



PENANG STATE MUNICIPAL SOLID WASTE MINIMIZATION AND RECYCLING PROJECT

OUTPUT-BASED PROGRAM TO INCENTIVIZE ORGANIC WASTE SEPARATION:

PROPOSED DESIGN



Technical assistance for the program design from the World Bank
Support from the Climate and Clean Air Coalition (CCAC) and the International Environmental
Technology Centre of the United Nations Environment Programme (UNEP-IEC)

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ACRONYMS

CCAC	Climate and Clean Air Coalition
FW	Total weight of food after separation at source
HMC	Highrise Management Committee
ISWM	Integrated Solid Waste Management
IVA	Independent Verification Agent
MS	Minimum Score
MSW	Municipal Solid Waste
NGO	Non-governmental Organization
MPPP	Penang Island Municipal Council
MPSP	Seberang Perai Municipal Council
MS	Minimum Score
MSWMU	Municipal Solid Waste Management Unit
MYR	Malaysian ringgit (currency)
OBA	Output-based Aid
PCCACWC	Penang CCAC Working Committee
PERMANDU	Performance Management & Delivery Unit
PIU	Project Implementation Unit
PHI	Potential Highrise Incentive
QTF	Quantity of Separated Food Waste
RBF	Results-based Financing
RM	Malaysian ringgit (currency, alternate abbreviation)
SWM	Solid Waste Management
TW	Total weight of waste generated in the highrise community
UNDP	United Nations Development Programme
UNEP-IETC	International Environmental Technology Centre of the United Nations Environment Programme

1 INTRODUCTION

The main approach for Penang's solid waste management (SWM) strategy involves waste reduction through a 3R-based (reduce, reuse, recycle) provision of comprehensive, standardized, quality and cost-effective SWM services and the establishment of a legal, regulatory and institutional framework for integrated solid waste management (ISWM). Its strategy also includes the privatization of collection, transfer and disposal and adoption of proven environmentally friendly and cost-effective technologies with priority given to local innovation and solutions. Public education campaigns to achieve attitude and behavior change continue to play an important and vital part in waste minimization and resource recovery.

Waste generated in Penang statewide is estimated to be about 2,200 metric tons/day. From this, about 600-800 metric tons/day are generated from Penang Island and about 1,500 metric tons/day from Seberang Perai (see Table 1.) All wastes are transported to Pulau Burung Landfill. The landfill is about 33 hectares and will last for the next three years, until approximately 2017. The landfill management is now in the process of expanding the landfill by 28 hectares; with this additional capacity it is estimated to last for another 10 years. Nevertheless, with this current rate of waste generation, the landfill will be filled within 13 years and another landfill will have to be identified.

Table 1 : Solid Waste Sector Information for Penang Island & Seberang Perai 2012

Solid Waste Sector Information				
No.	Item	Penang Island	Seberang Perai	Unit
1	Quantity of waste generated annually	288,377	528,275	Tonnes/year(2012)
2	Quantity of waste generated daily	790	1447	Tonnes/day (2012)
3	Quantity of waste generated per capita	1.07	1.47	Kg/capita/day
4	Total number of households in the city	189,829	195,829	Households
5	Percentage of municipal budget used for solid waste sector	25	43	Percent

Source: MPPP & MPSP, 2012

From available data for Penang, organic waste constitutes about 40-60 % of total waste and a large proportion of this is from food and garden waste (see Table 2). In order to expand the life of the landfill, it is only prudent to reduce the amount of such waste and thereby also save municipal expenditures on waste collection, transportation, disposal and treatment in later stages. In order to achieve waste reduction, a number of measures may be considered. Composting food and garden waste is option for reducing the amount of waste going to the

landfill. This organic waste can be segregated at its points of generation and then transformed into useful by-products. Besides, other discards (i.e. plastics, cardboard, aluminum, etc.) can be more easily recycled if they do not come into contact with the wet organic waste portions.

Table 2: Waste Composition of Seberang Perai Municipal Council (MPSP) & Penang Island Municipal Council (MPPP), 2003

Item	MPSP		MPPP	
	Tonnes (per day)	%	Tonnes (per day)	%
Food	605.84	50%	206.23	33%
Yard & Garden	148.99	12%	59.86	10%
Paper	54.12	5%	176.15	28%
Plastics	208.10	17%	89.89	15%
Textile/Rubber	38.48	3%	19.02	3%
Metal	43.36	4%	29.09	5%
Hazardous	2.69	0%	1.92	0%
Others	98.42	8%	37.74	6%
Total	1,200.00		619.90	

Source: Satang 2003 Survey taken from UNDP SWM Study Report 2007

Note: No other comprehensive waste characterisation studies were conducted after 2003.

The proposed ISWM strategy for Penang is to embark on a **resource recovery - organic composting objective**. Removing and recycling organic waste can reduce the co-mingled waste portion by potentially 40% of the total waste stream.

An important component of this strategy is to develop options and channels to facilitate organic waste segregation, and to have available technologies that can properly treat and handle the waste so that it can be managed in a safe and secure way. At the household level, it is vital that there are programs for backyard composting of food and other organic waste. At the community and city levels, suitable and proven technologies are available.

It is only by developing a suitable household organic waste segregation program, devising a proper waste collection system that will handle segregated organic waste, and applying the appropriate and affordable technologies to treat the waste, that the entire system is technically feasible.

Three types of actions are recommended to achieve this objective:

1. Re-designing the waste management system to collect organic waste from identified priority groups and to facilitate a material recycling-oriented society;
2. Capacity-building in selected local communities and NGOs to increase participation in organic waste separation, and sustaining this effort with a public awareness program that encourages a “zero waste” approach to consumption behavior, and;
3. Introducing economic incentives to improve the segregation of waste into the different material waste streams for recycling.

Further information on waste generation indicates that residential highrise dwellings are some of Penang’s largest organic waste generators. Hence, they are the sites at which Penang has chosen to pilot its first programs to encourage household organic waste separation and diversion.

Table 3: Estimate of Solid Waste Generation by Source on Penang Island

Sector	Waste Generation rate (kg/c/d)	Amount of Waste (tonne/day)	Organic Waste (tonne/day)	Recyclable Waste (tonne/day)	Non-Recyclable Waste (tonne/day)
Household (Highrise)	0.91	400.7	143.1	194.5	63.2
Household (Lowrise)	0.91	119.0	42.5	57.7	18.8
Household (Individual)	0.84	98.3	35.1	47.7	15.5
Industrial	1.5	246.4	6.6	234.1	5.7
Wet market (stall)	19.3	40.6	37.5	3.1	0.1
Hawkers stall	8.67	19.7	18.7	0.8	0.2
Hotel (room)	1.35	17.0	15.8	1.1	0.0
School	0.009	2.8	1.7	1.1	0.0

Sector	Waste Generation rate (kg/c/d)	Amount of Waste (tonne/day)	Organic Waste (tonne/day)	Recyclable Waste (tonne/day)	Non-Recyclable Waste (tonne/day)
College	0.016	0.3	0.1	0.2	0.0
Hospital (Beds)	0.57	2.3	1.5	0.8	0.0
Hypermarkets (m2)	0.0013	0.9	0.2	0.7	0.0
Universities	0.99	14.9	11.7		11.3
Turf Club (Manure)			10.0		
Total		962.9	320.2	541.8	103.2

Source: estimated by Study Team, 2005 (UNDP SWM Project)

Note: There are high proportions of organic and recyclable waste fractions in this estimate.

