of scale. Under existing circumstance, whether individual materials are successfully recycled is in the constraint of availability of overseas outlets. It results in adversely affecting the healthy development of the industry, therefore establishing no successful virtuous circle for its necessary development.

c. Bulk Reduction and Disposal

Lukewarm attitude of the Government concerning construction of waste treatment facilities makes account of snail-speeded construction of even some lesser controversial facilities as food waste treatment plants and EcoPark, resulting in substantial amount of recyclable materials being disposed at valuable landfills. It is therefore indispensable of the Government to evade any responsibilities.

Another example is the sludge treatment plant project (Note: sludge generated by sewage treatment plants is not considered as domestic waste). The plant is able to take up to 2 000 tonnes of sludge with 30% of which considered solid substances.⁹ However, its construction is not up to the original schedule in 2012 and it does not put into operation until the end of 2013.¹⁰ Further, no explanation has been given by the Government on why early construction of the treatment plant was not possible.

B. Strategic errors and its consequences

1. Ignoring role of industrial and commercial sectors in waste reduction, reuse and recovering

To explore the means for realization of the producer responsibility scheme, it should be noted that, as stated in the "Policy Framework", "consumers as decision-makers deciding which products to use must play their part as well" (Ch. 4, para. 79). It is also pointed out that "as Hong Kong is no longer a major manufacturing base, PRSs in Hong Kong will emphasize the shared responsibility of all parties along the supply chain, from importers and distributors to retailers and consumers" (Ch. 4, para.81), suggesting a relatively understanding and sympathetic attitude towards local business sectors. Without a deeper look, it seems that the Government has suggested sharing of responsibilities amongst all parties, but in fact there is no specification on the responsibility of business sectors in waste reduction, reuse and recovering

As indicated by specific policy measures in recent years, majority of clauses concerning the proposed producer responsibility schemes in the "Policy Framework" result in nothing but tissues of empty talk, which has been summarized as follows.

⁹ EPD, "Sludge Treatment Facilities - Project Profile", p.3,
<<http://www.epd.gov.hk/eia/register/profile/latest/esb169/esb169.pdf>>

¹⁰ <振英棄焚化爐 邱騰華「唱反調」 湯家驊指梁迴避泛民感失望>, *Sing Tao Daily*, 6 March 2012, p. A10.

Relevant Clauses in the Producer Responsibility Schemes	Present situation
Manufacturers are required to bear the responsibility of waste recovery for recycling	The consumer to bear the main responsibilities
Limiting the free distribution of certain products to reduce consumption	At least six free newspapers on market
A mandatory deposit system to encourage recovery of some categories of products	An implementation mainly on a voluntary basis
Levies on some product categories to facilitate the recovery and recycling of waste products	No such measures introduced
Restriction of certain ingredients to be used in production to facilitate the recycling of waste materials	No such measures introduced

More importantly, it has been claimed by government officials that the recovery rate of commercial and industrial waste has always been at a higher level, which was 65% in 2009.¹¹ Against this background, the Government has not been effectively monitoring the growth of commercial and industrial wastes for a certain period of time, not to mention to enhance their recovery rate via introduction of both legislative and administrative means.

Commercial and industrial waste has grown rapidly in recent years, which has become the main source for avalanche of municipal solid waste. From 2002 to 2010, there has been a sharp increase on daily disposal rate, accounting for a 60% increase of a total of 1,500 tonnes or more commercial and industrial waste. Amongst them, commercial waste constitutes three-quarters of such change. On the contrary, domestic waste per day has decreased by nearly 20% with a reduction of around 1,400 tonnes. To further compare the amount of reduction per capita, domestic waste during this period reduced by 0.25 kg per day, but the decrease was offset by the increase in commercial and industrial solid waste accordingly, resulting in an overall reduction of a mere 0.11 kg of municipal solid waste. The details have been shown by the following table:

¹¹ "LCQ18: The number and locations of 3-coloured waste separation bins," Press Release of the Hong Kong SAR Government, 26 May 2010.

Table 1: Daily Disposal of Municipal Solid Waste in Landfills

	2002	2010	Range of Increase or Decrease	Percentage Increase or Decrease
Domestic waste (tpd)	7,519	6,135	-1384	-18%
Commercial waste (tpd)	1342	2352	1010	+75%
Industrial waste (tpd)	561	627	66	+ 12%
Commercial and Industrial Waste (tpd)	1903	2979	1076	+ 57%
Municipal solid waste (tpd)	9422	9114	-308	-3%
Domestic waste (kg/person/day)	1.1 1	0.8 7	-0.25	-21.62%
Commercial and industrial waste (kg/person/day)	0.2 9	0.42	0.14	44.83%
Municipal solid waste (kg/person/day)	1.40	120 9	-0.1 1	-7.86%

Remarks: tpd: tonnes per day

Source: Environmental Protection Department: Monitoring of Solid Waste in Hong Kong (Waste Statistics for 2 006 and 2010). Plate 2.7 Per capita disposal rates of municipal solid waste and domestic waste

2. Over-reliance on exports

The Government openly admits that Hong Kong relies so much on export for effective absorption of local recyclable materials. Taking the year 2010 as an example, recyclable materials collected by local waste recyclers reached approximately 3.6 million tonnes, in which 3.57 million tonnes (about 99%)

were exported with the rest (less than 30 thousands) handled locally.¹² It can be seen that local recycling industry is far from thriving. Without any outlets from overseas market, landfills seem to be the only option for their disposal.

Concerning the constraint, it was highlighted by the Government that “low values, high transportation cost or lack of market demand for recovered materials particularly for plastics, glass, textiles, tyres and organic materials”¹³. The same can be observed from individual recyclable materials. During 2010, daily disposal of glass and wooden/rattan materials amounted to 373 tonnes and 295 tonnes respectively. Owing to the fact that the construction of food waste treatment plant is yet to start, daily disposal of industrial and commercial food waste in landfills has reached a total of 840 tonnes.¹⁴

It is nothing but a naked violation of the principle of fairness that we pass the buck of burden of recyclable materials to other countries or places with no qualms at all. Even from a practical perspective, such a strategy is also not what we consider as sustainable. Even the Mainland has imposed a rather strict regulation on import of what we called “foreign garbage”. On the other hand, there are also proactive measures that rectify high-polluting industries comprising definitely the recycling industry. In the long run, Hong Kong is not justified to rely on other places to absorb the recyclable waste that we produced.

3. Stiff insistence of non-intervention policy

As a principle, the Government has adamantly adopted an open market approach toward recycling and recovery industries without provision of subsidies and assistances of any form. Owing to a meager profit that can only be made, the industry is under labor-intensive operation with relatively low skills involved. Against this background, it would be difficult for any formation

¹² EPD, “Monitoring of Solid Waste in Hong Kong,” Statistics in 2010, “Plate 3.2: Municipal solid waste recovery rates in 2009 and 2010, Note 1, p. 12.

¹³ Waste Management Policy Division, EPD, “Recovery and Recycling of Municipal Solid Waste in Hong Kong”, November 2011. (環境保護署廢物管理政策組：〈香港都市固體廢物的回收及循環再造〉；Chinese only), Waste Reduction website,

<https://www.wastereduction.gov.hk/chi/materials/info/wr_msw.pdf>

¹⁴ Ditto. Plate 2.9: Composition of municipal solid waste in 2010 – Breakdown of major components, p. 9.

of economies of scale that inevitably incurs irregularity in daily operation. Under such adversity of business condition, it would be in vain to ask local recovery and recycling industries to shoulder the social function of effective recycling.

The prominence of non-intervention policy also results in continued procrastination of EcoPark as well as stagnant development of regional or district recycling centres.

It has been observed that government subsidies have long been a contributing factor that helps bring a success of local industrial and trade development. Now the self-proclaimed free but rigid economic policy has done nothing but ignored the positive contribution of recycling industries to the society, which is regarded as a serious flaw that obstructs people from seeing light at the end of tunnel.

4. Ignoring the fact that over half of the waste has no outlets

At present, recyclable materials comprise mainly waste paper, metals, plastics and old clothing, but the Government is yet to explain to the public there has still been substantial amount of waste that cannot be handled by the existing recycling system, including putrescible, glass, wood/rattan, household hazardous wastes (HHWs), etc. They make up of a total of 4 500 tonnes, equivalent to the half amount of all landfill disposal. Details are as follows:

Tonnes

	Household waste	Industrial and commercial waste	Subtotal
Putrescible	2747 (74.9%)	922 (25.1%)	3668 (100%)
Glass	310 (82.9%)	63 (16.8%)	374 (100%)
Wood/Rattan	74 (25.1%)	221 (74.9%)	295 (100%)
HHWs	75 (69.4%)	33 (30.6%)	108 (100%)
Total	3206 (72.1%)	1239 (27.9%)	4445 (100%)

Source: Plate 2.8: Composition of municipal solid waste in 2009 – Breakdown of major components, “Monitoring of Solid Waste in Hong Kong: Waste Statistics for 2010”

5. Small capacity results in low effectiveness

Several tenants of the EcoPark have commenced operation and their recycling capacities are listed as follows:

Tenants	Recyclable Materials	Recycling Capacity	
		tpq	tpd
Champway Technology Ltd.	Cooking oil	5000	54.9
Hong Kong Hung Wai Wooden Board Company	Wood and timber	12500	137.4
Shiu Wing Steel Limited	Metal	40000	439.6
Li Tong Group	Electronic and computer equipment	300	3.3
Hong Kong Telford Envirotech Group Ltd.	Plastic	5110	56.2
YOT EcoPark Plastic Resources Recycling Centre	Plastic	1560	17.1
St. James' Settlement "WEEE GO GREEN" EcoPark	Home appliances	50	0.5
Cosmos Star Holdings Limited	Car batteries	660	7.3
Total		65180	716.3

Remarks: tpq: tonnes per quarter; tpd: tonnes per day

Source: "Tenant Close Up", EcoPark website,
< <http://www.ecopark.com.hk/en/tenant-close-up.aspx>>

In fact, recycling via local means can help reduce transportation expenses and carbon emission. More importantly, unused recyclable materials, simply because of lacking overseas market, will no longer be disposed of in landfills if they can be processed locally. For instance, there was basically no outlet for scrap wood until the establishment of a wooden board company in the EcoPark, which is able to absorb hundreds of tonnes of scrap wood. It is anticipated that the flourishing of local waste recycling and processing industries might further stimulate an extra demand on "raw materials" and therefore boost up the waste recovery.

Glass as another example can serve as a good case to illustrate the interdependence between waste recovery and recycling. According to an official source on glass recovery and recycling, there is no leverage of using glass bottles over mineral materials in terms of cost saving. Given that the economic benefits generated by the recovery and export of glasses are far from significant, the future of this specific type of business looks grim.¹⁵ As there is no major glass recycling industry in the territories, the Environmental Protection Department had openly stated that it would not be advisable to put in place a large scale glass recovery mechanism prior to the existence of stable and reliable outlets for the glasses.¹⁶ Against this background, it should be beyond any doubt that recovery of recyclable waste hinges on the possible expansion of local recycling industry.

¹⁵ Waste Management Policy Division, EPD, “Waste Glass Bottles in Hong Kong”, Waste Management Policy Division, November 2011, (環境保護署廢物管理政策組：〈香港廢玻璃瓶的回收及循環再造〉2010年11月；Chinese only), Waste Reduction website;
<https://www.wastereduction.gov.hk/chi/materials/info/wr_glass.pdf>.

¹⁶ Ditto, June, 2007 version.

III. Proposed Guiding Principles

A. MSW Policy

1. “Policy Framework” has set out three policy tasks that represent a holistic and comprehensive picture, including (1) avoidance and minimization of waste; (2) reuse, recovery and recycling; and (3) bulk reduction and disposal. In the future, greater emphasis should be put on policy implementation and enforcement.
2. Given that the objective of introducing waste charges is to change behaviour of citizens, it would be more sustainable to instill a sense of self-obligation on waste reduction and recovery across the community.
3. As a matter of principle, the Government should trust our fellow citizens that they are able to develop their sense of environmental protection and are willing to assume the responsibilities on waste reduction and management. In the light of this, a higher priority should be attached to create an environment that is favorable enough to facilitate a community-wide participation on waste reduction, recovery and recycling. Whether these measures would adversely affect people’s livelihood should be considered as of secondary importance, as far as its influence is concerned.
4. The Government should initiate to rebuild public confidence by insistence on environmentally-friendly principles in municipal solid waste management. To this end, concerned government departments should take the lead and should provide sufficient resources on waste reduction and recovery, green procurement, etc. Beside greater effort that supports development of recycling industry, environmentally-friendly waste management facilities other than incinerator should be installed in no time. Such a move will be more appealing to the community on one hand, and will help get rid of any possible public suspicion what underneath the policy is nothing but shifting of necessary burden of government to ordinary citizens.
5. As an issue, municipal solid waste management is what affects people from all walks of life. Only mass mobilization could ensure a success of the policy targets that stress on fair share on responsibilities. In the light of recent upsurge on industrial and commercial waste in recent years, greater effort with forceful

remedial measures should be put in place in response to this imminent situation.

6. Policy measures under the three policy targets should be implemented in a more balanced way to create the necessary synergistic effect that is powerful enough to help bring about better results. For instance, source separation can help reduce the amount of waste; development of recycling industries can boost up waste recovery rate, etc.

B. Waste Charging System

1. In view of prioritization in policy implementation, waste charging should only be imposed following the full-scale implementation of waste reduction and recovering measures.
2. A reward mechanism should be included so that citizens actively engaging in waste reduction and recovery would not be charged or even be given monetary reward.
3. Waste charging should adhere to the principle of “revenue neutral”. All extra revenue generated should be earmarked for the development of circular economy and recycling industries.
4. Levy on municipal solid waste should be avoided from becoming another goods and services tax. More importantly, drawbacks from regressive tax should also be exempted.

IV. Policy Recommendations

A. MSW Policy

1. To rebuild public confidence that the Government is willing to make commitment on municipal solid waste management, it should take the lead and put in place seriously internal measures on waste reduction and recovery, green procurement, etc. Individual bureaux and departments should also be required to make account of their performance on solid waste management by preparing a specific chapter in their writing of annual environmental performance report. Furthermore, the Government as a whole should provide an annual environmental performance report that consolidates and reflects the overall performance of the entire government, particularly on provision of year-on-year comparison and figures on solid waste management for easy reference of the public.
2. To ensure a success concerning the implementation of MSW policies, the Government is advised to launch a community-wide campaign, therefore mobilizing people from all walks of life to actively participate in waste reduction and recovery. It should be highlighted that the mass education campaign aims not only at cultivating toward the public a stronger sense of environmental protection that leads to a lifestyle change only, but also at eliminating mutual disbelief that may come out in the course of policy implementation. More importantly, in order to make members of the public more contributive, this engagement exercise should be undertaken in combination with the visions that constitutes the betterment of our community.
3. The Government should act proactively to put forward forceful policy measures toward avoidance and minimization of waste, particularly via the introduction of producer responsibility schemes that facilitate waste reduction at the source. By doing so, it would help individual citizens get rid of disposal of waste that is totally unnecessary. Under the PRSs, manufacturers, importers, wholesalers, agents all bear their obligation to follow a set of criteria on manufacturing process as well as quality of the imported products including low energy consumption, minimum consumption of materials, non-toxic and low pollution, easy recovery, reduced use of packaging materials, etc. If implemented

successfully, there will be real choices in the market. Those willing to engage in waste reduction and recovery would have a chance to put them into practice on a daily basis, whereas those reluctant to do so might accept waste charging in a more open manner.

4. Utilization of creativity to upgrade waste recovery and recycling
 - a. Putting in place a multi-item recovering mechanism across the territories

This is what the Government can do to reduce transportation cost substantially. Taking restaurants as an example, recycling operators can collect cooking oil, glass bottles, metal cans, food waste and plastic bottles in one go, as long as these items can be under proper separation and storage. By doing so, waste from restaurants and catering industries will be sharply reduced.

Besides 3-coloured waste separation bins, waste reduction programmes on a voluntary basis initiated by the Government focus on single-item recycling (rechargeable batteries, computers, CFLs, fluorescent lamps, glass bottles, etc). But given the limited scope of distribution of collection points plus substantial transportation cost, value generated from recycling materials has been offset.

- b. Procurement of services as a means to compensate the waste recovery and recycling industries.

In the course of extracting recyclable materials from municipal solid waste, businesses engaging in waste recovery and recycling have reduced the amount of waste disposed at the landfills. Therefore, they will be justified to request to the Government a claim that they attempt to cover the cost concerned, while the Government is not able to take the provision of such service for granted. In the light of this, the service payment should not be treated as subsidies of any kind.

- c. Promoting waste recovery with cash return

Generally speaking, recyclable materials have had certain amount of cash value. Recovery and recycling with cash return can provide the participants with positive reinforcement, which likely boosts up the recovery rate. In order to

boost the development of recycling businesses, seed money should be injected to facilitate establishment of more social enterprises that start running their business in related industries.

d. Advanced technology to add value to waste recycling industries

Our research capacity and technological level are amongst all one of the highest in the world. Against this background, it is possible that the recycling and recovery industries can combine R&D and high technology, therefore speeding itself forward to the direction of high-tech development.