The Integrated Solid Waste Management (ISWM) Framework for Penang Implementation – Strategies document (2011) has identified highrise dwellings as one of the “medium hanging fruit” for project implementation.

Suitable “Medium Hanging Fruit” for Project Implementation

1. Wet Markets
2. Food Courts / Hawker Centers
3. Highrise Dwellings

Interviews with the stakeholders in this category indicated that they:

- generate a lot of organic waste or mixed waste from many sources
- are willing to separate waste at source
- are willing to cooperate with Government programs
- need sustained Public Education & Awareness Campaigns educate the people
- show willingness to separate their waste & cooperate with Government programs
- do not mind giving waste to collectors or composting centers
- need a mechanism to collect and dispose of organic waste daily either by private contractor or Government
- need some form of incentive for their efforts to separate waste
- may or may not have supportive management
- already have minimum mechanisms in place such as proper garbage bins, workers etc
- use communal bins that are shared by the rest of the neighbourhood resulting in unhygienic conditions with rubbish strewn around
- need separate bins for waste separation

Highrise dwellings in particular comprise up to 60% of housing in Northeast District and Southwest District of Penang Island. Highrise dwellings also exist in all districts on the mainland but compared to those on the Island, these are not as many. Most highrise dwellings in Penang provide centralized facilities where residents can dispose their garbage. Communal bins are provided and residents from individual units are required to bring their waste to these facilities. The garbage is often collected by waste collection contractors. However, in a few instances in George Town, there exist low-cost flats such as the Rifle Range flats where chutes are still in use. In such cases, residents are not required to bring their rubbish down to a centralized collection area.

Possible strategies for highrise dwellings are:

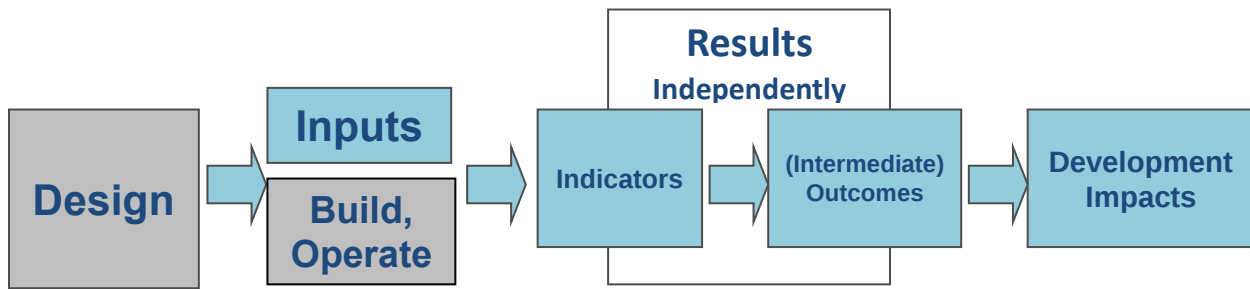
- Requirements that developers reserve space for recycling and composting facilities
- Requirements that the management provide two bins for the separation of food waste and recyclables
- Closure of all waste chutes to encourage residents to carry down their waste to centralized areas
- Regulations to make waste separation compulsory
- Incentives to unit owners for waste separation
- Identification and training of local environmental protection champions to run recycling activities
- Encouragement of authorities to collaborate with the Residents' Associations on waste minimization activities

2 DEFINING RESULTS-BASED FINANCING AND OUTPUT-BASED AID

Results-based financing (RBF) is an umbrella term that includes output-based aid (OBA), provider payment incentives, performance-based interfiscal transfers, and conditional cash transfers, among other tools. What these mechanisms have in common is the fact that a principal entity provides a financial or in-kind reward, conditional on the recipient of that reward undertaking a set of predetermined actions or achieving a predetermined performance goal¹. Resources are disbursed not against individual expenditures or contracts on the input side, but against demonstrated and verified results/outputs that are largely within the control of the recipient². The contracting spectrum for results-based financing is shown in Figure 1 below.

¹Mumssen, Y., Johannes, L., & Kumar, G. (2010). Output-Based Aid: Lessons Learned and Best Practices. Directions in Development: Finance. Washington, DC: World Bank.

Figure 1: Contracting Spectrum of Result-based financing



In general, RBF has the advantage of providing transparency since the value and criteria for allocating the reward, incentive, grant or subsidy is made public. There is also a benefit to the government, as the performance risks associated with the project are shifted to the service providers/recipients of the award, who do not get paid if they do not deliver the output/results.

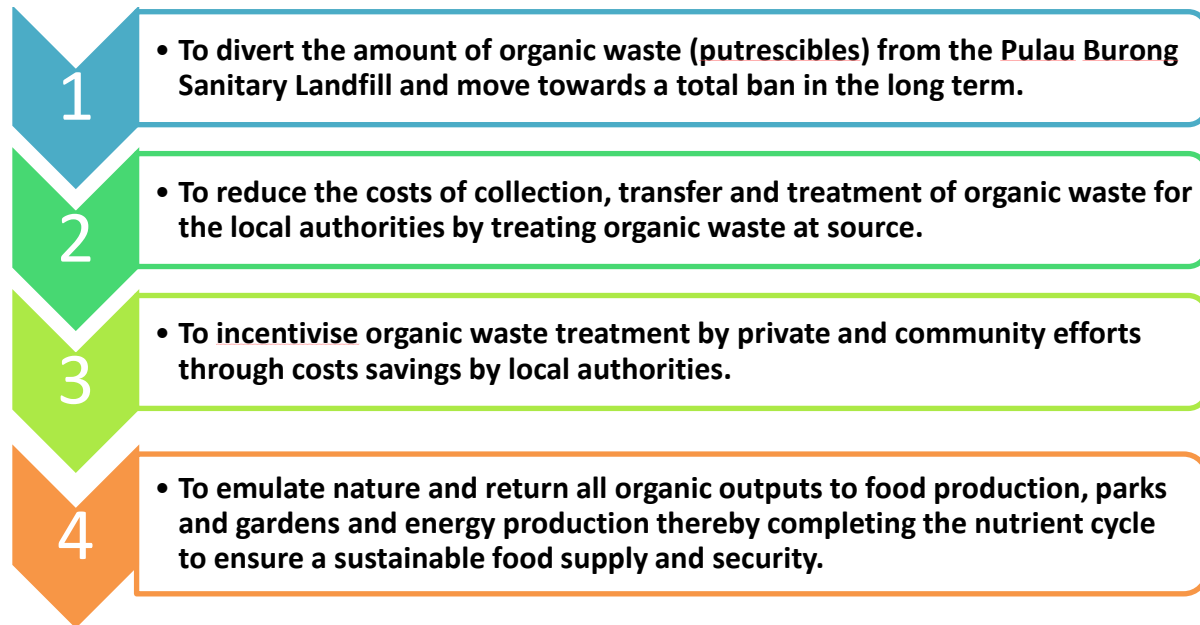
3 THE RESULTS-BASED FINANCING PROGRAM FOR PENANG