- Extracting rare earth minerals from waste electrical and electronic equipment. A feasibility study on opportunities of strategic rare earth materials processing industry in Hong Kong was released by the Federation of Hong Kong Industries and Hong Kong Productivity Council, identifying the potential for Hong Kong to develop a REE-based specialty intermediate materials industry in the light of four aspects¹⁷. On the other hand, valuable metallic substances can be extracted from waste electrical appliances and electronic equipments, in which advanced countries like Japan extract rare metal via recycling of the above-mentioned equipments.¹⁸ In view of local huge production of waste electrical appliances and electronic equipments, it should be advisable for the Government to sponsor the development of related technologies via Innovation and Technology Fund, therefore enhancing the technology level of recycling industries.
- Recycling waste cooking oil into biodiesel is regarded as another high value-added recycling industry.¹⁹

e. Incorporating the concept of “livable city” into the development of waste recycling

¹⁷ For details, see “Study by FHKI and HKPC Outlines Opportunities for Hong Kong to Develop Rare Earth Materials Processing Industry,” (Press Releases), Webpage of the Federation of Hong Kong Industries, 13 March 2012,

<http://www.industryhk.org/english/news/news_press/pr_120313_009.php>.

¹⁸ 〈外國購華稀土廢料 加工提煉〉, Wen Wei Po (online version), 21 June, 2011.

¹⁹ 〈荷航活用地溝油〉, Wen Wei Po (online version), 26 November, 2011.

As stressed, food waste without local outlets for soil conditioners produced has to end up in landfills. The Government is advised to develop outlets in the light of two aspects, including

- Rejuvenating arable land in rural area: At present, there exists idled arable land of considerable scale. In view of voices that express emerging desire to participate in farming at societal level, availability of big area of arable land is not impossible, if the Government initiates to work closely with the landlords concerned. As far as the advantages are concerned, this strategy will help reduce production of waste on the one hand, and will enhance a more vibrant city life on the other. More importantly, it can take up more soil conditioners produced from biodegradable waste;
 - Promotion of rooftop garden: rooftop gardening as a programme would be conducive to reducing carbon footprints as well as taking up more soil conditioners produced from biodegradable waste. Specific strategies are suggested as follows:
 - To introduce extensive rooftop gardening in public buildings and utilities, in which tall buildings may adopt a more economical extensive design, while shorter one the intensive design in order to reach as many eyeballs of inhabitants as possible;
 - Owners of private buildings should be encouraged to follow through the promotion of corporate social responsibility and the provision of matching fund.
5. Expedite the construction of waste treatment plants with incinerator as last resort
- a. To construct another EcoPark of similar scale in the East of New Territories. It would be crucial to establish recycling plants with strategic value. Together with possible absorption of waste glass and wood with no outlets in overseas market, recycled paper can also be one of the main products that come out to take up the handsome local market share.
 - b. In order to effectively take up daily production of industrial and commercial food waste totaling 900 tonnes, the construction of the two organic waste

treatment plants in Siu Ho Wan and Sai Ling should beyond any doubt commence as soon as possible, while the third one should be completed by 2020 as scheduled.

- c. Despite the fact that the installation of incinerators with state-of-art technology represents a more environmental-friendly choice, the effect is still far from satisfactory when compared with recycling and recovery of extensive scale. From cost effective perspective, the policy option is still inferior to waste charging. In the light of this, the installation of incinerators is what should consider the last policy option.

Comparison according to cost benefit analysis: between waste charging and incinerators

	Incinerator (From 2016 onward)	Waste Charging (From 2015 onward)
Capital Investment (in billion HK\$)	15	1
Annual Net Expenditure (in billion HK\$)	3.5	0.05
Daily Reduction of Landfill Disposal (in tonnes)	2700	2700
Total reduction of Landfill Disposal until 2022 (in thousand tonnes)	690	788
Cost to be saved in landfill disposal until 2022 (in thousand tonnes)	44	50
Net expenditure/revenue until 2022 (in thousand tonnes)	-351	+36

Remarks:

- Incinerator is expected to put into production in 2016. Treatment capacity is expected to be 3 000 tonnes per day with volume compression ratio at 90%. Residues will be sent to landfills for disposal.
- Waste charging mechanism can put into practice in 2015. It was suggested by experience from Taiwan that the mechanism could lead to 30% reduction of waste, which is equivalent to an amount of 2,700 tonnes. The amount does not take the assumption of upward trend of waste reduction rates into account.

- It is anticipated that the teething cost of the proposed waste charging mechanism will be HK\$1 billion. No matter the amount to be levied, it will all be contributed to the cash rebate to citizens or sponsorship to recycling and recovery industries. Therefore, there will be no net surplus or deficit involved.
- Assuming that the disposal cost per tonne is constant and maintains at the level of HK\$630. The amount does not take relevant waste transportation cost into account.

B. Waste Charging System

1. A partial charging mechanism should first be introduced on industrial and commercial waste as it appears to be an effective way in reducing their growth substantially.
2. There should be no way at all that levies on municipal solid waste have become goods and services tax of any sort. Notwithstanding inexorable increase in household expenditure, remedial measures should be in place to avoid the emergence of any blow that adversely affects the standard of living of low-income groups. Two policy measures have been suggested for consideration:
 - a. Similar to the existing policy measure that reduces water and sewage charges, each household should be provided with a garbage bag of a designated volume with no charges involved. Any excessive disposal will be required to pay for extra garbage bags. Such an arrangement can serve as a supplement to the quantity-based system; or
 - b. To dispense each citizens/household a special allowance for procurement of garbage bags every year. Such a move would be regarded as an incentive toward voluntary waste reduction, as the amount saved from using less garbage bags can be at a disposal of citizens concerned to other purposes.

Appendix B

**Incinerators – Heading in wrong direction and
failing to solve waste problems**

(April 2011)

Green Power


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Lok Ma Chau Frontier
Closed Area

2011
Major Works & Summary
of Financial Statements

Incinerators — Heading in wrong direction and failing to solve waste problem

04/2011

Earlier, the government was forced to abandon its plans for an extension of South East New Territories Strategic Landfill in face of strong opposition from the public and the legislature. Waste handling is a major issue facing Hong Kong. Every day, we generate more than 17,000 tonnes of solid waste and the three landfills that are in use are expected to be saturated within the coming three to seven years. The government re-tabled its proposal to build an incinerator, and its environmental impact assessment (EIA) public consultation ended in mid March. If the EIA was passed, a large scale incinerator would be built on a 12-hectare artificial island next to Shek Kwu Chau. While there are concerns on site selection and whether incineration technology has matured enough to prevent pollution problems, we hope to return to the basic question—can incineration solve Hong Kong's waste problem? Per capita municipal waste rose 7.7% from 2003 to 2009, and commercial waste even increased by 63%. Without a long-term waste reduction policy, the amount of waste generated in Hong Kong will continue to rise – so are we to build incinerators non-stop?

Annually, over 20 million tonnes of solid waste are produced in Hong Kong. This is mainly handled at the three strategic landfill sites at Tseung Kwan O, Ta Kwu Ling and Nim Wan. With present trends, the three sites will be filled up within three to seven years. It is very difficult to extend the existing landfills or build new sites, owing to the large area of land required, and over a decade required to study, plan, build and pass through the legal and consultation procedures. The case of South East New Territories Strategic Landfill has clearly demonstrated the difficulties involved.



Waste reduction and recycling are also solutions to the waste problem. In 2005, the Environmental Protection Department (EPD) issued the "Policy Framework for the Management of Municipal Solid Waste (2005-2014)". This set the following objectives: (1) Increase the recovery rate of municipal solid waste (MSW) to 45% by 2009 and 50% by 2014; (2) Reduce the amount of MSW generated in Hong Kong by 1% per annum up to the year 2014, based on the 2003 levels; and (3) Reduce the total municipal solid waste disposed of in landfills from 60% in 2004 to less than 25% by 2014.

Table 1: Statistics on municipal solid waste in Hong Kong, 2003-2009 (information source: the EPD)

Year	Annual amount (kton)	Waste generated		Handling methods	
		Difference from previous year	Per capita daily amount (kg)	Ratio to landfills (%)	Ratio for recycling (%)
2003	5,830	-	2.34	59	41
2004	5,700	-2.23%	2.28	60	40
2005	6,010	+5.44%	2.37	57	43
2006	6,230	+3.66%	2.44	55	45
2007	6,160	-1.12%	2.44	54	46
2008	6,440	+4.55%	2.53	51	49
2009	6,450	+0.16%	2.52	51	49

In 2009, the Environmental Protection Department announced the monitoring report of local municipal solid waste (see Table 1), which could be seen as a mid-term assessment of the Policy Framework for the Management of Municipal Solid Waste (2005-2014). Among the three objectives, only results for the first showed promise. The rate of recyclable material recovery from municipal solid waste was raised to 45% as early as in 2006, while in 2009 the figure was 49%, a mere 1% short of the target of 2014, so it was expected the target would be smoothly achieved. On the other hand, only in 2007 did we reduce the amount of municipal solid waste generated in Hong Kong by 1%. The objective was not achieved in all other years, and the 2009 figure was even 10.63% more than the 2003 level. In view of the rapid increase of municipal solid waste, it seems impossible to achieve the third objective: to reduce the total municipal solid waste disposed of in landfills to less than 25% by 2014. Hence, the government is hoping to develop other technologies to minimise the volume of waste disposed of in landfills. The main technology is incineration.

Advanced technology to reduce dioxin release

Hong Kong people may well be familiar with incinerators. In the 1970s and 1980s, there were refuse incinerators across Hong Kong Island, the Kowloon Peninsula, the New Territories and outlying islands. These early-generation incinerators were halted, and eventually demolished in the 1990s owing to the severe air pollution caused, and threats to nearby residents and the environment. At present, the government is planning to build Integrated Waste Management Facilities. The core is a large-scale incinerator. Tsang Tsui of Tuen Mun or an artificial island built next to Shek Kwu Chau are the sites selected for consideration.

In the past, incinerators were criticised for causing severe air pollution and discharging carcinogenic dioxin. However, as technology advances, the discharges of dioxins, suspended particles and organic pollutants have been greatly reduced through high temperature burning at over 850°C, air cleaning system and independent activated carbon injection system, etc. In recent years, modern incinerators have gained popularity in some countries such as German and Japan. There are about 1,700 incinerators in Japan, some are even close to residential areas. The Japanese government has turned incinerators into environmental education venues. The successful examples of merging incinerators with communities become good references for Hong Kong Government to promote incinerators.

Selected site is habitat of Finless Porpoise

The next problem is the selection of incinerator sites. There are two suggestions: Tsang Tsui, in Tuen Mun district, and an artificial island built next to Shek Kwu Chau, with the latter preferred by the government. The proposed incinerator belongs to the Integrated Waste Management Facilities, which include mechanical treatment system (shredding and sorting facilities for a mere 200 tonnes per day), fuel storage tanks, desalination plant, wastewater treatment plant, electricity system, berthing area for vessels, and storage of refuse containers. If the former option is selected, the air quality of Tuen Mun will certainly be worse. If this latter option is selected, a 11.8-hectare artificial island will be built by reclamation next to Shek Kwu Chau.

Apart from the artificial island, a 4.1-hectare breakwater will be needed to protect the facilities from wave action. This will result in 31 hectares of waters in the area being completely enclosed by the breakwater. The area of affected natural waters will be 43 hectares, causing a loss of marine habitat and fishery ground. Furthermore, the laying of underwater cables will destroy seabed habitats, with impacts as far away as the natural coast at Cheung Sha, south Lantau. The government proposes to build a marine park at Soko Islands as compensation for the ocean habitat loss due to Shek Kwu Chau artificial island. However, the large area of natural waters that will be lost forever cannot be compensated at all by designating other natural waters as marine park.

When the Integrated Waste Management Facilities start operation, enormous amounts of waste will be transported to Shek Kwu Chau by sea. The chance of ships getting around, leaking oil or releasing pollution is significantly increased. There are also fuel storage tanks, desalination plant and wastewater treatment plant that may leak chemicals and dangerous substances. The risk is too large for the natural waters. The area is also a key habitat of the globally endangered Finless Porpoise (*Neophocaena phocaenoides*), the protected White-bellied Sea Eagle (*Haliaeetus leucogaster*) and numerous kinds of corals.

Waste reduction at the source Core of the issue

When the issue of incineration was raised years ago, public concern centred around the technology and pollution problems. The recent debate also focused on the pros and cons of site selection when the government re-tabled the proposal for building incinerators. Even if the technological problems, site selection and negative impacts of incineration are finally tackled, we still have must return to the basic question—can incineration prove an ultimate solution to Hong Kong's waste problem?

Burning rubbish can immediately and drastically reduce waste volume by 90%. This seems to be a very convenient and easy solution. However, incineration cannot solve the long-term waste problem of Hong Kong at root. The proposed Integrated Waste Management Facilities can only handle 3,000 tonnes of solid waste daily, and municipal solid waste disposed of at landfills currently reaches 9,000 tonnes each day. Though the facilities may be large-scale, they still cannot meet the demands of local waste. If one incinerator cannot meet our demand, are we to build a second one? When the amount of rubbish increases, do we need yet another incinerator? In this case, we will only build more and more incinerators in future.

Waste reduction policy lacks vision

What we need now is not to handle the waste as fast as possible, but to solve the root problem. We hope to see the government take up the responsibility to reduce waste at source and increase the waste recovery rate. This way, resources are better utilised; waste as well as pollution and energy consumption are reduced. This should be at the top priority and promoted with all effort in tackling the waste problem. The government implemented waste classification and recovery in the 1990s, and the present recycling rate of municipal solid waste has reached the target set under the policy framework. Nonetheless, in view of the rapid and drastic increase in waste volume locally, the recycling effort cannot lessen the burden on the landfills.

In any case, this should not be an excuse for incineration. There is still considerable room for improvement for waste reduction at source. The government has been promoting waste reduction by words, without a matching policy. We have yet to see the implementation of producers' responsibility and waste levy legislation, or a policy on eco-friendly products design. Therefore, no major results can be expected.

As members of the public, we should also take up responsibility to reduce waste. After all, we are among the producers of the waste. If we can all reduce and recycle waste by avoiding disposable items, buying less packaged products, properly utilising recycling bins, and sending recyclables to recycling bins or locations, incinerators may not be needed.

If we choose the "easier" path, to develop incineration, we will only head towards a wrong direction. The result will be that not only is the core of the waste problem untouched, but also the public be less willing, and feel less urgency, to reduce waste. And we will go further and further away from solving the waste problem in Hong Kong.

Text | Dr. Cheng Luk-ki and Henry Lui

Appendix C

**Letter from WWF-Hong Kong to Director of EPD
regarding the development of IWMF (EIA-201/2011)**

(16 December 2011)



for a living planet®

世界自然基金會
香港分會

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Our Ref.: SHK/LDD 7/11

16 December 2011

Ms. Wong Sean Yee, Anissa, JP
Director of Environmental Protection
Environmental Protection Department
46/F, Revenue Tower, 5 Gloucester Road,
Wan Chai, Hong Kong
(email: eiaocomment@epd.gov.hk)

By Email ONLY

Dear Madam,

**Re: Development of the Integrated Waste Management
Facilities Phase I (EIA-201/2011)**

In our previous submission (18 March) regarding the captioned EIA report, we stated that the quality of the report did not follow current best practices in several key areas and could not be used to determine the actual environmental impacts from the proposed Integrated Waste Management Facilities, particularly at the ecologically important Shek Kwu Chau and urged that further work to be done before the EIA is approved. Unfortunately, little additional work has been carried out by the project proponent. In addition, Shek Kwu Chau seems to have been selected for this proposed project, despite the fact that will likely result in significant negative impacts to several species of conservation importance. Our current position, therefore, is that WWF objects to this EIA.

**WWF opposes the Government's proposal of building
an "integrated waste management facility" at Shek Kwu Chau**

WWF opposes the Government's proposal to construct an "integrated waste management facility at Shek Kwu Chau for three primary reasons:

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曾蔭權先生, GBM, KBE
主席： 楊子信先生
行政總裁： 龐毅理先生

義務核數師：香港立信德業會計師事務所有限公司
義務公司秘書：嘉信秘書服務有限公司
義務律師：孖士打律師行
義務司庫：匯豐銀行
註冊慈善機構

Patron: The Honourable Sir Donald Tsang, GBM, KBE
Chief Executive of the HKSAR
Chairman: Mr. Trevor Yang
CEO: Mr. Eric Bohm

Honorary Auditors: BDO Limited
Honorary Company Secretary:
McCabe Secretarial Services Limited
Honorary Solicitors: Mayer Brown JSM
Honorary Treasurer: HSBC
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- 1) The island of Shek Kwu Chau is the home of a number of rare species of conservation concern, including the white-bellied sea eagle (National Protection Class II), and its surrounding waters is also a core habitat for the finless porpoise. It is the view of WWF that the most updated scientific data provides strong support for Shek Kwu Chau and its surrounding waters to the south being designated as a Marine Park, rather than as an industrial facility for waste treatment.

- 2) WWF supports a holistic approach to manage waste (Appendix I)¹ in Hong Kong following the principle of sustainable development. Currently, efforts by the Hong Kong Government to reduce waste generation at source, recycle and change wasteful behavioral are clearly insufficient as indicated by Hong Kong's waste generation per capita, which remains one of the highest in the world, and clearly not sustainable. Hong Kong is a small city with not only a high ecological footprint but also heavy generation of waste. Without comprehensive and where necessary, mandatory waste management policies to tackle waste from both source and disposal, the burgeoning waste will degrade our natural landscape and impact our quality of life, as demonstrated by the proposed use of part of the Clear Water Bay Country Park as landfill.

- 3) The proposal to use part of the Clear Water Bay Country Park as the South East New Territories (SENT) Landfill Extension was found unacceptable by the people of Hong Kong. Shek Kwu Chau and its surrounding waters, although being an area of high ecological value, should also be conserved for wildlife protection and public enjoyment, instead of utilized for waste disposal.

Following the reasons illustrated above, WWF recommends that:

1. A substantial area of sea stretching from the southern coast of Shek Kwu Chau to the Soko Islands be designated as a Marine Park for the protection of the finless porpoise, which is listed as "Vulnerable" on International Union for Conservation of Nature (IUCN) Red List and "Endangered" in the China Species Red List, same as the Chinese white dolphin.

2. With regards to waste management, WWF does not oppose the use of incineration for waste disposal in principle. However, incineration should only be considered when all other

¹ Please refer to WWF's submission to the LEGCO PANEL ON ENVIRONMENTAL AFFAIRS SPEICAL MEETINGS ON 19 JANUARY 2006 in Appendix I.

reasonable (including mandatory) options have been employed. WWF supports the “Full recovery – Zero Waste” proposal initiated by Friends of the Earth (Appendix II) in November 2010 to reduce Hong Kong’s 9,000 tonnes of waste per day to 3,000 tonnes per day. One third of the waste should be effectively recycled, one third should be reduced at source and while the remaining should be treated through thermal treatment methods (such as waste incineration or gasification). The extension of the Tuen Mun and To Kwu Ling landfills should allow Hong Kong sufficient time to initiate aggressive measures to reduce waste in the coming years if the government shows sufficient determination to implement best practices.

Shek Kwu Chau should not have been selected as a suitable site

Although the project proponent noted that a site search exercise was conducted in 2008 under the study *Site Search for Integrated Waste Management Facilities in Hong Kong for Municipal Solid Waste* and the study findings were briefed to various parties, including ACE, according to the ACE paper 9/2008, the information presented to ACE members downplayed the ecological importance of the Shek Kwu Chau waters. With reference to para. 27 of the Site Selection Report in the Annex of the ACE paper, it was stated that: “*The nearby marine area is a fish spawning and nursery ground. Chinese white dolphin and finless porpoise have been sighted, though the area is not their core habitat.*” However, with reference to the AFCD marine mammal monitoring report (2009-2010) and the EIA, both reveal that some of the highest concentrations of porpoise in Hong Kong were observed at the southwest of Shek Kwu Chau, and the offshore waters at the southwest portion of the survey area (see our comments on the finless porpoise below for details). It was apparent that the conservation importance of the marine area of Shek Kwu Chau for finless porpoise has not been fully considered during the evaluation of the shortlisted sites, even though environmental considerations should be one of the major criteria. WWF considers the project proponent should strictly follow the EIA Basic Principle to avoid and prevent adverse environmental consequences of the proposed project (Principle Two: Avoidance, Pre-emption and Prevention of Adverse Environmental Consequences)² and that Shek Kwu Chau should not be considered as a suitable site for the construction of the IWMF.

With reference to the proposed broad land-use pattern under the Recommended Development Strategy for South West New Territories by the Planning Department in 2001 (Figure 1), Shek Kwu Chau has been proposed as Conservation Area (Landscape Protection Area/Coastal Protection

² Environmental Impact Assessment Ordinance, Cap.499 Guidance Note No.1/2010

Area). As the island is home to a number of rare species of conservation concern, WWF considers Shek Kwu Chau should be protected by conservation zonings or as a Site of Special Scientific Interest. As the site has been proposed for natural environment conservation³ and is consistent with the overall settings of the nearby Lantau South Country Park and waters, we consider that the IWMF development would be incompatible with the proposed land use and the surrounding environment.

Section 5b Water Quality Impact (SKC)

Disturbance and re-suspension of seabed sediments

The construction work of the artificial island will involve filling activities. Section 5b.6.1.8 mentions that the opening provided for marine access will be shielded by silt curtains to control sediment plume dispersion away from the site, and filling would only be carried out behind the silt curtain when it is completely closed. However, no information is provided on the period of time that shall be allowed for the suspended fill material (public fill, sand and/or rock) to settle after the filling, before the silt curtain is allowed to open for the barge access again.

The release or loss of elevated amount of suspended sediment from the work site would cause adverse impacts to the sensitive receivers such as corals (e.g. the closest one is just 6 m away from the boundary of the breakwater) and fish larvae inhabiting in the vicinity of the Project Site. The proposed mitigation measures (such as silt curtain) suggested in the EIA report may not be able to fully mitigate the impacts.

Water modelling prediction

WWF has concerns on the accuracy of the water modelling result of the current EIA study, which is heavily dependent on the results predicted by the regional Update Model (developed under Agreement No. CE 42/97, Update on Cumulative Water Quality and Hydrological Effect of Coastal Developments and Upgrading of Assessment Tool). WWF considers that the regional model is too coarse in scale and will not be able to provide a robust prediction on the change of water quality in the Project Area during the construction and operation phase. It is also deemed as insufficient to predict the accurate sediment loss rate and the extent of sediment plume dispersion caused by the reclamation and dredging works without collecting in-situ current velocity data from the Project Area.

³ See Appendix 5 of the Final Report of the South West New Territories Development Strategy Review (SWNT DSR) - A Summary of the Broad Land Uses Recommended by SWNT DSR

Discharge of brine water from desalination plant

According to 5b.6.2.17, the brine water drained from the desalination plant will be high in salinity (about 1.7-1.8 time more concentrated than the raw seawater), with a volume estimated to be about 1,520 m³ per day. A number of studies reveal that increases in salinity can cause detrimental effects to the eggs and larvae of marine species; affecting yolk utilization and larval growth and survival by influencing the amount of energy needed for osmoregulation⁴⁵, as well as prolonging the duration of their development⁶. The southern waters of Hong Kong (including the Shek Kwu Chau area) have been identified as the most important spawning and nursery grounds for commercial fisheries resources (Figure 2 and 3)⁷. In view of this, eggs and larvae spawned and released by nearby corals, fish and other marine species within the maximum predicted downstream influence distance of the saline water discharge (i.e. 72 m away from the outfall) will be adversely affected by the continual discharge of brine water from the desalination plant during the operation phase.

Section 7b Ecological Impact (Aquatic) (Artificial Island near SKC)

Corals

Light attenuation

The artificial island and the Skek Kwu Chau shoreline will be separated by a channel of 10-40m wide and 400m long. According to Section 2.4.3.6., the finished ground level of the artificial island and the cellular breakwater will be of +5 mPD and +9 mPD high. Corals, particularly the zooxanthellate varieties, require sunlight for photosynthesis for growth and survival; they are vulnerable to the stress caused by the decrease of light attenuation. The narrow channel and the shade of the proposed infrastructures will reduce the amount of available light passing through the water column, posing adverse effects to the feeding and the growth rates of corals, and may result in bleaching, partial or even total mortality.

Change in current velocity

Octocorals are heterotrophic suspension feeders, and usually feed on small organic food particles in the water column. However, since their nematocysts are small and weak, they cannot actively capture their prey but rather depend on water currents to bring in their food. Food particles

⁴ Howell B.R., Day O.J., Ellis T. and Baynes S.M. 1998. Early life stages of farmed fish. In: Biology of Farmed Fish. Black. K.D. and Pickering A.D. (Eds.). Sheffield Academic Press, pp. 27-66

⁵ Nasrolahi A., Farahani F. and Saifabadi S.J. 2006. Effect of salinity on larval development and survival of the Caspian Sea Barnacle, *Balanus improvisus* Darwin (1854). Journal of Biological Sciences 6(6): 1103-1107.

⁶ Luppi T.A., Spivak E.D. and Bas C.C. 2003. The effects of temperature and salinity on larval development of *Armases rubripes* Rahtbun, 1897 (Brachyura, Grapsioidea, Sesamidae) and the southern limit of its geographical distribution. Estuarine, Coastal and Shelf Science. 58:575-585.

⁷ ERM. 1998. Fisheries resources and fishing operations in Hong Kong waters. Final report submitted to AFCD.

transported to the coral colonies will then be trapped and captured by the tentacles and pinnules of the individual polyps. The intensity and speed of water current may thus affect their feeding rate. Water movement is one of the main factors directly affecting the growth and distribution of octocorals.

According to Section 5b.7.9.1, it was stated that the overall current speed within the channel will increase when compared with the original state. However, the extent and intensity of the change was not provided or assessed. If the future current speed is too high, it will bend the polyps through drag, lead to low rates of food intake and affect the growth of the octocorals.

Sediment elevation

As mentioned in Section 5b.7.3.32, "the maximum suspended solids (SS) elevation predicted at the nearest coral community would be 2.5 mg/L, which is 29.7% increase of the baseline SS level at Shek Kwu Chau monitoring station SM13 (8.6 mg/L). Although the elevation still complies with the WQO, it is at the margin of the SS criterion (elevation from 30% of the ambient SS). WWF opines the coral condition in the Project Area may deteriorate due to the elevation of the sediment from the construction work.

Coral translocation

No projects have ever attempted to translocate octocorals in Hong Kong waters. If the environmental condition of the recipient site is not suitable (e.g. in terms of concentration of suspended particles and the current speed), it will threaten the growth and survival of the translocated octocoral, which are water current sensitive, in particular the soft coral species *Dendronephthya* which needs to pump water into its body to provide rigidity (a hydroskeleton).

Finless porpoise

Inadequate Information to assess impact

The finless porpoise (*Neophocaena phocaenoides*), is listed as "Vulnerable" in the IUCN Red List of Threatened Species⁸, and CITES Appendix I (i.e. highest protection)⁹, and one of two resident cetaceans inhabiting Hong Kong waters. It has an even higher threatened status in mainland China, where it is listed as "Endangered" in the China Species Red List and the population is thought to be

⁸ IUCN Red List <http://www.iucnredlist.org/apps/redlist/search> Accessed on 16 March 2011. ⁹ CITES-listed species database. <http://www.cites.org/eng/resources/species.html> Accessed on 16 March 2011.

⁹ CITES-listed species database. <http://www.cites.org/eng/resources/species.html> Accessed on 16 March 2011.

seriously depleted¹⁰. More than 150 finless porpoises could be found in Hong Kong waters¹¹ during the peak season (December to May). Preceding monitoring¹² and current study both show that waters between Shek Kwu Chau and Soko Islands, including the proposed reclamation area, is amongst the most important habitat for the finless porpoise in Hong Kong, particularly during the dry season.

The data provided by the AFCD marine mammal monitoring report (2010-2011) and the present EIA study both reveal that notable concentrations of porpoise were observed at the southwest of Shek Kwu Chau, and the offshore waters at the southwest portion of the survey area. Sightings were noted within the proposed reclamation and breakwater area, as well as in close proximity to the proposed submarine cable alignment. In addition, a total of 49 porpoise individuals were sighted in the water areas in proximity to the Project Area during the six-month survey period, potentially comprising up to about 1/3 of the estimated total porpoise population in Hong Kong during the peak season. Furthermore, while most porpoise groups are usually of a small size (composed of 1-2 individuals), AFCD's study recorded a large aggregation of finless porpoise just south of Shek Kwu Chau. **In view of this, the Project Area should be considered a core habitat for the porpoise.**

It should be noted that due to its dull body colour and the relatively inconspicuous surfacing behaviour, finless porpoise is much more difficult to visually survey than the Chinese white dolphin, hence there is not much knowledge about finless porpoise ecology in Hong Kong waters (e.g. group composition and habitats used by calves). **In view of the importance of conserving cetaceans, and the major gaps in our understanding of the finless porpoise, WWF strongly believes that the precautionary principle should apply, and that the core habitat for this species off Shek Kwu Chau should not be reclaimed.**

WWF is also of the opinion that this porpoise impact assessment and preceding regular monitoring studies have confirmed the Project Area is of high ecological value. We question why such important habitat has not been avoided in the first place according to the Avoidance Principle (EIAO Guidance Note No.1/2010).

Impact from permanent loss of habitat

¹⁰ Smith, A.T. and Xie Y., 2008. *A Guide to Mammals of China*. Princeton University Press, Princeton.

¹¹ AFCD data.

http://www.afcd.gov.hk/english/conservation/con_mar/con_mar_fin/con_mar_fin_fin/con_mar_fin_fin_dis_where.html.

Accessed on 16 March 2011.

¹² AFCD. 2010. Monitoring of Marine Mammals in Hong Kong Waters – Data Collection (2009-10).

Reclamation work for the IWMF is very likely to result in porpoise's behaviour alteration, increase in stress and displacement from important habitat. The loss and modification of marine habitat may cause changes in their food sources (through change in prey aggregation), hence may affect the distribution of this marine mammal.

Lack of a comprehensive plan to conserve the finless porpoise

The Hong Kong Government has an obligation to protect species of conservation importance in Hong Kong, including the protected and globally "Vulnerable" finless porpoise. However, apart from a regular monitoring programme, to date there have been no active conservation measures proposed for this species. This is despite increasing threats in recent years, including the cumulative impacts from developments (e.g. a proposed windfarm at Southwest Lamma) as well as more high-speed vessel traffic. While WWF supports the designation of marine parks to protect important habitats for the finless porpoises, their role as a proactive threat mitigation tool to conserve the species should be rigorously studied and clearly defined. In addition, marine parks will not help reduce the impacts of some threats present in Hong Kong e.g. pollution. As such, there is a clear need for the Government to formulate and implement a finless porpoise Management Plan under an overarching policy for the conservation of this protected species.

The key aspects of such a best-practise Plan should be as follows:

- SMART management objectives for the species in Hong Kong waters
- The threats (e.g. threats from marine vessel traffic, new developments etc) to be addressed under the Plan, and goals to be achieved;
- Management strategies and measures;
- Evaluation of the conservation status of the porpoise based on the existing information;
- Types of activities and actions (e.g. research) to help achieve the objectives; and,
- Government roles and responsibilities.

Shek Kwu Chau should be designated as a Marine Park

The surrounding marine waters of Shek Kwu Chau should be designated as a Marine Park for the better protection of the finless porpoise and their vulnerable habitat. WWF also recommends that strong measures be put in place to prevent this area from becoming further degraded by anthropogenic activities.

Section 7b Ecological Impact (Terrestrial) (Artificial island near SKC)

White-bellied sea eagle (WBSE) and other avifauna

Nest of white-bellied sea eagle (*Haliaeetus leucogaster*)

With reference to the breeding surveys of WBSE by Agriculture, Fisheries and Conservation Department (AFCD) since 2002, it was stated that the heavy sea traffic at the area around Yeung Chau, which is located about 700 m from the Sai Kung Pier and town, may render the area less suitable for the WBSE to forage, incurring adverse impacts to their breeding success. Given that the estimated distance from the WBSE nest on Shek Kwu Chau to the nearest works from breakwater, berth and cofferdam are approximately 350 m, 500 m, and 550 m respectively¹³, we are very concerned that disturbance due to the construction and operation of the IWMF including vessel access near the nest will negatively affect the breeding success of the WBSE.

Noise Disturbance during construction

The project proponent suggests that the noisy construction works would be avoided during the breeding season of WBSE¹⁴, and the use of quieter plants and construction methods are proposed to minimize the noise disturbance on avifauna during construction¹⁵. Nevertheless, given that the WBSE is sensitive to human disturbance during the breeding season, and may even abandon a nest if disturbed¹⁶, we consider that the proposed mitigation measures cannot explicitly address the potential noise impacts on the WBSE.

Noise Disturbance during operation

While the predicted noise level during daytime, evening time and night time would meet the noise criterion, we consider that noise impacts during operation are still anticipated due to some sources of noise associated with the daily operation of the IWMF (e.g. marine vessels), rendering adverse ecological impacts to WBSE in particular during the breeding season.

Glare disturbance

While the project proponent suggests that “*any un-necessary outdoor lighting should be avoided, and inward and downward pointing of lights should be adopted*”¹⁷, we are highly dubious about the effectiveness of the proposed measures to minimize the glare disturbance on WBSE as the development scale of the IWMF is large (the size of the physical structure above the water surface

¹³ See Section 7b.6.2.92 of the EIA report for the IWMF

¹⁴ See Section 7b.8.3.34 of the EIA report for the IWMF

¹⁵ See page 76 of the Proponent's responses on the public comments received on the previous EIA reports

¹⁶ Clunie, P., 1994. *Plants and Animals: Flora and Fauna Guarantee: Action Statement No.60: White-bellied Sea-eagle Haliaeetus leucogaster*. Department of Natural Resources and Environment, Australia.

¹⁷ See Section 7b.8.3.41 of the EIA report for the IWMF

is 15.9 ha) and its close proximity to the WBSE nest. Since the glare disturbance may cause disorientation of birds by interfering with their magnetic compass and disruption in behavioural patterns including reproduction and foraging pattern¹⁸, we are worried that the artificial lighting from the IWMF will incur adverse impacts on WBSE, in particular during the breeding season.

Barrier effects of the IWMF structure

It is stated in Section 7b.6.3.51 that the height of the buildings associated with the IWMF would range from 5-50 m above ground and the stack height would be 150 m. Given that the flight heights of the WBSE (14 to 136 m above sea level) and Pacific reef egret (below 14 m) fall within the range of the building height, the buildings may act as physical barriers which obstruct the birds from using the coastal area. While there will be no direct occupation of the shoreline by the project¹⁹, we are still concerned the IWMF may prevent some avifauna from using the coastal area of Shek Kwu Chau as roosting and foraging grounds.

With reference to Figure 7b.1, three individuals of Pacific reef egret were recorded along the rocky shore near the proposed reclamation area while one individual of WBSE was recorded among the shrubland habitat near the shore. In addition, while it is stated in Section 7b.6.2.85 that the intertidal rocky shore is considered to be an important habitat for these two species, the project proponent fails to explicitly address the potential ecological impacts of the IWMF including the reclamation works on the avifauna, in particular the above-mentioned species recorded near the Project Area.

While the territory range of two breeding pairs of WBSE at Yeung Chau and Tai Ngam Hau were estimated to be 3-4 km in radius during the breeding period²⁰, we consider it inappropriate to compare the area of physical structure above water surface (15.9 ha) with the rest of the open sea and conclude that the impact is not significant. When the size and location of the IWMF in relation to the WBSE nest are taken into consideration, it will likely pose as a significant barrier to the WBSE and thus WWF remains concerned that the ecological linkage along the shore of Shek Kwu Chau will be adversely affected.