3.1 General Objectives of the overall Penang Organic Waste Policy

The Penang Organic Waste Policy seeks to encourage the separation and treatment of organic waste at source in order to divert such waste away from the landfill, and thus prolong the landfill's lifespan and reduce municipal costs. Because of the greenhouse gases that organic landfilled waste produces (carbon dioxide and methane, mainly), this policy is also part of Penang's local action towards a global commitment to mitigate the effects of global warming and climate change.

The strategy of the Penang Organic Waste Policy is outlined in Figure 2 below.

Figure 2: Strategies of Penang's Organic Waste Policy



The main target of the policy is to gradually divert all organic waste from the landfill by the year 2020. The incremental targets are shown in Table 4.

Table 4: Targets for Organic Waste Reduction to the Landfill

	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Organic waste Reduction (%)	5	10	20	30	40	50	60	70	80	100

Source: PEMANDU SWM Lab, 2011

Note: The Performance Management & Delivery Unit (PEMANDU) was formally established on September 16, 2009 and is a unit under the Prime Minister's Department.

It is with these objectives and targets in mind that the *Output-based Program to Incentivize Solid Waste Separation* is designed to help achieve. This pilot project constitutes "Activity 4" of the Climate and Clean Air Coalition's (CCAC) broader activities in Penang State.

3.2 Specific Objective of the RBF Program

While the aggregate objective is to divert waste from Penang's landfill, the specific objective of the proposed RBF program is to incentivize household-level behavior change: organic waste separation at source.

3.3 Source of Financing and the Program Budget

The World Bank has provided technical assistance for the design and implementation of the RBF scheme in Penang. The program will be first implemented as a pilot projects in selected communities and, if successful, scaled-up across the city. The source of financing for these pilot projects would be borne by the Penang State Government, Penang Island Municipal Council, and the Seberang Perai Municipal Council.

The participation of Penang in the activities of CCAC is led by the Penang State Government, Penang Island Municipal Council (MPPP), and the Seberang Perai Municipal Council (MPSP) in collaboration with the International Environmental Technology Center of the United Nations Environment Program (UNEP-IETC) and the World Bank.

3.4 Program Operation

General Operation

"Incentive payments"--cash awards-- are given to participating highrise communities if they successfully separate food/organic wastes at source. Separated food/organic waste will be evaluated on pre-determined measures. The highrise households, organized around a Highrise Management Committee (HMC) will receive an incentive payment based on this score, subject to both a minimum score and a maximum incentive payment ceiling.

The basic unit for promoting organic waste separation will be the residents' Highrise Management Committee (HMCs). The outreach, education and mobilization necessary to change residents' behavior with respect to waste separation will be within the purview and responsibility of each HMC. Guiding educational resources and promotional materials may be additionally provided to the HMCs by the municipality-run Project Implementation Units (PIUs) (See Section 3.8 below, on PIUs and the project's organizational arrangements). The municipal government will not specify or direct the means and methods used by HMCs to achieve the goal of waste separation by households. Furthermore, HMCs are empowered to decide on the activities to be financed by the incentive payments received.

3.4.1 Waste Diversion Approach

Each of the municipal councils, MPPP and MPSP, has chosen moderately different systems and technologies for the collection and processing of separated household waste. As a result of these differences, the specific project designs (specifically with respect to evaluation) are also different.

On Penang Island, the MPPP has chosen a decentralized system—medium-capacity waste processing machines that are installed on-site at each high-rise building (see Annex 1). Households separate their food wastes and bring them to this machine, where it is ground, mixed with water and microbial liquid called *bokashi*, and processed into a liquid soil enhancer or “slurry”. The company that markets the machine also is responsible for collection, removal, and transportation of the slurry. It owns the slurry that the machines produce.

On the mainland, the MPSP has chosen a more centralized system. High-rise buildings separate their food wastes and the Urban Services Department of the MPSP is responsible for providing them standard-sized waste bins and regular collection of the food waste.² It transports the food waste to a high-capacity, privately-owned and operated waste processing center (see Annex 1).

The application of RBF should remain neutral to the chosen technology of each city. That is, the general principles of payment only upon verified outputs holds true regardless of a centralized or decentralized waste collection and processing system. Nevertheless, because of the MPPP and MPSP’s differences, the document explains each sides’ process for evaluation and payment separately.

3.4.2 Pilot Project Sites

The following highrise dwellings have been identified as pilot project sites (see :

Penang Island

1. River Road Flats – Low Cost Flats
2. Taman Pelangi Flats, Lebuhraya Macallum – Medium Cost Apartments
3. The Peak, Mt. Erskine, High-end Condominiums

Seberang Perai

1. Taman Tanjung Indah Flats, Butterworth – Low Cost Flats
2. Taman Pandan Apartments, Butterworth – Medium Cost Apartments
3. Harbour Place, Jalan Chain Ferry, Butterworth – High-end Condominiums

² There is one exception to this: Taman Pandan, medium-cost apartments in Butterworth, currently relies on the private food waste processing company (Shence) for collection.

Figure 3: Location of the Pilot Project Highrise Buildings



Note: The Peak at Mt. Erskine (MPPP) was just confirmed as the sixth participating highrise building. Unlike other buildings, it has yet to start any food waste separation.

3.5 Definition, Measurement, and Verification of Outputs

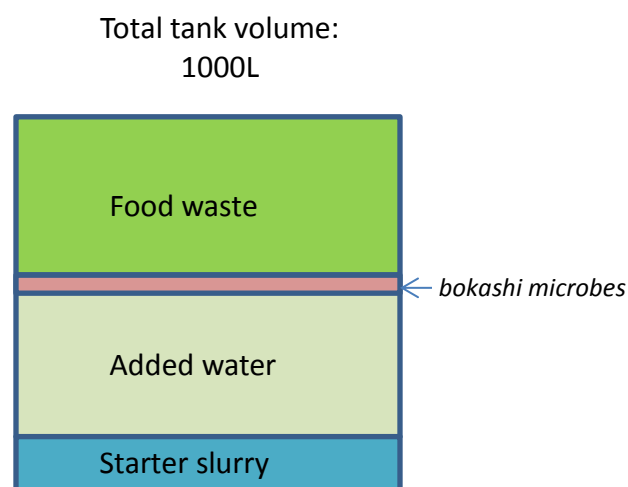
3.5.1 Penang Island

The desired and measured output of each MPPP highrise community is the quantity (kg) of source-separated organic waste during the evaluation period. Based on its quantity of separated food waste collection, each highrise community receives a quantity of separated food waste score (QTF) that has a maximum of 100 points.