Residual Impact

It is stated in Section 7b.9.1.6 that the possibility of WBSE nest abandonment still remains even though the proposed mitigation measures during construction and operation phases are

¹⁸ *Ibid*

¹⁹ See page 76 of the Proponent's responses on the public comments received on the previous EIA reports

²⁰ AFCDC Newsletter Issue No.5: The Population and Breeding Ecology of White-bellied Sea-eagles in Hong Kong

implemented. In the absence of effective mitigation measures to address this potential irreversible ecological impact, i.e. nest abandonment by WBSE, we consider that the project proponent fails to provide justification for his statement “*Residual impact on the nest of White-bellied Sea Eagle is considered to be acceptable*”²¹. Given that the WBSE is a species of conservation importance and the breeding pair at Shek Kwu Chau is one of only eight active breeding pairs recorded in Hong Kong in 2008/2009²², we consider that this potential residual impact on WBSE is unacceptable.

Section 8b Fisheries Impact (SKC)

Additional studies are required to update the fisheries resources

WWF rejects the findings of the fisheries impact study. The methodology used is weak, the data out-of-date, would not be acceptable for other important fauna/resources, and is inadequate for an assessment in an EIA. Furthermore, there are strong ecological reasons to suspect that the methodology used will produce findings that have little relation to current conditions in the Project Area. We have previously expressed our grave concerns on two other coastal development projects resulting from the over reliance on Port Survey data and earlier 1998 study results (the latest one released in 2006) and the out-dated data, and the project proponents agreed to conduct supplementary fishery surveys.

Port Surveys are grossly inadequate for identifying and quantifying fisheries resources and important fisheries areas in Hong Kong. The nature of the Surveys (through fishers’ interviews) and the length of time (i.e. every few years) between Surveys particularly cast serious doubts on the quality and accuracy of the fisheries information. Since the Surveys relied almost entirely on reported catches from fishers, the high sampling errors and systematic bias may largely affect the accuracy of the estimates. In addition, the interview data is not ground-truthed by actual fishing surveys. As the size of fish stocks often vary massively from year to year due to naturally large variations in recruitment, the every-several-year Port Surveys should not be expected to reflect the state of current fisheries resources with any accuracy several years after they have been completed, not withstanding the inherent weaknesses of the interview based methodology.

Using data of such dubious quality could likely lead to the under-estimation of the potential impacts from the work to the fisheries (both resources and fishermen livelihood) in the Project Area. The impact on the fisheries, in particular, the fish eggs and larvae, if not being assessed carefully, will

²¹ See Section 7b.9.1.8 of the EIA report for the IWMF

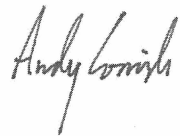
²² AFCD Newsletter Issue No.18: Breeding Ecology of White-bellied Sea Eagle in Hong Kong –A Review and Update

cause detrimental impact to the fish stocks, as well as the prey availability to the porpoise, affecting their distribution, abundance and feeding behaviour.

In conclusion, the data obtained from the Port Survey 2006 was considered inadequate to reflect the status of fisheries resources in the Project Area, given that no ground truthing/ supplementary fisheries surveys were conducted. WWF opines that the current conclusions on the impacts of the project on fisheries resources are meaningless, given the inadequacies of the methods used to derive them.

We would be grateful if the our submission will be duly considered.

Yours faithfully,

A handwritten signature in black ink that reads "Andy Cornish". The signature is written in a cursive, slightly slanted style.

Dr. Andy Cornish
Director, Conservation
WWF – Hong Kong



for a living planet®

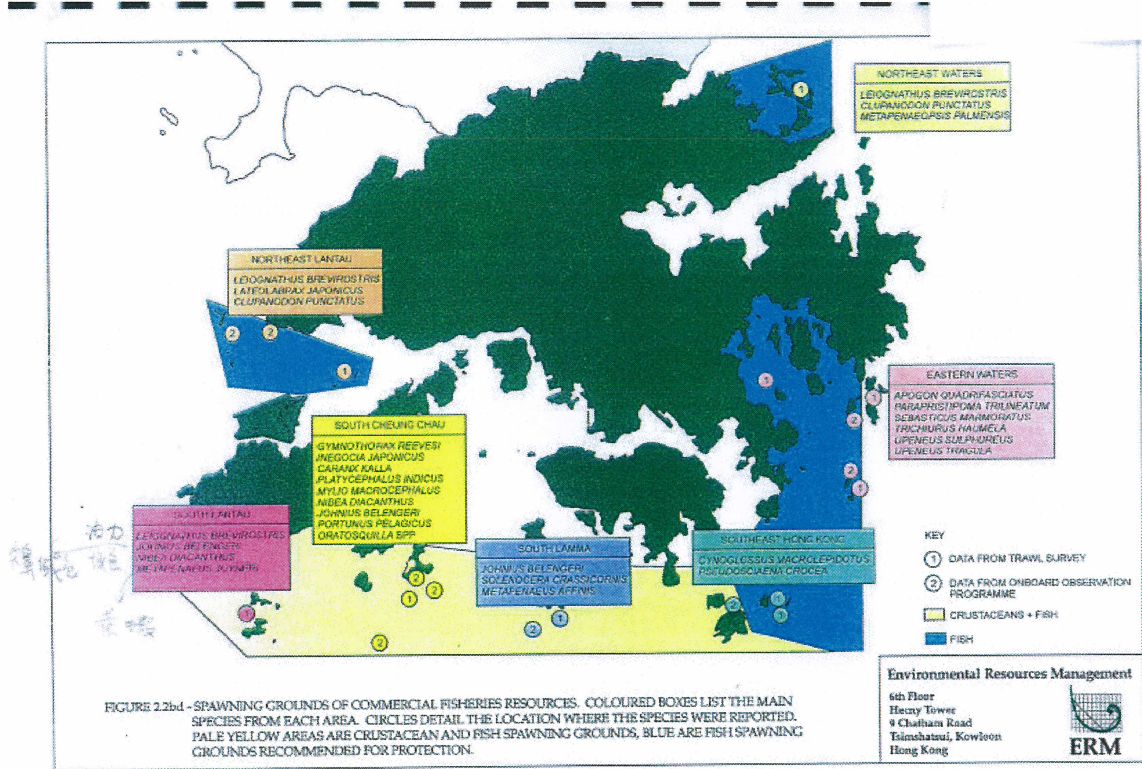
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Figure 2 Important spawning ground of crustaceans and fish (highlighted in yellow)



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主席：楊子信先生
行政總裁：龐駿理先生

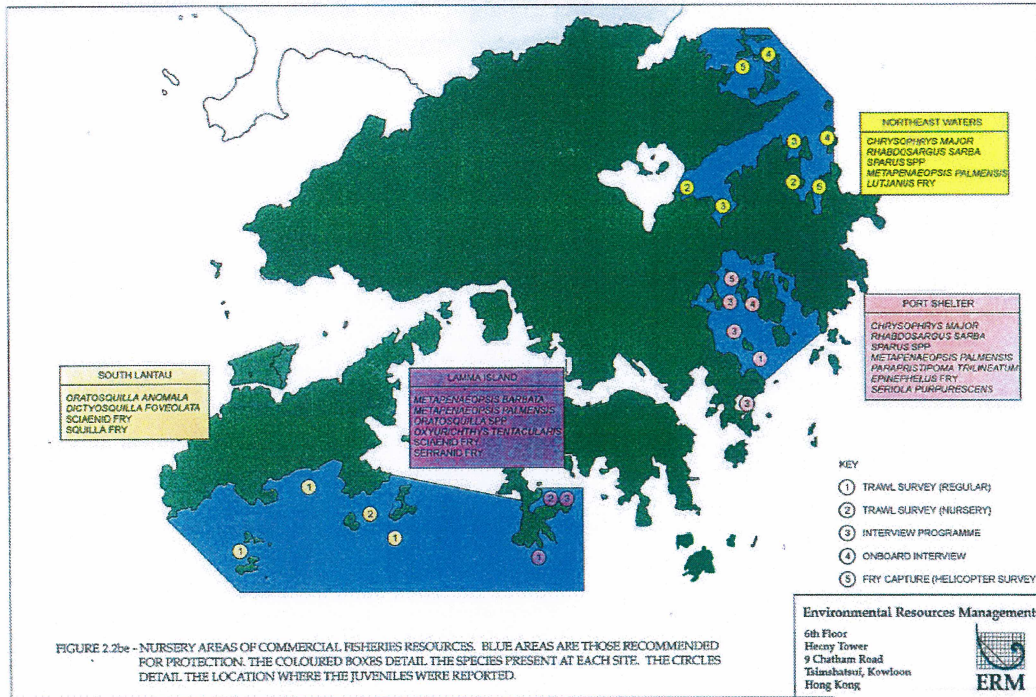
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義務公司秘書：嘉信秘書服務有限公司
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註冊慈善機構

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Chief Executive of the HKSAR
Chairman: Mr. Trevor Yang
CEO: Mr. Eric Bohm

Honorary Auditors: BDO Limited
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McCabe Secretarial Services Limited
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Registered Name: 世界自然(香港)基金會 World Wide Fund For Nature Hong Kong

Figure 3 Important nursery areas of commercial fisheries resources



Appendix I

LEGCO PANEL ON ENVIRONMENTAL AFFAIRS SPECIAL MEETINGS ON 19 JANUARY 2006

WWF Hong Kong's Comments on "A Policy Framework for the Management of Municipal Solid Waste (2005-2014)"

1. WWF Hong Kong welcomes the Hong Kong Government to take the initiative for leading to community to sustainable waste management solutions. We share deeply the concerns on the seriousness and urgency of the problems we are facing regarding to municipal solid wastes (MSW).
2. We support the "polluter-pays" principle and encourage the Government to show strong political will in implementing the proposed policy tools. We welcome the use of the waste hierarchy as the guiding principle for managing MSW in Hong Kong. In particular, we consider the Government should put more efforts to address the MSW problems at source under the avoidance and minimisation approach.
3. While generally supporting the Government's policy framework, we feel the timetable for achieving targets should be accelerated. Quite simply, the urgency of the situation is not reflected in the three 10 year targets. Hong Kong, as a small, densely populated but wealthy region, should be a world leader in waste management. Instead, we are lagging behind due to a lack of Government foresight, and lack of political will to impose environmental restrictions on business in the face of resistance from that sector.

Waste Avoidance and Minimisation

4. The Government should set up more ambitious targets for waste avoidance and minimisation. In addition to the proposed legislation on waste charging – the MSW Charging Bill, the proposed Product Eco-responsibility Bill should impose stringent

conditions to discourage businesses and individuals from wasteful behaviours, for instance, the abuse on plastic bags and increasing trend of excessive packaging.

Reuse, Recovery and Recycling

5. WWF considers the Government should review the current waste recycling programmes on paper, plastic bottles and aluminium cans to further enhance the efficiency and quality on source separation of domestic waste. Such programmes have been ongoing for many years now but are often misused by the public, and are not readily available in many areas of Hong Kong. The scheme should also be extended to glass. The Government should also provide incentives to business to facilitate the recycling of reusable products. It could also lead the way by setting targets for its own departments, and publishing the results.

6. WWF welcomes that the Government intends to introduce mandatory Producer Responsibility Schemes (PRSs) on specific products that require particular attention. Prior to the implementation of mandatory PRSs, the pilot schemes underway should be carefully reviewed so as to optimize the product recollection and recycling efficiency in the mandatory schemes.

Bulk Reduction and Disposal

7. It is stated that the biodegradable fraction of MSW will be treated and stabilized by biological treatment such as composting and anaerobic digestion. However, as mentioned in the document, the market for the end-products from composting is very limited in Hong Kong and China. As such, apart from composting and anaerobic digestion, WWF suggests the Government to further investigate other biological treatment techniques to set up an integrated biological treatment framework for biodegradable MSW to produce various kinds of end-products such as ethanol and other bio-gases for different markets.

8. The Government suggested that **thermal treatment** such as incineration can be one of the solutions for waste treatment in the future. WWF urges the Government to explicitly address the environmental impacts associated with incineration, and clearly

inform the public. In particular, we recommend that the residual level of pollutants after the proposed treatment especially dioxin, a highly toxic by-product of incineration, should be made transparent to the public so that a wise decision could be reached.

9. Some studies are being conducted to investigate the feasibility of extending the three strategic landfills. While WWF regards **landfill extension** as an unsustainable solution for MSW management, we contend that waste management should not be used as a reason to breach our protected area system. We are in the view that the potential environmental impacts of landfill extension should be explicitly addressed at the planning stage to avoid impacts on environmentally sensitive areas such as the Country Parks, Conservation Areas and Sites of Special Scientific Interest. Landfill extension should be a last resort when all other reasonable options have been exhausted.
10. We suggest that the MSW management, implementation and law enforcement should be overseen by one single authority. In particular, we have concerns that the MSW charge may lead to more undesirable environmental impacts such as illegal dumping of waste, also known as “fly-tipping”, especially in the rural areas and agricultural lands. The Government should ensure that adequate resources should be in placed for effective monitoring systems and enforcement actions to minimise such impact.
11. Resolving the current situation with regard to municipal waste is even more urgent when ones considers the cost to our natural environment. The policy framework neglects to mention the cost to society of having large areas of land devoted to landfills, and the cost to our natural biodiversity of having significant amounts of waste littering the land and sea, with plastic bags for example smothering corals and being mistakenly consumed by marine creatures.
12. We urge Legco to support, and push for acceleration of the Government’s policy framework to manage municipal solid waste. We strongly hope it will not allow vested interests in the business sector to dilute the proposed framework which will not only

benefit Hong Kong society as a whole, but also our natural environment and biodiversity.

Appendix II

Towards Sustainable Waste Management

“Full recovery – Zero Waste” Proposal

The Tseung Kwan O Landfill expansion controversy triggers the need to re-examine a long-term waste management strategy for Hong Kong. However, the Government does not seem to have learnt from this lesson, and responded only by reiterating the need for incineration for solving the imminent waste problem. We want to ask, is the over-emphasis on incineration a wise and sustainable approach? Or is there, in fact, a third, fourth or even a better combination of choices apart from a factitious dichotomy between incineration and landfills?

We believe that the best waste management strategy is to give priority to allocate currently available (human, time, capital and other) resources to raise society’s ability to reduce waste at source. Therefore, in this proposal we make "full recycling of resources and zero land-filling of waste" as the goals which are to be achieved by strictly applying the following waste management hierarchy. Waste avoidance and reuse is the top priority, followed by waste recycling, and the last resort being other waste treatment methods, including but not limited to incineration and land-filling of waste.

- **Current Status**

The amount of waste produced by Hong Kong families and businesses per day amounted to 17,675 tonnes.²³ Even with nearly half (49%) of the municipal solid waste being recycled, does it mean that Hong Kong has done enough to reduce waste? In fact, coming hand in hand with the increase in waste recovery rate, the total amount of solid waste generated has been increasing steadily, falling short of the 1% yearly reduction target committed to by the government in 2005.

In fact, Hong Kong still needs to handle about 9,000 tonnes of commercial, institutional and household waste - that is “municipal solid waste” - every day. After the omission of industrial waste, waste disposed per capita per day in Hong Kong is still as high as 1.18 kg.²⁴ The amount of waste disposed of in Hong Kong is not only of the highest volume among the four little dragons of Asia, it is more than double the volume per capita per day in South Korea and Taiwan. (See Table I below)

Table I: Comparison of Municipal Solid Waste of Asia's “Four Little Dragons”

	Hong Kong (2009)	Taiwan (2009)	South Korea (2007)	Singapore (2008)
Disposal of Domestic and commercial waste (Daily) (tonne)	8,334 tonnes / day	11,951 tonnes / day	21,230 tonnes / day	7,179 tonnes / day

²³ Environment Protection Department, Hong Kong, *Monitoring of Solid Waste in Hong Kong 2009*, July 2010.

²⁴ *ibid.*

Per-capita disposal of municipal solid waste (daily) (kg)	1.18 kg / day *	0.52 kg / day **	0.44 kg / day ***	0.84 kg / day ****
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* Hong Kong 2009 year-end population: 7.03 million; ** Taiwan 2009 year-end population: 23.12 million; *** South Korean 2007 year-end population, 48.46 people; **** Singapore 2008 year-end population: 4.83 million.

Source: Hong Kong Environmental Protection Department, Environmental Protection Administration of Taiwan, South Korea, Ministry of Environment and National Environment Agency of Singapore.

In city of Taipei and region of South Korea, they implemented a wide array of waste reduction at source policies, such as the producer responsibility system, volume-based waste charges and the aggressive recycling of food waste. As a result, between 1994 and 2000, the amount of waste generated (disposed volume plus recycled volume) has been decreased by 26% in South Korea, while the amount of waste disposed was also significantly reduced by 44%. For Taipei, since it implemented the volume based waste charging scheme in 2000 the volume of waste produced has been reduced by 28% and the waste disposal rate has been sharply reduced by 60% in just five years' time.

“Three –three-to-zero” solution

Hong Kong currently disposes of about 9,000 tonnes per day of municipal solid waste. It is recommended that a three-pronged approach should be taken to deal with this problem:

The first prong: About 3,000 tonnes of municipal solid waste shall be treated through the comprehensive recycling of food waste, through composting and anaerobic digestion technology (ADT).

The second prong: To source reduce at least 3000 tonnes of municipal solid waste by strengthening source reduction incentives such as the implementation of a producer responsibility scheme.

The third prong: About 3,000 tonnes of municipal solid waste can be treated through thermal treatment methods (such as waste incineration or gasification) to drastically reduce the volume of waste which cannot be economically recycled.

The objective of the “three-three-to-zero program” is the “full recovery of resources, zero waste to landfills,” The key to this program is that the three-pronges to this approach must be put to action **simultaneously**. Thus, one cannot simply take the easy steps, and avoid the difficult ones.

We believe that if the Hong Kong Government is determined in the next two years (2010-2012) to set a good example via waste reduction policies, and to race against time, through the launching of policy measures such: as environmentally friendly product design; waste charging; producer responsibility; landfill bans; promote the local recycling industry; increase investment in environmental education; and, the full implementation of green procurement.

Through these policy measures the daily generation of municipal solid waste in Hong Kong can be reversed in three years, and a significant reduction of 6,000 tonnes can be achieved

within ten years. As for the remaining one-third of the waste, even though it is inevitable to use thermal treatment methods to dispose of 3,000 tonnes, it is possible therefore to reduce by approximately 66% the emissions of dioxins, heavy metals and other harmful substances while effectively relieving the pressure on the very precious landfill space. Landfills in Hong Kong should be reserved for the disposal of ashes that cannot be effectively re-used currently and for unexpected situations.

Five Measures

1. Waste Charges by volume

The annual operating costs of waste disposal in Hong Kong amounted to HK\$1.2 billion.²⁵ It includes the operating costs of the three strategic landfills, refuse collection fleets and refuse transfer stations. The figure does not include the construction, rehabilitation and land costs of the facilities mentioned above.

As waste disposal costs are borne entirely by tax, the waste generators, i.e., the public, lack economic incentives to reduce waste. Coupled with the fact that businesses are not subject to corporate environmental responsibility on waste reduction, all these have contributed to the increase in waste generated in Hong Kong. For example, in 2009, the amount of municipal solid waste generated amounted to 6.45 million tonnes, up 7.3% when compared with the same figures in 2005. Therefore, we propose the adoption of the polluter pays principle and change the current hidden flat rate charge (through existing general taxes) to a volume based charge.

The possible measures include:

- a. The collection of waste disposal charges from every end-user (commercial, industrial, households and Government departments alike), through mandatory use of designated waste bags.
- b. To relieve the economic pressure of such measures on low-income groups, making references to the existing concessions on water bills, small quantities of these designated waste bags should be provided to all these parties.
- c. The proceeds from such waste charges should be used entirely for environment-related purposes. In particular, they should be devoted to fund research and education in waste reduction and to support environmental procurement.

2. Comprehensive recycling of food waste

By wet weight, 36% or 3,280 tonnes/day of municipal solid waste are putrescible waste which consists mainly of food waste. Therefore, to significantly reduce the amount of waste in Hong Kong, it would be crucial to reduce the generation and the recycling of food waste.

The possible measures include:

²⁵ Environment Protection Department, Hong Kong, *A Policy Framework for the Management of Municipal Solid Waste (2005-2014)*, Chapter 2, 2005.

- a. Promulgation of the "Food Bank" – Putting the industrial and commercial production of surplus food for reuse by social welfare institutions and civil society organizations, for distribution to low-income households in need. This does not only reduce waste and reduce greenhouse gas emissions, it will also relieve the economic pressure on low income groups. At the same time, business enterprises should all be held responsible for food (and other) waste that they produce.
- b. Encourage the community and the industry to launch food waste reduction campaigns. Examples include the "one dollar rebate for less rice" campaign initiated by the Greener Action. This would create an economic incentive for reducing food waste at source.
- c. Landfill ban - With reference to the practice in countries such as Germany, Sweden and Denmark, the landfill should not accept food waste.
- d. The establishment of a food waste recycling system - Food waste should be separately collected for composting and anaerobic digestion technology (ADT) treatment.
- e. Waste charges – The volume based waste charges will serve as the last step in encouraging the community to reduce food waste.

3.Producer Responsibility Scheme

Following the introduction of the government's program on source separation of domestic waste for recycling in recent years, the waste recovery rate in Hong Kong reached 49%. Still, 23% of the waste disposed in the landfill is paper, 19% plastics, 1.9% metals and 3.6% glass and almost all of them can be recycled into useful products if they are properly source-separated. In a bid to reduce unnecessary food wastage, all restaurants, supermarkets, wet markets, food manufacturing plant should fulfill their producer responsibility, change their marketing strategy, implement better inventory control and adopt green procurement to reduce food waste and foodservice sector waste. Possible measures include:

- a. The "Electrical and Electronic Equipment Producer Responsibility" Bill should be submitted by the Government to the Legislative Council within 2010;
- b. Submitting draft bills on producer responsibility on beverage containers, packaging waste, rechargeable batteries by 2012. These measures were promised by the Government for implementation in 2005, and yet the Government has failed to fulfill its promises badly.
- c. Require all restaurants and food manufacturer above a certain size or above certain sales volume to establish a challenging waste reduction targets and develop their own resource and waste management programs by 2012 or earlier.

4.Support for Environmentally Friendly Production and Recycling Products

To complement with the Producer Responsibility Scheme, we must create markets for locally recycled products.

The possible measures include:

- a. Subsidize environmentally-friendly product design and related research activities, and studies on waste reduction;
- b. The Government should set an example for the full implementation of green procurement, replacing existing procurement arrangements with the principle of "preference over equivalent products", removing the consideration of non-recycled products so long as there are supplies of locally recycled products that can satisfy similar functions.
- c. Provide assistance to public institutions, charitable institutions and community groups on how to undertake green procurement.
- d. Provide support for companies to develop Mainland and overseas markets for recycled products.

5.Waste Recycling and Treatment Facilities

To be genuinely comprehensive, the above policy measures should be supplemented with all the essential hardware. Feasible measures include:

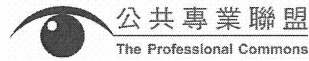
- a. The construction of food waste composting and anaerobic treatment facilities;
- b. Reserve industrial / special land use areas for handling and recycling facilities for electrical and electronic waste, plastic recyclables and other recyclable materials;
- c. Reserve currently idle urban public places, such as idle land under flyovers and some of the existing refuse collection points, as recovery points;
- d. Construction of a waste to energy incinerator with a daily processing capacity of not more than 3000 tonnes; the facilities must deploy current best practices in emission and operational controls.

Concluding Remarks

The Government has been strongly advocating the construction of incineration facilities as the main approach. In fact, from planning to completion of such facilities, there is still seven to eight years in the interim. However, waste reduction actions cannot come to a standstill during this period. Thus, it is high time that the government put the suggestions in this programme into action and reduces the amount of waste generated in two or three years' time and get a win-win outcome - pressure on landfills is relieved and more green jobs can be created. This is also the legitimate means to attain sustainable development.

Supporting Organizations:

Petitioning Organizations:



Dr. Chung, Shan Shan, Assistant Professor, Department of Biology, HKBU

Hon. Tanya Chan, Hong Kong Legislative Council Member;

Hon. Hon Andrew CHENG Kar-foo Hong Kong Legislative Council Member;

Hon. Cyd Ho Sau-lan, Hong Kong Legislative Council Member

Mr. CHAN Kai-yuen, Eastern District Council Member

Ms. Chan Yuen-han

Appendix D

Hong Kong “Zero Food Waste” in Green Country

(June 2013)

Green Power



香港「零」廚餘

Hong Kong's "Zero Food Waste."

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環境局在五月底公布了《香港資源循環藍圖2013-2022》，期望將人均每日棄置廢物量，由2011年的1.27公斤，減至2022年0.8公斤，十年內廢物量目標減幅四成。根據2011年的「香港固體廢物監察報告」，本地都市固體廢物量每日接近九千公噸，當中多達三千五百公噸是廚餘，即約佔四成。近年無論是家居廚餘或是工商業廚餘均有顯著升幅，廚餘已成為新一屆特區政府減廢的主要目標。香港人每日人均廚餘量相比鄰近地區如上海、新加坡、南韓和台灣，分別為其6.3倍、1.6倍、1.7和2.6倍。現時香港的廚餘回收量只佔整體廚餘量的3%，實屬杯水車薪。相比鄰近的南韓和台灣，香港在應對廚餘方面的工作，起步的確較遲，但正好讓我們能借鏡他人的成功，邁向「零」廚餘。

The Environment Bureau has unveiled the "Hong Kong: Blueprint for Sustainable Use of Resources 2013-2022", targeting a reduction in the daily per capita waste disposal level from 1.27 kg in 2011 to 0.8kg in 2022. In other words, reducing the waste disposal per capita by 40% in 10 years. According to the report "Monitoring of Solid Waste in Hong Kong 2011", municipal solid waste totals almost 9,000 tonnes per day in Hong Kong. Of this, 3,500 tonnes is food waste, accounting for almost 40% of the total. In recent years, there have been significant increases in domestic, commercial and industrial food waste. Food waste has become the main target of solid waste reduction for the new SAR government. Compared to nearby cities like Shanghai, Singapore, South Korea and Taiwan, the food waste per capita in Hong Kong is 6.3, 1.6, 1.7 and 2.6 times of them, respectively. Currently, the recycling rate of food waste is only 3% of the total. Undoubtedly, this is only a drop in the bucket. Compared to our neighbours, South Korea and Taiwan, Hong Kong has started off our work for food waste relatively late. But this can allow us to learn from the success of others while we take our steps towards "Zero Food Waste".

廚餘泛指所有在生產、加工、食用過程前後剩餘的食物，有些是無法避免的，例如是不能食用的部分，即魚骨和果皮等；有些卻是可以避免的，例如因分量過多而造成的剩菜剩飯、因食用期限已過而需丟棄的食物、裝飾伴碟用的食物等。在本港全年三千五百公噸廚餘當中，七成來自家居，三成來自工商業。由2008年至2011年，香港的都市固體廢物總量其實輕微下降了0.3%，但廚餘總量卻不跌反升，升幅更達兩成。

香港政府早在2005年制定的《都市固體廢物管理政策大綱(2005-2014)》，以及剛公布的《香港資源循環藍圖2013-2022》，都提到要採用多層次廢物管理架構來解決廢物問題，即首要避免產生廢物；其次是重用、回收及循環再造；最後才是棄置。現實是香港政府一直只採取「以設施處理廢物」的思維，廚餘量多年來只升不跌，又沒有全面而完善的廚餘回收，回收量亦一直處於非常低的水平。最終，大部分廚餘亦只會送往堆填區處理。

Food waste generally refers to all food remaining before and after food production, food processing and food consumption. Some of the food waste is unavoidable, such as inedible parts like fish bones and fruit skin etc. while some is avoidable such as leftovers due to excessive orders or supplies of food, discarded food that has expired and food used merely for decoration. Among the annual 3,500 tonnes of food waste in Hong Kong, 70% is domestic food waste and the remaining 30% is commercial industrial waste. In fact, the volume of municipal solid waste has declined slightly, by 0.3% from 2008 to 2011. Yet, the volume of food waste has increased by 20%.

The Hong Kong Government has mentioned both in the "Policy Framework for the Management of Municipal Solid Waste (2005-2014)" and the recently unveiled

"Hong Kong: Blueprint for Sustainable Use of Resources 2013-2022" that a multi-tiered waste management hierarchy has to be adopted to tackle our waste problem. That is a prerequisite to prevent waste production followed by waste reuse, waste recycling and waste recovery. Disposal is the last resort. The reality is that the Hong Kong Government has been adopting the mindset of "Using Facilities to Handle Waste" without any thorough and comprehensive plan for food waste recycling. Hence, the food waste-recycling rate remains very low. Eventually, most food waste is sent to the landfills.



廚餘是香港都市固體廢物的最大來源。
Food waste is the main component of municipal solid waste in Hong Kong.

廚餘棄置於堆填區，產生大量溫室氣體，以及高污染的滲濾污水。

Food waste is disposed of in landfills, producing large volumes of greenhouse gases and highly polluted sewage.



南韓廚餘回收達九成

Food Waste Recycling at 90% in South Korea

香港以往從源頭減少廚餘的工作，多數由民間自發推動，例如之前有團體舉辦過活動鼓勵學校減少午膳吃剩飯鏟、鼓勵食肆如市民點餐時「少飯」減收一元等。直至去年十二月，環境局正式成立「惜食香港督導委員會」，由政府帶頭推行「惜食香港運動」，除了增加公眾對廚餘的關注，亦實質推動政府部門和公共機構減少廚餘，目標是在未來三年減少廚餘量一成。然而除了明確減廚餘的目標，目前還未見具體的落實方案。

至於捐贈可食用食物方面，香港現時約有二十五間非牟利機構推行食物回收計劃，但有關的統計數字不詳。按現時推行食物回收機構的規模及回收點估計，每機構每日可收集二百公斤食物，即所有機構一天合共可收集約五公噸食物，但此數量只佔香港廚餘總量的0.14%。以現時大量工商業廚餘情況來看，捐贈食物以達減廚餘的目標，仍有相當距離。

再看看香港政府在回收廚餘製成有用資源的工作，當局正計劃興建兩座有機資源回收中心，處理來自工商界的廚餘。第一期及第二期有機資源回收中心，將建於北大嶼山的小蠔灣和北區的沙嶺，預計分別於2015年及2017年落成，廚餘會轉化成堆肥和生物氣(如沼氣)，後者會用來發電。屆時兩所中心合共每天能處理五百公噸廚餘，但這亦只佔全港廚餘總量的一成四。此外，環保園即將興建私營廚餘回收再造廠，該廠每日能處理二百公噸廚餘。按三個回收設施合共能處理的廚餘量，即是在可見的未來，本地回收設施亦只能應付整體香港廚餘量的兩成。

In the past, most food waste reduction campaigns were initiated by the public. For example, an organization initiated an event urging schools to reduce lunch food waste and encouraging the public to ask for less rice during ordering, for which they could receive a \$1 discount. In December last year when the Environment Bureau set up the "Food Wise Hong Kong Steering Committee", the Government began acting as a pioneer through promoting the "Food Wise Hong Kong Campaign". On top of increasing public awareness of food waste, it also motivates government departments and public institutions to reduce food waste. The target is to reduce food waste by 10% in the coming 3 years. However, other than the clear target set, there is yet to be a concrete implementation plan.

With regard to food donations, there are currently 25 non-profit organizations in Hong Kong promoting food recycling, but there are no detailed statistics on this area. Based on the food recycling organizations and locations, it is estimated that 200kg of food can be collected daily per organization. In other words, 5 tonnes of food can be collected daily, which amounts to 0.14% of total food waste. Compared to the large amount of

commercial and industrial food waste, it is very unlikely to achieve the food waste reduction target if we solely rely on food donations.

Let's look at how the Hong Kong Government works on turning recycled food waste into useful resources. The government is planning to build two Organic Waste Treatment Facilities (OWTF) to handle commercial and industrial food waste. The first phase and second phase of the OWTF will be built at Siu Ho Wan, north Lantau, and Shaling in North District. Construction work is forecast to be completed in 2015 and 2017, respectively. Food waste will be transformed to useful compost products and biogas (e.g. methane). The latter can be used to generate electricity. The two phases of facilities developed will have a total daily treatment capacity of 500 tonnes of organic waste, but this only accounts for 14% of the total food waste in Hong Kong. That is: even in the foreseeable future, the local recycling facilities can handle only 20% of the total Hong Kong food waste.

食物銀行捐獻站。
Donation station
for a food bank.





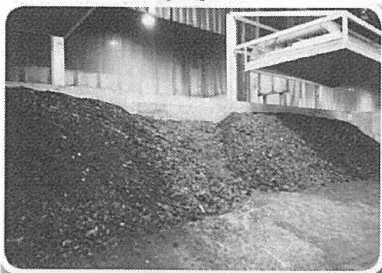
• 完全成熟的堆肥經篩選，可作土壤改良劑。
Totally composted products can be used as soil conditioner.



九龍灣廚餘處理試驗設施及其廚餘轉化堆肥過程
Kowloon Bay Pilot Composting Plant and process of converting food waste to composting products



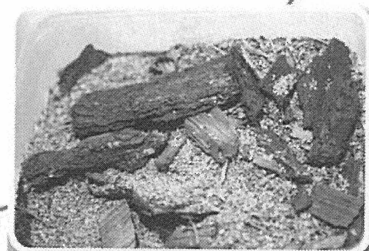
• 剔除不能處理的成分。
Filtered material that is not suitable for further processing



• 經分解處理後的半熟堆肥，置於空地進行約兩個月的發酵，期間需翻動及噴水。
Semi decomposed compost after treatment, placed in an open space for about 2 months of fermentation. Flipping and water spray are required during the period.



• 在密封式堆肥裝置進行約十日的分解處理。
Placed in air-tight composting unit for about 10 days to undergo decomposition.



• 混入木屑等膨鬆劑，有助改良處理廚餘過程的疏氣效果。
Mixed with sawdust and other leavening agents to help improve food waste treatment processing.

從以上最樂觀的估計，即現時正在或將會推行的減少廚餘措施和回收廚餘設施均進行得相當理想，當中仍有差不多五成廚餘是需要送往堆填區。香港的廚餘回收量偏低，相比南韓，當地政府於1998年起推行垃圾徵費和廚餘回收，2005年更禁止廚餘送去堆填區，現時南韓的廚餘回收率高達九成多，已回收的廚餘當中，分別有五成和四成再造成堆肥和飼料，一成則轉化為能源。現時南韓的廚餘製造量比起實施垃圾徵費前已減少兩成多，每人每天生產約0.3公斤廚餘，人均廚餘製造量僅是香港的六成。此外，台北市於2000年推行垃圾費隨袋徵費，2005年開始強制要求家居及工商業將廚餘分類回收作堆肥和豬糧，結果台北市廚餘回收量由1999年的2.4%，大幅增加至2010年的44%，每人每天生產約0.2公斤廚餘，人均廚餘製造量只是香港的四成。

Based on the most optimistic estimates, then, even if all the food recycling measures and facilities are working well, there is still almost 50% of food waste for sending to landfills. Compared to South Korea, the rate of food recycling is still low. In South Korea, the government implemented food recycling and imposed levies on garbage in 1998. Since 2005, it even prohibits food waste being sent to landfills. Currently, its food waste recycling rate is 90%. Among the recycled food waste, 50% and 40% are transformed to useful compost products and fodder, respectively, while 10% is converted to energy. The amount of food waste has decreased by more than 20% in South Korea since the levy on food waste was imposed. The daily food waste per capita is around 0.3kg, which is 60%

of the amount in Hong Kong. In addition, Taipei has imposed levies on garbage bags since 2000, and it is mandatory for household and commercial and industrial food waste to be recycled and converted to compost products and fodder. As a result, the food waste recycling rate has increased tremendously – from 2.4% in 1999 to 44% in 2010. The daily food waste per capita is just 0.2kg, which is only 40% of the amount of Hong Kong.