More specifically, the quantity separated food waste score (QTF) is a function of: 1) the fraction of *separated* food waste out of expected total waste in the highrise building and 2) the fraction of food waste generally found within the highrise building's total waste generation. The expected total waste of the highrise is based on per-capita or per-household waste generation data gathered from a recently conducted waste characterization study. The fraction of food waste (irrespective of separation) is also based on data from the same study. Details for the calculation of QTF are available in Annex 2.

To determine the amount of separated food waste collected during the evaluation period, the project design relies on the Independent Verification Agent (IVA) which in the case of MPPP, is the company that markets the food waste processing machine and collects and transports the slurry. The slurry is collected in 1000 liter tanks and consists of food waste, water, *bokashi*, and remains of slurry from the previous batch (“starter slurry”). By subtracting the amounts of water, *bokashi*, and starter slurry, the IVA can determine how much food waste has been collected.³ These non-food waste components of the slurry must be regularly recorded by the IVA. Water, specifically, can be tracked using the machine’s existing water meter. Figure 4 demonstrates the composition of the tank’s slurry.

Figure 4: Composition of Food Processing Machine’s Output Tank



As the company collects and transports the slurry multiple times during the evaluation period, the dates of collection, the amounts of slurry, and the amounts of the slurry’s individual components must be carefully tracked. At the end of the evaluation period, the Project Implementation Unit (PIU)(see section 3.8 on organizational arrangements) must aggregate the IVA’s slurry production across all of its cycles and report on the total food waste collected in liters and kilograms. An example of the IVA’s expected record-keeping is available in Figure 5.

³ This amount of food waste is in liters and will need to be converted into kilograms for the purposes of evaluation. While food waste volume to mass conversion is imperfect, a safe approximation can be made.

Figure 5: Example of Slurry and Food Waste Record-Keeping (Penang Island)

Cycle No.	Start Date	Collection Date	Amount slurry at collection date (L)	Amount starter slurry at start date (L)	Amount water during cycle (L)	Amount <i>bokashi</i> during cycle (L)	Amount food waste during cycle (L)	Amount food waste during cycle (kg)*
1	1 Jan 2014	8 Jan 2014	1000	200	400	2	398	*
2	5 Jan 2014	10 Jan 2014	900	100	300	2	498	*

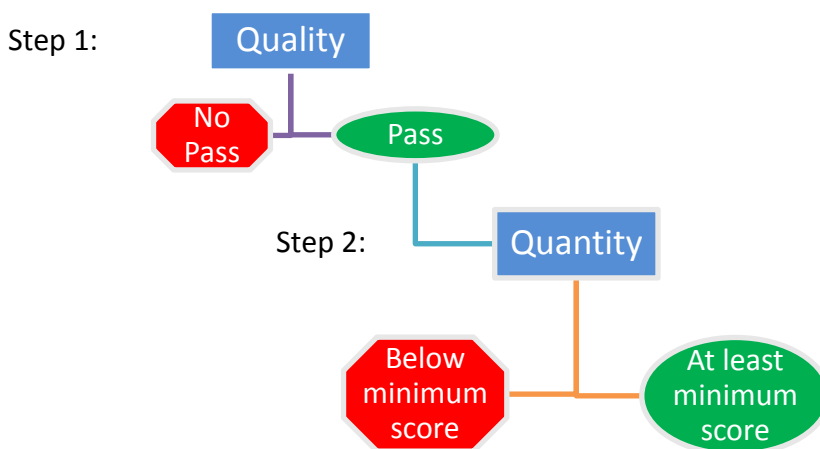
**conversion of food waste from L to kg pending current studies underway*

The quality of the food waste is not evaluated in the MPPP's highrise buildings because it is considered implicitly part of the quantity assessment. As only organic food waste is acceptable in the processing machine, no plastics, papers, metals, etc., will distort the final measurement. At the time of writing, one of the highrise buildings (Taman Pelangi) had already begun the food waste separation and processing (although not the evaluation or RBF project). This building demonstrated high-quality separation. The only notable fact is that many continue to bring their food wastes in plastic bags, requiring the machine operator to spend additional time opening plastic bags. This additional time and labor is the responsibility of the HMC; it may choose to invest in this as part of the "costs of doing business" or it may devise schemes to encourage households to avoid using plastic bags.

3.5.2 Seberang Perai

The desired and measured outputs of each MPSP highrise community include both the quality and quantity (kg) of source-separated organic waste during the evaluation period. The MPSP will collect the standardized waste bins that it provides the highrise communities. When they are delivered to the private food waste processing center, each bin will be evaluated. Because of these two criteria (quality and quantity), the evaluation of each collected waste bin is divided into two stages. In stage 1, the quality is assessed. If the waste bin passes, it will move to stage 2, in which its quantity will be assessed. Figure 6 demonstrates this.

Figure 6: Two-step Verification Process of MPSP Waste Bins



For the quality evaluation, each waste bin must pass two criteria.

- 1) The waste bin must have pure 100% organic waste
- 2) The waste bin must have water/moisture content below 25%⁴

The first quality criterion is necessary because the private food waste processing company does not accept waste for its machine that is less than 100% pure organic material. Any bin that is currently received and has plastics, paper, or metals is discarded in the main mixed waste stream. This includes bins that have organic waste that is subdivided into plastic bags or containers.

The second quality criterion is necessary as a safeguard against possible misrepresentation of the quantity (step 2) of organic food waste. That is, the project design seeks to avoid any exaggeration of actual quantities that could come from households adding water weight versus pure food weight. Further photographic explanation of the quality assessments are provided in Annex 3.

If the waste bin passes the quality evaluation, it is then quantitatively assessed. Since the food waste bins are standardized and distributed by the same source (MPSP), the IVA can assess how full they are to determine a rough proxy for their weight. Each plastic waste bin has an internal line along its circumference. If the food waste reaches this line, its weight is about 30 kg. Therefore, food waste that reaches 50% below the line has a weight of about 15 kg. The IVA notes and records the date and approximate weight of the food waste bin by looking at how full it is. He or she does not subtract any water/moisture weight from the assessment. Further photographic explanation of the quantity assessment is provided in Annex 3.

⁴ 25% is listed here based on conversation with Shence that suggests that typically water content is about 20%. 25% is chosen to provide households some margin for error. The percentage can be adapted based on the MPSP's further assessment.

As the IVA will receive many waste bins over the project’s evaluation period, he or she is responsible for keeping a record of each bin’s evaluation. At the end of the evaluation period, the PIU will take the IVA’s records and aggregate the quantity scores to determine the total quantity of food waste segregated. Note again that waste bins that do not pass the quality evaluation do not receive a quantity score at all. Figure 7 provides an example of record-keeping needed from the IVA.