借鏡台北回收系統

Lessons Learned from the Recycling System in Taipei

香港現時的廚餘回收率低得驚人，主要原因是沒有回收系統。現時只有小部分酒店和餐廳自行回收廚餘。2011年，政府推出「屋苑廚餘循環再造項目」資助計劃，合共資助了五十六個屋苑推行廚餘回收。由於廚餘回收純屬自發性質及欠缺系統性，結果是每日送往九龍灣廚餘處理試驗設施處理的酒店和商場廚餘，只有約0.63公噸，而五十六個屋苑每日合共所能回收的廚餘亦不足六公噸。

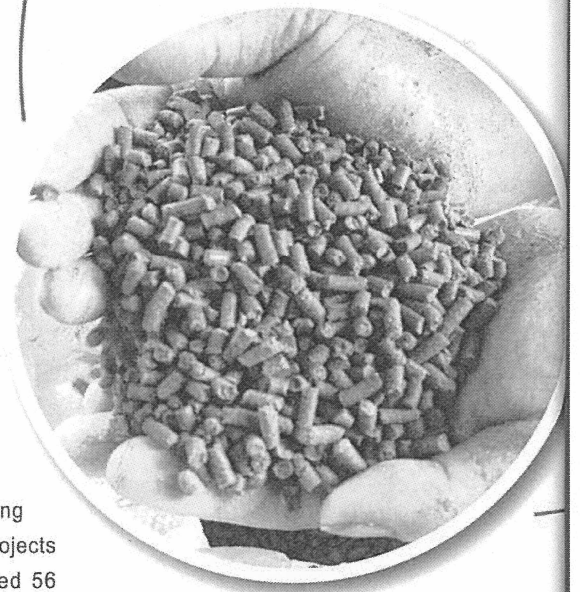
要增加廚餘回收量，政府首要是建立全港性的廚餘回收系統，必需做到源頭分類和提供便捷衛生的收集點，然後再交由認可的廚餘回收商處理。以台北市為例，廚餘跟其他的可回收資源(如廢紙、塑膠和玻璃等可回收廢棄物)和垃圾是分開處理的，於不同的指定時間和地點，直接交給政府的清潔車收集和處理。廚餘亦進一步分類為「生廚餘」和「熟廚餘」，所謂「生廚餘」是指未煮的蔬菜和果皮等，可以用來堆肥；「熟廚餘」則是烹調過的食物，如剩菜和剩飯等，可以用作動物飼料。從台北市例子可見，分類和回收廚餘由政府強制執行，加上全面的廚餘回收系統，事半功倍。

不過，由於香港多是高樓住宅和大型商場，比較難跟台北市規定的一樣，要市民定時定點將廚餘回收，當局可改為在各大屋苑、食肆、酒樓和商場設立廚餘回收點，方便居民及商店將廚餘分類回收，並規定有關管理機構(如物業管理公司或外判清潔公司)每日在指定時間，將已分類的廚餘運送到各區指定的廚餘回收中心。政府若考慮運輸成本和教育需要，亦可資助屋苑就地設置廚餘堆肥機，親身參與廚餘循環再造，有助提升市民的環保意識。

建立了良好的回收廚餘系統後，將會收集到更多的廚餘，隨後便需要良好的廚餘再造產品市場配合，整個回收系統才能持續下去。最普遍來說，廚餘可再造成堆肥和動物

The food waste recycling level in Hong Kong is shockingly low. The main reason is the lack of a recycling system. Currently, only few hotels and restaurants recycle their food waste by themselves. In 2011, the Government launched a funding project, "Food Waste Recycling Projects in Housing Estates", which funded 56 housing estates to implement food waste recycling. As the food waste recycling is purely voluntary and is not systematic, the food waste sent to the Kowloon Bay Pilot Composting Plant from hotels and shopping malls only amounts to 0.63 tonnes, while the amount from the 56 funded housing estates is less than 6 tonnes.

To increase food waste recycling, the government has to first establish a territory-wide food waste recycling system. It is necessary to implement source separation and to provide convenient and hygienic collection points. The food waste should be then passed to authorized food waste recyclers for further processing. Take Taipei for example: food waste together with other recyclable waste (e.g. used paper, plastics, glass) is processed separately from other garbage. The recyclable waste is directly passed to the cleaning cars for collection and processing at different assigned times and locations. Food waste is further classified as "raw food waste" and "cooked food waste". "Raw food waste" refers to waste like uncooked vegetables and fruit skins that can be used as compost products; while "Cooked Food Waste" refers to cooked food such as leftovers that can be used as fodder. Taking Taipei as a reference, it can be learned that the implementation of source separation and food waste recycling can be made mandatory by the government.



利用廚餘再造而成的魚糞。
Recycled food waste as fish fodder

The efficiency could be much enhanced provided that a comprehensive food waste recycling system is available.

However, unlike Taipei, Hong Kong buildings are mostly high-rise residential and shopping malls. It is more difficult to require the public to send out their food waste at the assigned time and locations. The government could consider setting up food waste collection points in big housing estates, restaurants and shopping malls in order to facilitate source separation and collection by residents and shop owners. It can also require relevant management units (e.g. property management companies or cleaning contractors) to transfer the separated food source to assigned food waste recycling centres in various districts. Considering the costs of transportation and educational benefits, the government can subsidize housing estates to install food waste composting machines, allowing citizens to experience the food waste recycling in person and increase their environmental awareness.

After setting up a well-established food waste recycling system, more and more food waste will be collected in future. To make the recycling system sustainable, a good food waste recycled products market is required. For most common

飼料，按目前本地農業和養殖業情況來看，估計最多每日可吸納五十公噸堆肥、二百公噸豬糧和二十公噸魚糧，相當於八百三十公噸廚餘量，即佔香港廚餘總量的兩成三。由於很難單靠本地市場吸納所有廚餘再造產品，政府便需協助業界為廚餘再造堆肥和動物飼料尋找出路。當局可考慮透過資助研發有關的生物科技，以提升堆肥和動物飼料的品質，亦應為港產的廚餘再造堆肥和動物飼料進行品質檢測認證，以確保這些廚餘製品符合國際品質要求，這都有助開拓廚餘再造產品的銷售市場。

cases, food waste can be recycled as compost products and fodder. According to the current situation of local agricultural and aquacultural industries, it is estimated that 50 tonnes of compost products, 200 tonnes of pork fodder and 20 tonnes of fish fodder can be consumed daily. These amounts would be created by recycling 830 tonnes of food waste, accounting for 23% of Hong Kong's total food waste. Since it is difficult for the local market to absorb all the food waste recycled products, the government needs to help

the industry to find ways to solve the issue. The government can consider funding the research development of relevant biotechnology to improve the quality of the compost products and fodder. A quality assurance certificate scheme for these products can ensure those food waste products comply with international quality standards. All these actions can certainly help develop the market for the food waste recycled products.

推廣社區苗圃不但可吸納更多堆肥，更有助改善香港的城市環境。

Promoting urban planting can not only absorb more composting products, but can also improve our urban environment.



盡快落實廢物徵費

Imposing Levies on Waste Collection

然而，較回收和再造廚餘更為優先的，當然是從源頭入手，減少產生廚餘。按南韓和台北的經驗，一旦推行廢物按量徵費，每月可以減少約三分之一至一半廚餘量，成效立竿見影。可持續發展委員會正籌備今年中就廢物徵費的機制和收費原則諮詢公眾，較早前環境局估計香港將來廢物徵費水平可能約二十至四十元一個月，這並不是一個高的徵費水平，而且徵費是否能收回成本，並不是考慮重點，最重要是透過經濟誘因，令市民減少製造廚餘及其他廢物，培養減廢文化。

Compared with recycling and recovery of food waste, tackling the source of food waste course deserves higher priority. Based on the experiences of South Korea and Taipei, once a quantity-based charging system is imposed on waste, food waste can be further reduced by one-third to half. The effect is obvious. The Council for Sustainable Development is preparing for a public consultation on the principle and mechanism on waste levies. The Environment Bureau has estimated

the waste levy of Hong Kong could range from \$20 to \$40 per month. This is not a very high levy. Also, the emphasis is not on whether the levy can cover the costs, but to provide an economic incentive for the public to reduce food waste and other solid waste production, to cultivate a culture of waste reduction.

Of course, education has an important role to play. The "Food Wise Campaign" recently launched by the Government

當然，教育亦是重要的一環。政府最近展開的「惜食香港運動」是很好的開始。以南韓為例，減少產生廚餘教育不單停留於口號式的宣傳，還有全城參與的部分，例如將每個星期三訂為全國「無廚餘日」，又推出食客「清」碟獎賞運動，假如客人碟中沒有剩食，即獲獎品。除了一般市民，教育工作亦應以工商界為對象，例如與飲食業界合作，定期提供培訓，改善食肆就食物採購、貯存和利用等方面的預測和管理。

隨著全球愈見頻繁的經濟及交通往來，食材選擇愈來愈多。社會富裕亦同時帶來嚴重的廚餘問題。大量廚餘佔用堆填區空間，帶來了令人頭痛的廢物處置問題；廚餘在堆填區腐化後產生大量溫室氣體，加劇全球暖化，造成的是環境問題；將原本可循環再造成有用資源的廚餘，棄置於堆填區，這是有關浪費資源的問題。然而，進一步看廚餘問題，同時亦是道德問題。豐衣足食並非必然，現時全球有超過八億人生活於饑餓之中。即使在香港，仍有約有兩萬名十五歲以下兒童得不到足夠食物。

食物是珍貴的資源，即使我們飽足，亦不可浪費。今年六月的世界環境日，就以「思前·食後·厲行節約」為主題，目的是提醒人們減少食物浪費，及降低生產食品時對環境的影響。如香港要徹底減少廚餘，政府必需一改以往「以設施處理廢物」的思維，認真地制定並落實全面的減廢回收政策，香港「零」廚餘，才會變成指日可待的現實。

is a very good start. Take South Korea as an example, education on food waste reduction does not just stop at promotional slogans. The whole city actually participates. For example, they set every Wednesday as a nationwide "No Food Waste Day". They also organize a rewards program for "Clear Plate" diners. A customer will receive a reward if there are no leftovers on his or her plate. Apart from citizens, the education work also targets the business sector. In collaboration with the catering industry, they provide training to improve the management of food purchasing, storage and usage in restaurants.

With increasing globalisation, there are more and more food options. Affluence also brings a serious problem of food waste. Food waste uses up a lot of space in our landfills, causing headaches regarding waste disposal. Food waste in landfills will produce a large volume of greenhouse gases as it decomposes, exacerbating global warming and leading to environmental problems. Disposal

of food waste that can be recycled is a waste of resources. However, if we further look into the problem of food waste, it is also a moral issue. Being able to fill up the stomach should not be taken for granted. Over 800 million people are still living in hunger. Even in Hong Kong, there are still about 20,000 children aged under 15 who are not able to get enough food.

Food is a precious resource. Even if we are affluent, we should not waste food. The theme of World Environment Day this year is "Think. Eat. Save". The purpose is to remind people of reducing food waste and minimizing the impact on the environment during food production. If Hong Kong is really committed to reducing food waste, the Government has to change its previous mindset of "Using Facilities to Handle Waste" and to seriously design policies on waste reduction and recycling. Then, the target for Hong Kong with "Zero Food Waste" can be a realistic goal just around the corner.



Appendix E

“Trash Course” in South China Morning Post

(20 August 2013)

Green Power

Hong Kong produces mountains of plastic waste, so why are our recycling plants struggling to stay open? Elaine Yau digs for some answers

TRASH COURSES

Plastic, plastic everywhere, and all with nowhere to go: the bales of flattened drinks bottles, clothes hangers and other discarded items piling up at Lee Hing-tak's sprawling recycling plant in Tuen Mun Eco Park epitomise the deep dysfunction in the city's plastics recycling system.

For one thing, little recycling is actually conducted in Hong Kong aside from a few operators like Lee, who runs Telford Envirotech. Most of the purportedly recycled plastic waste is gathered by scrap collectors who bundle it for export to mainland processing plants.

Of the 843,200 tonnes of plastic waste recovered in 2011, as much as \$39,300 tonnes - 99.5 per cent - was exported. Just 0.5 per cent was recycled locally, according to the Environmental Protection Department.

Although mainland regulations stipulate that only processed plastic waste can be imported, this wasn't strictly enforced. So traders have simply gathered the unsorted plastic into bales, declared it processed and sent it across the border, where the material can sell for about HK\$2,000 per tonne.

For the most part, Hong Kong's plastic recycling business is "nothing more than waste smuggling to the mainland", Lee says.

Those operations came to an abrupt halt in March when the Chinese customs officials launched Operation Green Fence. Scheduled to run until November, the campaign aims to crack down on waste smuggling. Since then, more than 100,000 tonnes of plastic waste intended for the mainland has piled up at various New Territories collection points, the Recycle Materials and Re-production Business General Association estimates.

Yet local recyclers such as Telford and Wah Lung Plastic

Company, also in Tuen Mun, struggle to source sufficient volumes of cheap plastic waste to sustain their operations.

Meanwhile, some 1,694 tonnes of the 2,000 tonnes of plastic that Hongkongers throw out every day (about 85 per cent) wind up in landfills - an absurd state of affairs when the government is trying to rally support to expand existing waste dumps and build a giant waste incinerator on Shek Kwu Chau.

Lee operates two production lines at Telford: one turns clear plastic bottles into plastic crystals - industrial material for generating fibre that can be spun into textile; the second converts bottles into plastic sheets, which can be used to produce rubbish bins and other containers. But he can only get enough plastic waste to run his machines for one day each week.

Similarly, Wah Lung, which processes plastic waste into pellets for industrial reuse, has had to import material from the US to feed its operations.

"Why do I need to bring in waste plastic from overseas when so much of it is dumped in landfills every year?" says Wah Lung's owner, who prefers to remain anonymous. "My dad set up the business in the '60s. Before local manufacturers moved operations to the mainland, we would collect waste plastic from them for raw material. A decade ago, there were around eight recyclers which really

turned waste plastic into products for local use. But the government kept introducing obstacles to our business," he says.

Officials set conditions such as criteria for effluent discharge that small enterprises could not fulfil without any technical or financial support, he says. Many firms were forced to close.

And as the US economy soured after 2008, the Wah Lung boss says, he couldn't even import enough plastic waste to keep his machines running and has since had to reduce his team of workers from 12 people to just four.

Operation Green Fence has also hit French trader Michel Jospe, whose Hong Kong-based company, Methong Plastics, brings in plastic waste from Europe for processing on the mainland. Shipments that have been rejected by Chinese customs are now stranded in Hong Kong, so some of it will have to go to landfills, he says.

Nevertheless, Jospe reckons the mainland clampdown is a chance for Hong Kong to revamp its woeful waste disposal strategy. "In France, 90 per cent of waste is recycled, with only 10 per cent incinerated for electricity generation," he says.

"Operation [Green Fence] is a good opportunity for Hong Kong to come up with new ideas and outlets for the waste. Such outlets exist. It's just that the Hong Kong government didn't think carefully about the situation. They either don't release licences [for recyclers] or they ask for too many [requirements] that are difficult to achieve by people who recycle. At the end of the day, things go to landfills."

Our plastic waste woes are also due to a disposal chain that went



Telford Envirotech executive Lee Hing-tak at his plant in Tuen Mun. Photos: K.Y. Cheng

85% of plastic waste generated in Hong Kong goes to landfills

awry from the beginning - from household rubbish to waste processors to factories making products from recycled materials, says Lee Kin-man, an associate professor at the Technological and Higher Education Institute specialising in solid-waste-recycling technology.

"So collection of waste plastic is in chaos now," Lee says.

Because waste sorting was never properly done at the source, this yielded a mishmash of different types of plastics that local recyclers could not use without incurring extra cost for separation. So they merely shred the waste to produce basic industrial materials such as plastic pellets that are exported to mainland factories.

However, recyclers face fierce competition from mainland rivals as manufacturers can buy processed plastic waste domestically.

Hong Kong should do more to reuse its plastic waste, Lee Kin-man says. "Although it cannot support big-scale manufacturing, production lines can be set up to convert discarded plastic bags and bottles - the two main types of household plastic waste - into new bags and bottles. Other adulterated waste plastic can also be made into park benches."

Snag with the 1

When the levy on plastic bags was introduced in 2009, officials and green groups hoped it would curb excessive use (and disposal) of plastic. But it hasn't exactly turned out that way.

About 3,000 retailers covered in the first phase of the scheme were required to charge customers 50 cents for every plastic bag issued, instead of giving them for free. While production of conventional "tank-top" bags fell by 68 per cent, the plastic industry estimates that overall use of the material has risen by 27 per cent since the levy came in. A 2011 survey by the Hong Kong Plastic Bags Manufacturers' Association found the decrease in tank-top bags was more than made up for by increases in production of rubbish bags (63 per cent) and "non-woven" bags (96 per cent). Widely distributed as so-called eco-bags, the non-woven version use 30 to 50 times more plastic than conventional bags.