Figure 7: Example of Waste Bin Record-keeping (Seberang Perai)

Date	Quality	Quantity (kg)
	Pass?	
Jan 1, 2014	No	N/A
Jan 4, 2014	Yes	25
Jan 8, 2014	Yes	30

*Note: Waste bins that do not pass quality evaluation do not receive a quantity score.
If there are multiple waste bins from the same building, collected on the same date, each waste bin should be listed separately.*

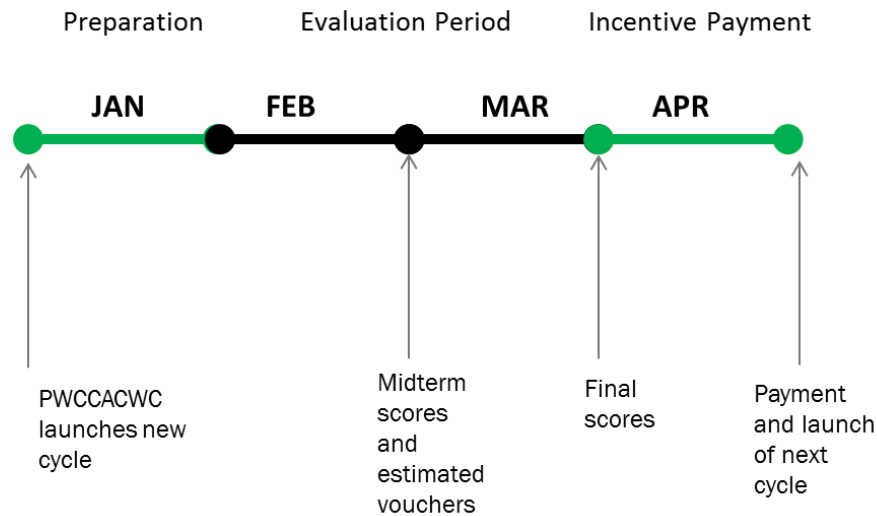
At the end of the evaluation period, the IVA will add-up all of the food waste quantities for each high-rise building. This aggregate number will factor into the building’s “quantity of separated food waste” score (QTF), the same as in Penang Island.

As in Penang Island, the maximum QTF score is 100 and the QTF is a function of: 1) the fraction of *separated* food waste out of expected total waste in the highrise building and 2) the fraction of food waste generally found within the highrise building’s total waste generation. The expected total waste of the highrise is based on per-capita or per-household waste generation data gathered from a recently conducted waste characterization study. The fraction of food waste (irrespective of separation) is also based on data from the same study. Details for the calculation of QTF are available in Annex 2.

3.6 Project Cycle

For both Penang Island and Seberang Perai, the proposed project designs recommend a project cycle that lasts four months, allowing for one month of preparation, two months of evaluation, and one month for incentive payment calculation and disbursement of the award. Figure 8 demonstrates the project cycle.

Figure 8: Proposed Project Cycle



- (a) At the beginning of the cycle, the PCCACWC makes an official announcement regarding the start of the evaluation period. The announcement would include the beginning and end dates of the evaluation period, the amount of the potential highrise incentive (PHI) in Malaysian ringgit (MYR) per resident for that cycle, and the minimum score (MS) required in order to be eligible for an incentive payment.
- (b) At the end of month two, a mid-term evaluation is conducted to assess each highrise building's performance over the last month. The IVA aggregates total quantities of food waste segregated. The Project Implementation Units (PIUs), discussed further below in 3.8 Organizational Arrangements, calculate the quantity of separated food waste score (QTF) using the IVA's data. From the QTF, it also calculates an estimated incentive payment voucher.

The estimated incentive payment voucher is not a real voucher that can be redeemed for cash. It is given, however, because HMC and residents may not know what a score of 50 or 75 means. It is more meaningful for this score to be translated into a ringgit value. The estimated voucher suggests to the HMC that if the score received at mid-term evaluation is that same as at final evaluation, the highrise building could receive "X" amount of money. That is, if the highrise receives a QTF score of 75/100, it could receive 75% of the Potential Highrise Incentive (PHI) or "X" ringgit (depending on what the PHI is). More information on incentive payments is detailed in section 3.7.

- (c) At the end of month three, after the evaluation period is over, the IVAs submit their food waste records. Based on this information, the PIUs calculate the final scores and the estimated amount of the incentive that each HMC has earned. The PIU compiles

these scores and the incentive payments into a single report that is then submitted to the Penang CCAC Working Committee (PCCACWC) within three weeks of the end of the evaluation period.

- (d) Within one week of the IVA/PIU submission, the PCCACWC reviews and approves the report submitted and transmits it to the Municipal Solid Waste Management Units (MSWMU) for payment. The results would be publicly announced concurrently with the opening of the next cycle.

A general principle of incentive payments for behavior change is that the reward must be given in a timely and salient manner to the individual(s) whose behavior one seeks to alter. That is, it is best to provide the reward as immediately as possible after the desired behavior is observed. For obvious reasons, it is logistically and bureaucratically difficult for the municipal councils to verify and disburse payments after each time a household separates its waste. An initial version of the project design suggested a longer project cycle of six months. This is a long time for households to “feel” the impact of their efforts.

3.7 Incentive Payments Based on Outputs

As a reward for successful verification of the desired outputs, the municipal governments provide incentive payments to participating HMCs. The proposed incentive payments are made to each HMC after each evaluation period, based on the HMC’s objectively verified outputs as measured by the IVAs for that evaluation period.

To ensure a minimum quality and quantity of source-separated waste before any incentive would be paid, a minimum score (MS) is established. HMCs need to achieve at least the MS, in order to be eligible for any incentive payment. Above the MS, the amount of the incentive would be scaled in proportion to the actual quantity of separated food waste score (QTF) score it receives. The actual MS should be set by each municipal council. It may choose to gradually increase the required MS over time, in order to encourage higher levels of performance among the highrise communities. Please see Annex 2 to see a discussion of how to determine a MS.

The incentive payment would also be subject to a ceiling, known as the potential highrise incentive (PHI). The PHI would be the maximum incentive that a participating neighborhood could earn, if they were to achieve the maximum possible score of 100 on their QTF. The actual value of PHI would be determined before each evaluation period. Annex 4 provides an example and rationale of how the PHI could be determined.

MPPP and MPSP currently spend a large percentage of their total annual budget on waste collection, transportation, disposal, and treatment. By diverting waste from the landfill, this proposed RBF program intends to reduce municipal SWM costs. With these cost-savings, all or

some portion of the money can be returned to high-rise communities who participated in the waste diversion.

Therefore, the PHI is tied to cost-savings for the municipality. However, the *actual* value of the incentive for a HMC would be calculated as follows:

- If $QTF < MS$, no incentive would be paid, i.e. $I = 0$.
- If $QTF \geq MS$, then the incentive would be:

$$I = \frac{PHI \times QTF}{100}$$

Where I = Actual value of the incentive payment to the HMC

PHI = Potential Household Incentive, determined prior to each evaluation period

MS = Minimum Score required in order to be eligible for an incentive payment

QTF = Quantity of Separated Food Waste Score

3.8 Organizational Arrangements

To verify and monitor the neighborhood incentive program, the Penang CCAC Working Committee (PCCACWC), the Municipal Solid Waste Management Unit (MSWMU) within the Penang Island Municipal Council (MPPP) and the Seberang Perai Municipal Council (MPSP), the Project Implementation Units (PIU), and the Independent Verification Agents (IVAs) would assume the following responsibilities shown in Table 5. Figure 9 presents a proposed flowchart of the organizational arrangements.

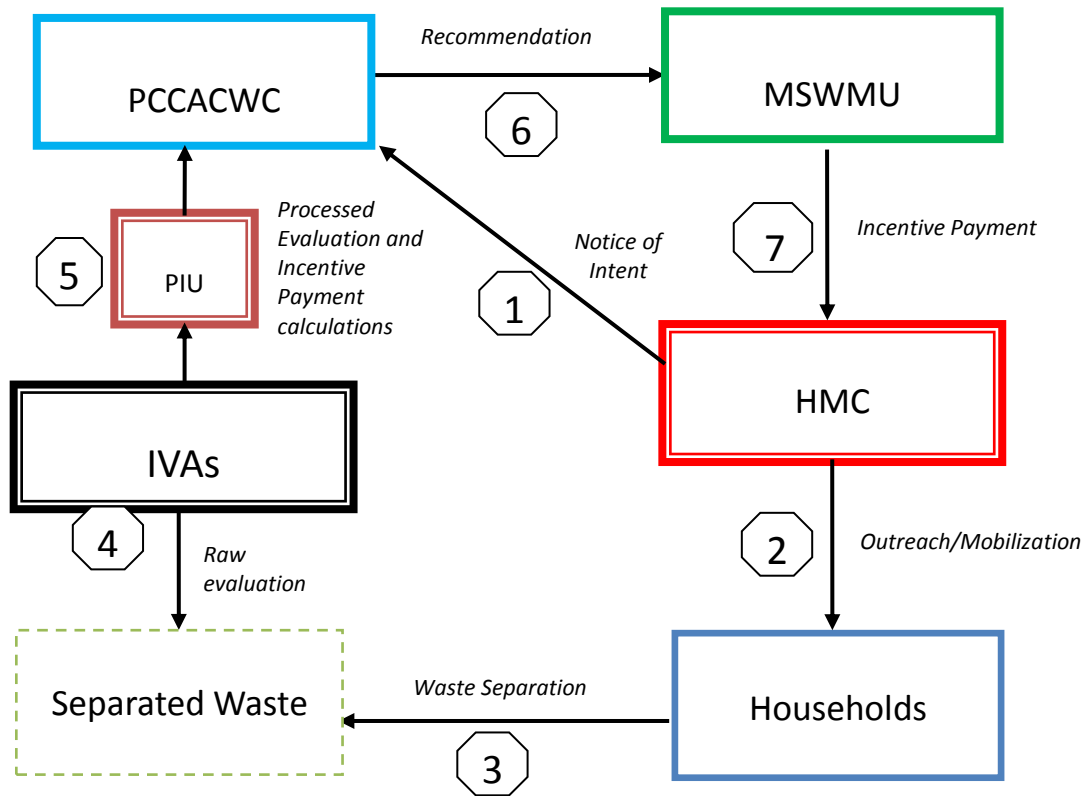
Table 5: Institutions, Actors, and Responsibilities

No	Institution	Actors	Responsibilities
1	Penang CCAC Working Committee (PCCACWC)	1. YB Chow Kon Yeow (Chairman) 2. YB Phee Boon Poh (Co-Chairman) 3. YB Teh Yee Cheu 4. Secretaries of MPPP and MPSP 5. Penang Green Council 6. Local consultants	Responsible for overall implementation and oversight of the program Identifies and manages the (IVAs) Reviews and approves the report submitted by the IVA/PIUs and transmits it to the MSWMU for payment

No	Institution	Actors	Responsibilities
			Ensure proper coordination of activities between the municipal government and other institutions involved
2	Municipal Solid Waste Management Unit (MSWMU)	1. Directors of Urban Services, MPPP and MPSP 2. Finance Departments, MPPP and MPSP	Reports to the PCCACWC on program-related matters Determines the waste diversion costs for MPPP and MPSP and the PHI to each highrise building Disburses the incentive payments to the HMC upon recommendation by the PCCACWC
3	Project Implementation Unit (PIU)	Officers of the Urban Services Departments: MPPP 1. Mohd Rouse bin Md. Rejab 2. Foo Kok Beng 3. Muniroh bt Zakaria MPSP 1. Mohd Puad bin Hamid 2. Chew Eng Seng	Coordinates IVA activities with HMCs and addresses concerns from either party Trains the IVA on verification protocol Takes IVAs' records to aggregate and determine the total separated food waste amounts during the evaluation cycle. Calculates the actual incentive payment amounts based on the food waste amounts from the IVA, and the PHI from the MSWMU; submits recommendation to PCCACWC Provides midterm scores and

No	Institution	Actors	Responsibilities
			estimated payment vouchers to HMCs
4	Highrise Management Committees (HMC)	HMCs of: Penang Island 1. River Row Flats 2. Taman Pelangi Apts 3. The Peak Condos, Mt. Erskine Seberang Perai 1. Taman Tanjung Indah Flats 2. Taman Pandan Apartments, Sungai Puyu 3. Harbour Place Condos, Jalan Chain Ferry	Promote household-level waste separation within the highrise building through outreach and mobilization Receive and disburse the incentive payments from the MSWMU Coordinate with the PIUs as necessary
5	Independent Verification Agents (IVAs)	Penang Island Bio-Regen Photonics Sdn Bhd Seberang Perai Green Tech Shence (SI Green Management Sdn Bhd)	Conduct waste evaluation and data record-keeping Works with and through the PIU to address questions or concerns about the verification protocol

Figure 9: Proposed Flowchart of Organizational Arrangements



4 PROPOSED TIMELINE

The proposed timeline for this project is as shown below:

Table 6: Proposed Program Timeline- Preparation

No	Activities	Dec-13	Jan-14	Feb-14	Mar-14	Apr-14	May-14	Jun-14	Jul-14	Aug-14	Sep-14	Oct-14	Nov-14	Dec-14	Jan-15	Feb-15
A	Project Preparation															
1	identify Project sites															
2	Obtain commitment from participating HMCs															
3	Briefings to HMCs															
4	Identify organic waste diversion methodology															
5	Pilot Project Profile Sheet															
6	Call for CCAC Working Committee meeting															
7	Project Workshop															