The levy is a sore point for Lee Hing-tak, managing director of plastic recycling firm Telford Envirotech, who thought it might be used to support businesses like his. The fund remained in the government coffers, which put paid to his plan to open a plant in Tuen Mun Eco Park to turn old plastic bags into new ones.

"The public thinks the levy was used for recycling, but none of the plastic bags discarded here are recycled. They end up in

landfills when vast quantities of new plastic end up in mainland every day. But the Env Protection Dep from domestic, mixed with food and other refuse are difficult to handle. Instead, the go reduce usage or encourage of their own reusable bags. It estimates million has been the levy's impact. In 2009, and the fund has been used for programmes including active citizenship.

Under a plan proposed by the city's retailers, the department proposed that retain the sum green activity."

But Lee argues better use of agents in the d

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"If the elde economic ince would collect l waste of their i could turn the bags for local t Elaine Yau

able to handle 180 tonnes of plastic waste per month.

"The centre processes locally generated plastic waste into value-added materials such as plastic flakes and pellets for further processing or manufacturing into useful products," an Environmental Protection Department spokesman says. "Despite the unstable market environment, the centre has maintained production at about six tonnes of plastic waste per day on average, even after the tightening of import control on recyclable materials by the mainland."

Amid rows over landfill expansion and plans for an incinerator, a steering committee led by Chief Secretary Carrie Lam Cheng Yuet-ngor is being set up to

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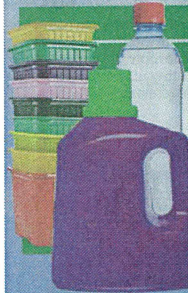
[Recycling is] nothing more than waste smuggling to the mainland

LEE HING-TAK, BOSS OF RECYCLING FIRM

What recyclers find useful

Types of plastic	Examples of products	Worth recycling
PET (polyethylene terephthalate)	Drinks bottles	Yes
HDPE (high density polyethylene)	Shampoo and detergent bottles	Yes
PVC (polyvinyl chloride)	Water pipes	No
LDPE (low density polyethylene)	Plastic bags, food wrap	Yes
PP (polypropylene)	Microwave containers	Yes
PS (polystyrene)	Lids for take-away drink cups, eggs cartons	No

Source: Plastic recyclers



Plastic waste piles up in Tuen

Appendix F

**Overseas Examples of Integrated Waste Management
Facilities/Incinerators
(March 2011)**

Environmental Protection Department

Overseas Examples of Integrated Waste Management Facilities/Incinerators

Source: "Explanatory Booklet for the Proposed Integrated Waste Management Facilities"
Environmental Protection Department (March 2011)



Example 1: Spittelau incineration plant in Vienna, Austria, designed by famous painter and designer Friedensreich Hundertwasser.



Example 2: Maishima Waste-to-Energy Plant in Maishima, Osaka, Japan, with the Spittelau incineration plant in Vienna as its design blueprint.



Example 3:
Incinerator in Frankfurt, Germany,
decorated with cartoon flying dragons
on its external walls.



Example 4:
Incinerator in Beitou, Taipei, with a
revolving restaurant at the top of the
chimney.



Example 5: A new incineration plant in Roskilde, Denmark,
designed by famous architect Erick van Egeraat in
2008 under commission from Kara/Noveren, to be
open for operation in 2013.

Appendix G

Economic Analysis

ICF GHK

The Rezoning of Sites to Facilitate the Implementation of the Government's Integrated Waste Management Policy for Hong Kong - Economic Assessment

P60251123

October 2013

A report submitted by ICF GHK

Date: 04 October 2013

Job Number P60251123

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Date	4 October 2013

ICF GHK is the brand name of GHK (Hong Kong) and the other subsidiaries of GHK Holdings Ltd. In February 2012 GHK Holdings and its subsidiaries were acquired by ICF International.

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1 Introduction

1.1 Objective of this Paper

This paper provides an initial economic assessment of the rezoning application submitted by the Integrated Waste Management Action Group (IWMAg) as an alternative to the Integrated Waste Management Facility (IWMF) at Shek Kwu Chau (SKC) proposed by the Hong Kong Government.

1.2 Background and Context

1.2.1 The Proposed Integrated Waste Management Facility at Shek Kwu Chau

Hong Kong currently generates over 17,000 tonnes per day (tpd) of municipal solid waste (MSW). While almost half of this is recovered and recycled, the rest is sent to landfill; there is nowhere else for it to go.

The Government's goal, as set out in its latest waste management plan – the *Blueprint for Sustainable Use of Resources 2013-2022* (the Blueprint) – is to reduce the proportion of waste sent to landfill to just 22% by 2022. In order to achieve this, the Government plans to increase the SAR's recycling rate to 55% and to commission an IWMF to deal with the remaining 23%. The primary component of this IWMF is a waste-to-energy plant capable of incinerating 3,000tpd of MSW and converting this waste into electricity which would then be fed back into the grid. A smaller, 'demonstration scale' (200tpd) recycling plant for the recovery of recyclables from mixed MSW is also planned as part of the IWMF.

The Government intends to develop this IWMF on an artificial island to be reclaimed just off the coast of Shek Kwu Chau, off the southern coast of Lantau. The facility – still the subject of a judicial review and without funding support so far from the Legislative Council (LegCo) – is expected to be operational by 2022 at the earliest.

1.2.2 The Integrated Waste Management Group's Rezoning Application

The IWMAg considers SKC to be inappropriate location for the IWMF. Moreover, it considers the Government's proposed IWMF not to be a genuine 'integrated waste management facility' – more just a large-scale incinerator. IWMAg's counter-proposal is to replace the one super incinerator at SKC with four regional IWMFs, each providing a range of different types of waste management facilities to meet local needs. Smaller scale waste-to-energy plants (with a total capacity not less than the Government's proposed 3,000tpd) would form part of these facilities, but IWMAg's proposal emphasises first and foremost the need for increased sorting, recycling and recovery of waste, with incineration and ultimately disposal at landfill as a last resort. The objective of IWMAg's proposal is to provide a range of holistic integrated waste management facilities at appropriate locations across Hong Kong in order to help the Government better deliver its integrated waste management policies.

1.3 Approach to this Economic Assessment

This paper is structured based on the approach undertaken for the economic analysis:

- Section 2 reviews the current and future waste management situation in Hong Kong to identify the real problems that the competing proposals would need to address
- Section 3 introduces the alternative proposal
- Section 4 provides an assessment of the degree to which the alternative proposal addresses Hong Kong's waste management problems – as well as its wider economic implications
- Section 5 concludes

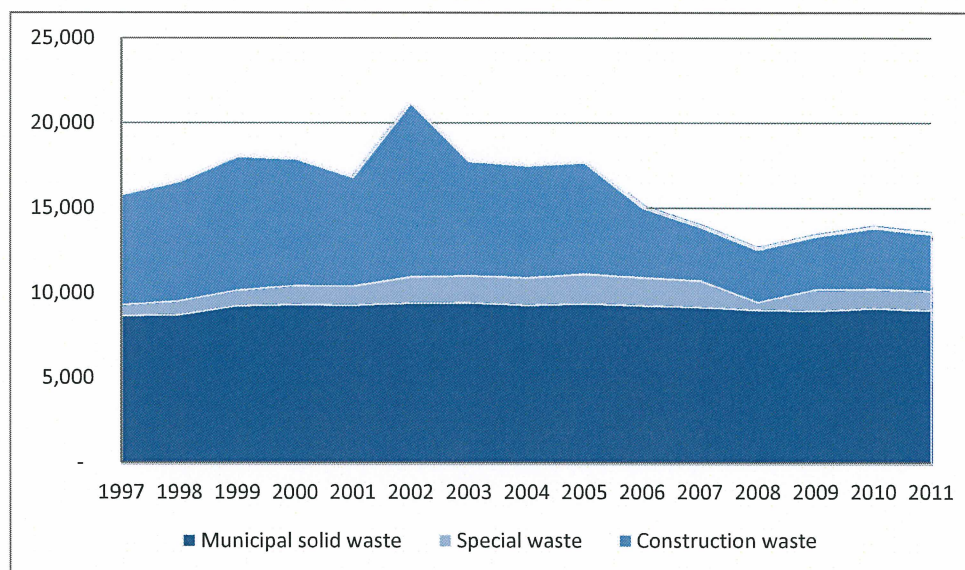
2 Understanding Hong Kong's Waste Management Problems

2.1 Baseline Analysis: The Situation Today

2.1.1 Hong Kong's High MSW Generation and Disposal Rates

According to the latest waste management statistics from the Government, Hong Kong sent almost 13,500 tonnes of waste per day to landfill in 2011 – equivalent to 4.9 million tonnes per year or 1.9kgs per person per day. While Hong Kong has made considerable progress in reducing the amount of waste it sends to landfill over the past decade, almost all of this reduction has come from diverting construction waste away from landfills, as shown below in Figure 2.1. The amount of MSW sent to landfill has barely changed since 1997.¹ By 2011, two thirds of all waste sent to landfill was MSW.

Figure 2.1 Total Waste Sent to Landfill By Source (tonnes per day)



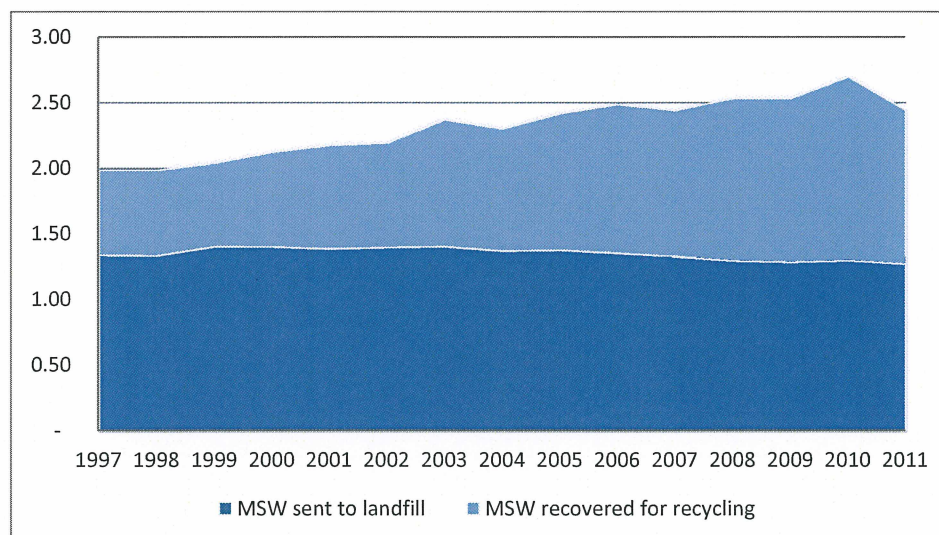
Source: Environmental Protection Department, Annual Waste Statistics

2.1.2 Informal Processes and a Lack of Waste Management Infrastructure

As shown in below in Figure 2.2, the primary reason why the amount of MSW sent to landfill remains high is the fact that the SAR's waste generation rates have continued to rise over the past decade, even on a per capita basis. The only reason why this ever increasing rate of waste generation has not led to commensurate increases in the amount disposed of at landfill is down to the progress Hong Kong has made in boosting recycling. MSW recycling rates have risen steadily over time and broke the 50% barrier for the first time in 2010. However, the industry remains primarily informal and relies heavily on exporting recyclable materials to the Mainland. Moreover, once these recyclable materials have been recovered from the waste stream, there is nowhere else for the remaining waste to go other than to landfill.

¹ Hong Kong has consistently sent between 8,600 and 9,500 tonnes of MSW to landfill every year from 1997 to 2011.

Figure 2.2 Amount of MSW Recycled or Sent to Landfill Per Capita (Kgs per person per day)



Source: Environmental Protection Department, Annual Waste Statistics

2.1.3 Landfill Capacity is Running Out Fast

In the absence of alternative waste treatment options, non-recovered and non-recycled waste in Hong Kong is disposed of at one of the SAR's three landfill sites:

- Northeast New Territories Landfill Site (NENT)
- Southeast New Territories Landfill Site (SENT)
- West Territories Landfill Site (WENT)

All three landfills began operation in the 1990s. As shown in Table 2.1 below, in their current capacities without extension, all three are expected to be full by 2019.

Table 2.1 Utilisation of Current Landfill Facilities

	Daily Intake Quantity (avg)	Total Capacities	Remaining Capacities*	Full by
NENT	2,513 tonnes	35 mil m ³	19 mil m ³	2017
SENT	4,814 tonnes	43 mil m ³	8 mil m ³	2015
WENT	6,131 tonnes	61 mil m ³	33 mil m ³	2019

Source: Environment Bureau (EnvB), Hong Kong Blueprint for Sustainable Use of Resources 2013-2022, May 2013. Notes: * Remaining capacities as estimated in 2011

2.2 The Counterfactual: Government's Future Plans

2.2.1 Waste Reduction Initiatives

Recognising Hong Kong's high MSW disposal rates, the over-riding target in the Government's latest waste management Blueprint is to reduce the SAR's MSW disposal rate on a per capita basis by 40% over the next decade, from 1.27kg per day today to 0.8kg per day by 2022. The Government's plan is to achieve this target through:

1. Driving behavioural change through introducing policies and legislation to reduce waste generation (e.g. MSW charging and Producer Responsibility Schemes)
2. Mobilising the community through targeted campaigns aimed at food waste, glass beverage bottles collection, "bring your own bag", and community green stations etc.

3. Introducing new waste management infrastructure and facilities, including:
 - a. A new Sludge Treatment Facility (STF) in Tuen Mun, with a design capacity of 2,000tpd to be commissioned by the end of 2013
 - b. Two Organic Waste Treatment Facilities (OWTFs) to treat food waste, of 200tpd by 2016 and 300tpd by 2017 respectively
 - c. An IWMF at SKC to treat 3,000tpd of MSW to be commissioned by 2022 at the earliest

2.2.2 Landfill Extension

Recognising that Hong Kong's landfills are running out of space, the Government recently sought approval from the Legislative Council (LegCo) to extend the NENT and SENT landfills and to secure funding to investigate the possibility of extending WENT. If approved, the operating life of NENT would have been extended to 2028, and that of SENT to 2023². The applications were unpopular and were ultimately withdrawn.

However, for the purpose of this analysis it is assumed that extensions to all three landfills are secured. The alternative – no landfill capacity beyond 2019 and no incineration plant until 2022 – is not realistic.

2.3 Defining the Problem to be Addressed

Even with the above measures in place, the Government still expects Hong Kong to have nearly 7,500tpd of MSW needing disposal by 2017 and 6,200tpd by 2022.³ Set against these future estimates it is clear that the capacity of the planned composting plants and the SKC incinerator are not sufficient to meet future MSW demand: some 2,700 tonnes of MSW would still need to be sent to landfill every day by 2022. Landfill extensions would provide somewhere to dispose of this waste but come at a significant cost – not only in dollar terms but also in terms of the opportunity cost of the required land and environmental costs.

In light of this, urgent action is required to address three fundamental problems:

1. Hong Kong continues to generate too much waste
2. Hong Kong continues to send too much of this waste to landfill
3. Hong Kong needs swift action to allow it to plan its landfill extensions

It is against this context that the IWMF proposals put forward by the Government and the IWMAg should be viewed and appraised.

² No information about post-extension operating life for WENT is available in the public domain to date.

³ The *Blueprint* (May 2013) targets 1kg per person per day by 2017 and 0.8kg per person per day by 2022. Hong Kong's projected population by 2017 and 2022 is 7.43 million and 7.72 million respectively according to the latest estimates from Census and Statistics Department.

3 Overview of the Alternative Plans

3.1 The Hong Kong Government's Proposed IWMF at SKC

The proposed IWMF to be built on reclaimed land just off the coast of SKC is planned to comprise:

- A waste-to-energy plant, capable of incinerating 3,000tpd of MSW and turning this heat energy into electricity for transfer back to the grid via submarine cables to Lantau
- A 'demonstration scale' (200tpd) recycling plant

The artificial island – which has not yet been reclaimed – would be about 11.8 hectares (ha) in size, including berthing and storage areas for waste containers. A 4.1ha breakwater would also be constructed to ensure safe loading and unloading of waste, as well as to guarantee safety of the facility itself.⁴

The IWMF at SKC would adopt the most advanced technologies available internationally. No adverse health impacts are expected as a result.⁵

The location of this facility, as well as those proposed under IWMAG's alternative proposal, is shown below in Figure 3.1.

3.2 IWMAG's Alternative Proposal

Rather than have one large IWMF at SKC, IWMAG's alternative proposal is to rezone sites with a view to facilitating the development of four smaller regional IWMFs at different locations across the Hong Kong SAR.

Each site would be expected to house a range of waste treatment facilities such as sorting centres, recycling centres, composting plants and waste-to-energy plants. The facilities would be provided on a scale to match the specific needs of each region and would be tailored to handle the various kinds of waste arriving at the site. Two of the four sites would be expected to house waste-to-energy plants with a total capacity of 3,000tpd. Further capacity could be provided at these sites as necessary.