Table 7: Proposed Program Timeline- Implementation

B	Project Commencement and Implementation Activities	May-14	Jun-14	Jul-14	Aug-14	Sep-14	Oct-14	Nov-14	Dec-14	Jan-15	Feb-15	Mar-15	Apr-15	May-15	Jun-15	Jul-15	Aug-15	Sep-15	Oct-15	Nov-15	Dec-15
1	Confirming Project sites																				
2	Waste characterization studies																				
3	Stakeholder Workshops																				
4	Promotional materials																				
5	Begin organic waste separation at Pilot Project sites		1 st Cycle				2 nd Cycle					3 rd Cycle				4 th Cycle					
6	Begin recording and documentation																				
7	Calculate mid-term scores																				
8	Calculate final scores																				
9	Disburse incentive payment																				
10	Conduct monthly on-site meetings																				
11	Project Review																				

5 POTENTIAL RISKS AND SUGGESTIONS FOR MITIGATION

There are various potential risks to the project designs, several of which are largely dependent on available and accurate data. Current data collection is underway to better understand municipal SWM costs and savings. Overall, however, it is recommended that these pilot projects are seen as truly pilots—learning opportunities that may need refinement after the first cycle of implementation. Table 7 presents potential risks considered and suggestions for mitigation.

Table 8: Potential Risks and Suggestions for Mitigation

No.	Risks	Suggestions for Mitigation	Level of Risk
1	The amount of the rewards are insufficient to motivate individual household behavior change	The project actively recognizes that incentive payments are not a final solution and that public education, outreach, and mobilization are all necessary. This is particularly the case for upper and even middle income residences. It is also advised that HMCs use the funds for a collective local community project since if subdivided to the individual household level, the payments may be small and even less significant. For high income condos, if a community project is insufficient motivation, the money can be tied to charitable giving—something that perhaps more people (or can be socially pressured to) care about. The complementary public education activities are critical to promote lasting behavior change; incentive payments can be seen as a short-term catalyst to long-term attitudes and mind-sets.	Low
2	The frequency of the rewards are insufficient to motivate households	The project moved from an initial proposal of 6-month project cycles, to a 4-month project cycle in order to mitigate this risk. A mid-term evaluation and voucher was also included to motivate participants. The feasibility of this shorter cycle depends on the administrative burden the calculation and disbursement of funds may pose to the municipal councils.	Low
3	The IVAs are not truly independent and there is a potential conflict of interest	The IVAs (the private food waste processing companies) share the same goal as municipal councils—that is, to receive high quality and quantity separated food waste. This is because the private companies need this food waste as an input for their organic fertilizer production. Because the goals are the same, the risks of a conflict of interest are minimized. However, it is notable that Bio-Regen (on Penang Island) is a relatively new player in the market and commercially benefits from its ability to proliferate its machine into new high-rise buildings. It may be motivated to over-report the quantities of separated food waste as project success may allow its product to be adopted elsewhere. At the same time, as there are no competitors with similar enough machines, all of	Medium

		the technology's information must come from Bio-Regen. To mitigate the risk, the PIUs (or other IVA, like Penang Green Council) should be able to read the water meters and starter slurry amounts independent of Bio-Regen.	
4	The costs of transportation (in MPSP) may offset the potential cost-savings to the city, thereby rendering the project ineffective or decreasing the incentive payments amounts to be useless	This may be true in the short-term. This is because there may be a minimum collection amount of food waste (landfill diversion) first required. One way to frame this is as a short-term subsidy: the city may "lose" money in the short-term and be subsidizing transportation costs. However, in the medium and long-term, behaviors change, more households participate and economies of scale can be leveraged. Currently the municipal councils are still estimating their transportation costs, as well as the total costs of solid waste management per metric ton. Therefore, the risk is inconclusive.	Medium
5	The projects may be overly dependent on the few private food waste processing operators and the market for organic fertilizers may be limited	The projects are short-term pilots in 6 highrise buildings. Therefore, for these pilots, the risk is low. Over time, if these pilots scale to reach many more communities, there should be an additional assessment of whether these technologies are appropriate or capable of handling larger quantities of food waste. If, for example, the market for organic fertilizer is smaller than anticipated, then the business-model of both private companies is threatened and the cities/state may need to look into other ways of processing and diverting the food wastes.	Low
6	Free-ridership: When the incentive payment goes to the HMC, there will be highrise residents who benefit from the award even if they do not participate in the food waste separation.	This is always a risk when incentive payments go to a collective body. The HMCs will have a difficult time targeting the award to specific participating households. The HMCs and highrise communities should establish social norms and apply community pressure to encourage non-participating households. This works best if there is strong social cohesion in the building but regardless, as more household participate, the social norm is de-facto in place.	Low
7	Households may bring food and organic wastes from elsewhere	This may happen (and in fact, has been observed at Taman Pelangi, MPPP). However, the	Low

	(markets, hawker stalls, etc.) and thereby distort the amounts collected so that they are not representative of household food waste separation.	argument from a municipal cost-savings perspective is that it does not matter where the food waste is coming from so long as it is diverted. A metric ton of waste should cost the municipality the same amount of money regardless of its source. Highrise residents can be entrepreneurial and find waste from other sources. The “risk” may be that highrise buildings collect more food waste than they produce, thereby getting a QTF score greater than 100. There is no problem in this case because the PHI is capped based on expectations for residential highrise food waste generation.	
8	In MPSP, collection of food waste will be irregular. The result is that the food waste will decay further, leading to unpleasant smells and maggots. Aside from being a health hazard it will discourage residents from further separating their food wastes.	This is a serious risk. The food waste collection, transportation, and processing system must be properly established in order to prevent this from happening. The project design team has already asked the Urban Services Department of MPSP to provide regular collection even if the bins are not full and even if it means that in the short-term, it may have to subsidize collection and transportation costs until a critical mass of food waste is collected.	High

6 SUMMARY OUTLINE OF THE PROPOSED RBF PROGRAM

Table 9: Summary Outline of Proposed RBF Program

Design Element	Description
Objective	Promote high quality and high quantity separation of organic food waste at source.
Operational level	- HMCs promote household-level waste separation through outreach and mobilization activities. - Based on successful verification of outputs, HMCs receive an incentive payment.
Outputs	- High rate of source separation of organic wastes by households. - High quality of the source separated organic materials.
Institutional arrangements	- The PCCACWC would be responsible for overall implementation and oversight of the program. - IVAs conduct regular output verification and keep a record of all collected data during the evaluation period. - PIUs take the data from IVAs and calculate the QTF and incentive payment scores. - MSWMU disburse incentive payments to HMCs. - HMCs mobilize households and determine how to spend the incentive payments, received as grants from the municipal government.
Verification process	- In MPPP, only a quantity measure is assessed. The quality measure is implicit in the quantity measure. - In MPSP, first the waste bin undergoes a quality assessment. If it passes, then a quantity measure is evaluated.
Incentive payment	- The incentive to be paid to a HMC would be based on the quantity of separated food score (QTF). The QTF is based on the quantities of food waste separated during the evaluation period. - If the QTF is at least the minimum score, the HMC receives a percentage of the pre-determined potential highrise incentive (PHI). - The PHI is tied to the municipal cost-savings of food waste diversion.
Timeline	- Program cycles of four months each, with three cycles every year. - Within each cycle, an evaluation period would run for two months, from the start of the second to the end of the third month of each cycle.