IWMAG's rezoning application cites four possible sites across Hong Kong that may be suitable for the development of smaller, regional IWMFs:

- Within the NENT Landfill boundary, Ta Kwu Ling
- Within Area 137, Tseung Kwan O
- Northeast Lantau
- Within the WENT Landfill boundary, Tuen Mun

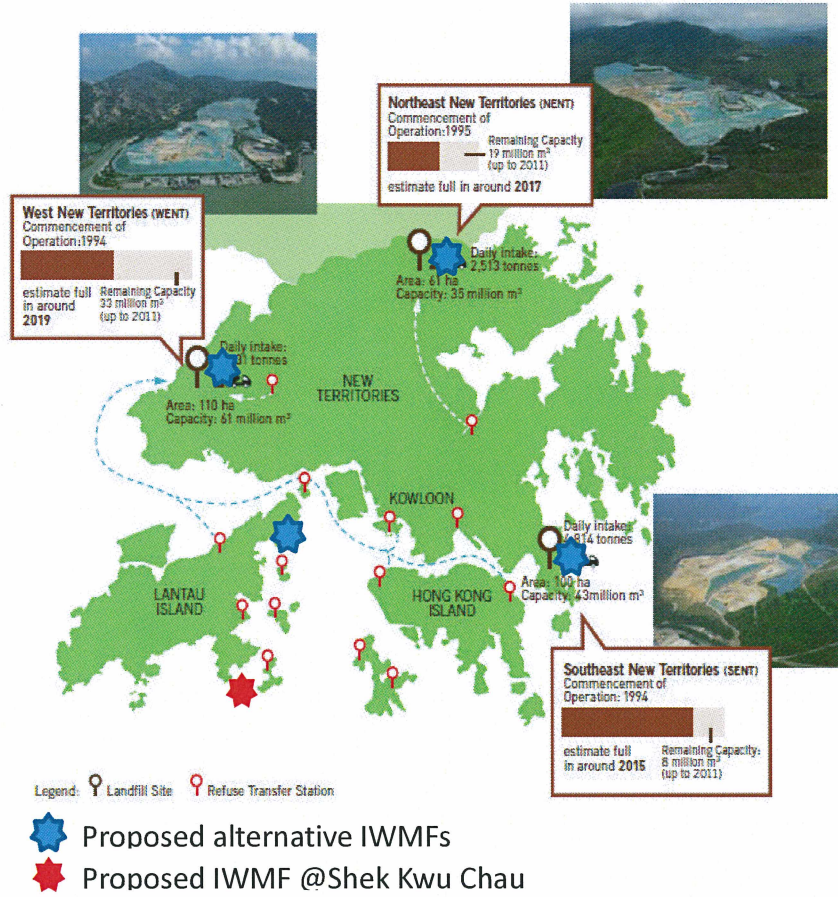
Further details on each location can be found in the Rezoning Application documents.

⁴ EnvB & EPD, *Legislative Council Panel on Environmental Affairs – "Reduce, Recycle and Proper Waste Management"(CB(1) 1369/11-12(01))*, 26 March 2012

⁵ EPD Website

(http://www.epd.gov.hk/epd/english/environmentinhk/waste/prob_solutions/WFdev_IWMF.html)

Figure 3.1 Location of the Proposed IWMFs



Source: IWMAG based on Hong Kong Blueprint for Sustainable Use of Resources 2013-2022, Environment Bureau, May 2013

4 Economic Assessment of the Two Incineration Proposals

4.1 Introduction

This assessment considers the relative merits of the Government's proposed facility at SKC versus IWMAG's proposals for four smaller, regional facilities. The two proposals are assessed first and foremost against their ability to resolve Hong Kong's key waste management problems, as identified in Section 2:

1. Hong Kong continues to generate too much waste
2. Hong Kong continues to send too much of this waste to landfill
3. Hong Kong needs swift action to allow it to plan its landfill extensions

Further costs and benefits of the two proposals are then considered including project costs, project risks, land use and environmental implications

4.2 Ability to Resolve Hong Kong's Waste Management Problems

4.2.1 Problem 1: Hong Kong continues to generate too much waste

Both proposals focus on reducing the amount of MSW that is disposed of at landfill, rather than reducing waste at source. It is unlikely that either proposal will significantly affect Hong Kong's overall waste generation rate, although it is possible that the IWMAG's more regional, community-based solution could do more to involve the community and drive behavioural change than a single facility in a remote location. However, the marginal impact, if any, is likely to be small.

4.2.2 Problem 2: Hong Kong continues to send too much of this waste to landfill

If the Government's planned waste reduction measures and initiatives succeed in hitting their targets then Hong Kong will have some 7,500tpd of MSW needing disposal by 2017, and 6,200tpd by 2022. Assuming that the Government's proposed measures to reduce per capita waste disposal affect all waste streams equally then the potential composition of this waste stream in 2017 and 2022 is shown below in Table 4.1.

Table 4.1 Potential Composition of Hong Kong's MSW Waste Stream in 2017 and 2022 (tpd)

	2011	2017	2022
Putrescibles	3,994	3,301	2,742
Paper	1,931	1,596	1,326
Plastics	1,694	1,400	1,163
Wood/Rattan	318	263	218
Glass	278	230	191
Textiles	217	179	149
Metals	182	150	125
Household hazardous wastes	83	69	57
Others	298	246	205
Total	8,995	7,434	6,176
Of which:			
Organic Waste Treatment Facility	-	500	500
Waste to Energy Plant	-	-	3,000
Remainder sent to landfill	8,995	6,934	2,676

Under the Government's proposal, the total capacity of the waste-to-energy plant would be 3,000tpd. This would still leave some 2,700tpd of MSW in need of disposal. Government's IWMF plans also include a 200tpd recycling plant, allowing roughly 7% of this remaining waste stream to be sorted and potentially recycled.

There is a greater flexibility in IWMAG's proposal, which places greater emphasis on recycling and regional IWMFs with a range of waste sorting and treatment facilities. As shown in Figure 4.1, a significant proportion of the remaining waste-stream by 2022 would be materials that could be recovered, recycled or composted. IWMAG considers that these resources could be captured through the provision of appropriate facilities, with the remainder incinerated at waste-to-energy plants with total capacities at least matching those proposed by the Government. Under this alternative scenario, the volume of MSW still needing to be sent to landfill could be reduced significantly.

4.2.3 Problem 3: Hong Kong needs swift action to allow it to plan its landfill extensions

Under the Government's plans, the IWMF at SKC is expected to take upwards of nine years to develop. Subject to resolution of the Judicial Review and funding approval from LegCo, it is estimated that the IWMF will not be commissioned until 2022 the earliest – three years after Hong Kong's landfills are expected to run out of capacity. One cause of this long development timetable is the need to reclaim the artificial island at the SKC site, which is estimated to take at least three years.

IWMAG has not developed a project timeline for its alternative proposal. The length of time required to commission the four facilities would be subject to the scale and technology to be adopted, securing funding approval and the necessary EIA process and results. However, it is highly possible that IWMAG's alternative proposal may allow waste-to-energy and other waste treatment facilities to come online sooner:

- None of the four sites require reclamation, thereby saving at least two years for each site
- Two of the sites are within existing landfill boundaries so the EIA process might not take long; a third site is on land zoned OU (deep waterfront industry)
- Smaller facilities might also be less objectionable, thereby requiring less time for objections and appeals.

If not extended, Hong Kong's last remaining landfill, WENT, will be full by 2019. It is possible that IWMAG's proposals could allow regional IWMFs to be operational before this site hits capacity, thereby extending the landfill's life. With the additional sorting, recycling and composting facilities proposed by IWMAG, it may be possible to divert sufficient waste such that not all three landfill sites need to be extended, or at least extended on a smaller scale.

4.3 Cost

4.3.1 Capital Costs

Under the Government's plans, the latest capital cost estimates for developing the IWMF at SKC stand at \$11.4 billion (September 2011 prices)⁶, \$2.4 billion of which is due to the cost of building the facility on an artificial island involving reclamation works, berths and seawall construction, and sub-marine cables.⁷ Additional costs would also be necessary to upgrade the electricity grid in Lautau to allow it to handle electricity generated at the SKC plant, but estimates of these costs are not available.

IWMAG has not developed cost estimates for its alternative proposal: these could only be estimated once the range of facilities at each site has been determined and once the technology to be adopted for the smaller waste-to-energy plants has been selected.

⁶ \$14.96 billion in money-of-the-day prices.

⁷ EnvB & EPD, *Legislative Council Panel on Environmental Affairs – "Reduce, Recycle and Proper Waste Management"* (CB(1) 1628/11-12(01)), 20 April 2012

Reclamation costs would be saved but it is possible that economies of scale could make larger facilities most cost-effective to procure such that the net effect is unclear.

However, facility development costs are not the only capital costs that need to be taken into consideration. As explained above, under Government's plans there could be a more urgent need to extend Hong Kong's landfill sites. This is expensive both in absolute terms – Government's recent application to extend NENT was estimated to cost \$4.0 billion (September 2011 prices) – and in terms of opportunity cost given the scarcity of land in Hong Kong. Under the IWMAG's alternative solution, landfill extensions will still likely be necessary given the tight timeline but the scale (and cost) of extension may be less and the costs could potentially be deferred.

4.3.2 Operating Costs

Under the Government's plans, the latest operating cost estimates for the IWMF at SKC stand at \$353 million per annum.⁸

IWMAG has not developed cost estimates for its alternative proposal and it remains unclear whether there are economies of scale in operation or not that would make operating four smaller facilities more or less expensive than operating one large one.

However, the wider operating cost implications of the two proposals also need to be taken into consideration, particularly in terms of landfill operating costs. According to the Blueprint, the Government currently spends some \$600 million per year operating Hong Kong's three landfill sites. Given the likely need to extend these landfills sooner and by a greater extent under the counterfactual, total landfill operating costs would likely be greater under the Government's proposal than under IWMAG's proposal.

4.3.3 Transportation Costs

Under the Government's plans, MSW from three of the SAR's seven operating waste transfer stations (RTSs) – Island West, Island East, and West Kowloon – would be barged to SKC for incineration. Post-incineration, the remaining ash (estimated at 10% by volume and 30% by weight) would be barged to WENT. This waste is presently barged directly from the three RTSs to WENT.

As demonstrated by the map shown in Figure 3.1, under IWMAG's proposal the distance would be less from each of these RTSs to the North Lantau IWMF than to the one at SKC, and then less from the IWMF to WENT. Shorter distances mean reduced vehicle operating costs.

4.3.4 Opportunity Cost

Under the Government's plans, the immediate opportunity cost is the next best alternative use of the waterbody and seabed that would be reclaimed to create the 11.8ha artificial island, the 4ha breakwater and to lay the submarine cables for transferring power back to the grid at Lantau. There are also significant opportunity costs involved in extending the landfills.

Under IWMAG's alternative proposal, two of the four IWMFs would lie within the boundaries of existing landfills. The opportunity cost to these sites is therefore minimal: land that would otherwise have been used for burying waste is instead used to sort, treat, compost and incinerate waste. The third IWMF at Area 137 would be on a site currently zoned for OU (Deep Waterfront Industry) and therefore considered compatible. The most significant opportunity cost would be related to northeast Lantau site, although the site does not infringe on the area reserved for the future expansion of Disneyland. That the site remains vacant despite its reclamation having been completed a long time ago (as with Area 137) implies the opportunity cost of the land is not large.

⁸ EnvB & EPD, *Legislative Council Panel on Environmental Affairs – "Reduce, Recycle and Proper Waste Management"* (CB(1) 1369/11-12(01)), 26 March 2012

4.4 Risk

There are risks associated with both proposals – both in terms of risk of malfunction and ongoing operation, specifically related to transportation and storage.

This paper assumes that management and operation of the IWMFs proposed under both the counterfactual and the alternative proposal is up to the required standards and that any risk of malfunctioning is negligible. However, the impact of any malfunction on Hong Kong's waste stream would be more significant under the Government's plans; under IWMAG's proposal if one facility were to malfunction there would still be three more that could be used.

In terms of transportation and storage, SKC's island location means barging is the only means of moving MSW and residual ash to and from the IWMF under the Government's plans; road transportation is not possible. As a result, delivery of waste to the IWMF may need to be suspended during typhoons or under severe weather conditions. Waste would need to be stored at the RTSs until conditions improved. Such storage problems are less likely to happen under IWMAG's alternative proposal that allows delivery of waste by road.

4.5 Flexibility

Under the Government's plans, Hong Kong's future MSW treatment options would be dominated by one super incinerator, supported by two small composting plants and a small waste sorting facility.

Under IWMAG's proposals, Hong Kong would develop a more diversified range of regional waste treatment facilities, with each site's facilities specifically designed to meet the scale and type of waste produced locally. This option provides greater flexibility to adjust the range and type of facilities provided as new technologies develop and as the composition of Hong Kong's waste stream changes, and may also open up opportunities for investment in recycling industries in Hong Kong

4.6 Environmental Impact

Both proposals would have impacts on the environment that need to be taken into consideration.

Under Government's plans, the major impacts would be on the ecosystem around SKC. The area was previously identified as a Conservation Area by Government and is a major habitat for finless porpoises, white-bellied eagles and coral. The plan would also visual impact implications for residents and visitors to South Lantau, although these would be mitigated to an extent by the proposed greening measures.

Under IWMAG's proposals, only two of the four sites would likely have significant environmental implications; the other two are presently landfill sites so the marginal impact of adding IWMFs could be small. The northeast Lantau site would involve use of some green belt land. While the site is close to Disneyland, appropriate landscaping and architectural design can be used to build an IWMF matching the visual style of the theme park. Even with any adverse visual impact, the economic impact of this is likely to be small: tourists wishing to visit Disney are unlikely to change their behavior and go elsewhere or spend less if the IWMF is constructed.

The facility at Area 137 would also have visual impact, although this is unlikely to be any worse than the likely alternative use of the site: deep waterfront industry. Siting an IWMF here may also reduce the noise and air quality issues of trucks garbage driving through Tseung Kwan O by providing marine access to the landfill.

With an emphasis on sorting and recycling, the amount of waste sent to landfills under IWMAG's proposal could be reduced, thereby potentially improving the quality of environment around existing landfills.

5 Conclusions

This paper has provided an initial, high-level assessment of the IWMAG's rezoning application. The application has been assessed against the Government's plans to build a IWMF at SKC from the perspective of which proposal is likely to contribute most to resolving some of Hong Kong's most pressing waste management problems. Additional considerations such as cost, risk and impact on the environment have also been reviewed.

The summary results of this assessment are provided below in Table 5.1.

Table 5.1 Comparison of the Government's Proposal and the Alternative Proposal

	Government's Proposal (Counter-factual)	Alternative Proposal
Ability to resolve Hong Kong's most pressing waste management problems		
Problem 1: Hong Kong continues to generate too much waste	Unlikely to affect rate of waste generation at source.	Unlikely to significantly affect rate of waste generation at source, although this more regional solution could do more to involve the community. Marginal impact, if any, is likely to be small.
Problem 2: Hong Kong continues to send too much waste to landfill	Total capacity of the waste-to-energy plant would be 3,000tpd. A further 200tpd recycling plant would also be developed. All remaining waste would go to landfill.	Emphasis on sorting, recycling and composting facilities at regional IWMFs can provide additional waste treatment capacity, on top of the 3,000tpd (or greater) waste-to-energy plants. Overall waste to landfill would be lower under this proposal.
Problem 3: Hong Kong needs swift action to allow it to plan its landfill extensions	The IWMF at SKC is expected to take upwards of nine years to develop – the IWMF is not expected to be commissioned until 2022, including three years for reclamation.	Detailed implementation timeline not available but IWMAG's proposal could allow faster implementation of regional IWMFs. Faster implementation plus reduced long term waste to landfill could allow necessary landfill extensions to be scaled back.
Wider Impacts		
Cost: Capital Costs	\$14.96 billion (MOD, April 2012 estimate) including reclamation cost (est \$2.4 billion). Additional costs required to upgrade the electricity grid in southern Lantau and to fully extend Hong Kong's existing landfills.	Facility construction cost to be determined. Reclamation and grid upgrading costs are not required. It may be possible to defer and/or avoid some landfill extension costs if waste recovery improves significantly.
Cost: Operating Costs	\$353 million p.a. Transportation costs between RTSS, SKC and on to WENT. Costs of operating fully extended landfill	Facility operating costs to be determined. Transportation costs between RTSS and the four facilities are likely to be lower. It may be possible to defer and/or avoid some landfill extension operating costs if waste recovery improves significantly.
Cost: Opportunity Cost	Some costs in terms of use of waterbody and seabed that would be reclaimed.	Some opportunity cost at two sites: Area 137 and northeast Lantau. Both sites still vacant long after

	Government's Proposal (Counter-factual)	Alternative Proposal
	Significant opportunity cost involved in extending the landfills.	reclamation so cost may not be large.
Risk	Increased risk of impact of malfunction ('all eggs in one basket'). Sea access only increases risk.	Reduced impact of malfunction at one site (other sites still operational). Alternative proposal allows delivery of waste by road.
Flexibility	Large investment in super incinerator ties Hong Kong to this treatment method	Involves development of a more diversified range of regional waste treatment facilities. Provides greater flexibility to adjust facility provision as new technologies develop and as composition of waste stream changes. There may be investment opportunities in recycling industries in Hong Kong.
Environment	Major impact on ecosystem around SKC. Visual impacts for residents and visitors to South Lantau, although mitigated by proposed greening measures.	Two of the four sites may have environmental impacts implications. Northeast Lantau site - some use of green belt, but marginal impact considered small. Adverse visual impact on nearby Disneyland can be avoided with appropriate landscape and architectural design. Area 137 - visual impacts, although unlikely to be worse than alternative use of the site: deep waterfront industry. Facility may also reduce the noise and air quality issues of trucks garbage driving through Tseung Kwan O. Reduction of waste going to landfills may improve the quality of environment around existing landfills.

Overall, IWMA's proposals appear to better address Hong Kong's waste management problems and have better wider impacts. The key driver behind these results is the IWMA's proposal that Hong Kong needs a flexible range of facilities – not just a large scale waste-to-energy plant – in order to capture more of Hong Kong's MSW stream. The greater the proportion of this waste stream that is captured, the greater the benefits.

Further analysis is required to model the composition of Hong Kong's future waste stream and thus the range of facilities that might be provided at each regional centre. Cost estimates can then be developed to allow for a fair comparison of the potential cost and benefits to both proposals.