ANNEX 1: FOOD WASTE PROCESSING TECHNOLOGIES

Penang Island (MPPP)

Penang Island's pilot projects have chosen a decentralized system for food waste collection and processing. A food-waste processing machine installed at each participating high-rise building. The specific machine is manufactured and marketed by Bio-Regen Sdn Bhd.

Food waste, water, and a patented microbial liquid called *bokashi* are added to the machine and piped to containers that each have a total capacity of 1000 L. The resulting slurry is a liquid soil enhancer. The tanks are periodically emptied and the contents removed, transported, and owned by Bio-Regen. Slurry (about 200L) is often left in the container as a “starter slurry” for the next batch of slurry. Water is added typically via a foot-pump that the machine operator uses as he adds and grinds food waste. The amount of water can be tracked through an attached water meter.

Bio-Regen Machine



Bio-Regen Slurry Containers



Seberang Perai (MPSP)

Seberang Perai's pilot projects have chosen a more centralized system for food waste collection and processing. High-rise buildings separate their food wastes and the Urban Services Department of the MPSP is responsible for providing them standard-sized waste bins and regular collection of the food waste.⁵ It transports the food waste to a high-capacity, privately-owned and operated waste processing center called Green Tech Shence (SI Green Management Sdn Bhd).

Shence receives the waste bins and currently already assesses its contents and weight. If its contents are impure—that is not 100% organic food waste—it discards all of the contents into

⁵ There is one exception to this: Taman Pandan, medium-cost apartments in Butterworth, currently relies on the private food waste processing company (Shence) for collection.

the main mixed waste stream. If it is pure, it will assess the bin's weight by looking at how full it is and also, by tipping it slightly to the side, it visually calculates how much water rises. It reduces the weight by the percentage water/moisture content since for its business model, it prefers drier food waste.

Shence's Entrance



Shence's Food Waste Processing Machine



Shence Employee demonstrating his assessment of different waste bins received from MPSP collection



ANNEX 2: CALCULATION OF QUANTITY OF SEPARATED FOOD WASTE SCORES (QTF)

The following calculation should be used by the Project Implementation Units (PIUs) for both MPPP and MPSP projects.

- A unique and separate calculation should be conducted for each participating high-rise building.
- The calculation should be conducted at both the mid-term evaluation (end of month 2) and final evaluation (end of month 3).

$$QTF = \frac{FW}{TW} \times \frac{1}{X} \times 100$$

Where:

FW = Total weight of food waste separated and collected over the evaluation period (from IVA records)

TW = Estimated total weight of all waste generated in the entire highrise community during the evaluation period (based on waste characterization studies)⁶

X = Estimated proportion of food waste out of total waste generated (based on waste characterization studies)

100 is the maximum score

TW and X will vary across buildings according to the waste characterization studies

Example 1:

$$QTF = \frac{1000 \text{ kg}}{4000 \text{ kg}} \times \frac{1}{0.5} \times 100 = 50$$

⁶ In May and June 2014, waste characterization studies of each participating highrise building were conducted by the company Infitech. These studies took approximately 30 households from each highrise building and assessed their waste quantity and composition on a weekday and a weekend. From this data, a representative per-capita and per-household quantity (kg) waste is derived. Also from this data, the percentage food waste is derived.

The example shows that if one-fourth (1000 kg/4000kg) of all waste is separated food waste, and food waste constitutes half (0.5) of all waste, then the QTF is 50. In other words, in this scenario, the score of 50 means that half of all food wastes produced are being diverted.

Minimum Score (MS) determination

In order to qualify for an incentive payment, the highrise building must achieve a minimum score (MS). What that minimum score is left to the discretion of each municipal council.

In the example above, a QTF of 50 meant that half of all food waste produced was diverted. This is a reasonable MS but the municipality could also determine that even if highrise buildings divert 25% or 10% of their food wastes, they should qualify for some reward.

ANNEX 3: PHOTOGRAPHIC EXPLANATION OF THE EVALUATIONS OF EACH WASTE BIN (MPSP)

In Seberang Perai, each waste bin will be evaluated by the IVA. The first step is a quality assessment. If the bin passes, it will then be given a quantity assessment.

Step 1: Quality Assessment

To pass, the waste bin must:

- 1) Have pure food waste
- 2) Have moisture content below 25%

Pass



No Pass



*in the bin on the far right, the highrise residents did separate their food wastes into small plastic containers. However, the small plastic containers are unacceptable.

Step 2: Quantity Assessment

MPSP distributes standard size waste bins. If waste reaches the internal circumference line, it is about 30kg. The IVA conducts a visual assessment. He notes and records the date and approximate weight of the bin by looking at how full it is. He does *not* subtract any weight for water or moisture content.



If the waste hits this line, it is
~30kg

~15 kg

ANNEX 4: DETERMINATION OF POTENTIAL HIGHRISE INCENTIVES (PHI)

Each building's Potential Highrise Incentive (PHI) should be tied to municipal cost savings that result from the separation and diversion of organic food waste. At the discretion of the municipal government, a fraction of the cost savings may be used to determine the PHI. Moreover, the value of the PHI could be steadily decreased each cycle such that the incentive program gradually phases out.

*****Note: at the time of writing, the precise savings and waste composition figures were still being determined by the municipal councils. These figures are merely meant to provide an example for how to calculate the PHI*****

- I. Calculate the program's savings per metric ton of waste diversion
 - a. In Penang, assume the average savings from diversion of waste is as follows:
 - Penang Island Municipal Council (MPPP) - MYR 160 per metric ton
 - Seberang Perai Municipal Council (MPSP) - MYR 180 per metric ton
 - b. From this potential savings per metric ton, the municipalities should subtract the marginal costs *to the municipality* for implementing the program and diverting a metric ton of food waste.⁷
 - For Penang Island, fixed costs would include the facilities and sites for the food processing machines and the machines themselves. Marginal costs would include electricity, water, labor (for processing the waste), etc.
 - For Seberang Perai, fixed costs would include any facilities for collecting food waste and the waste bins. Marginal costs would include mainly the cost of collection and transportation.

General savings per metric ton of waste diversion

– Program costs per metric ton of collected food waste
= Program's savings per metric ton of waste diversion

Simply for the exercise, let us say the program's savings per metric ton of waste diversion is equal to **MYR 120** in both MPPP and MPSP.

- II. Calculate the baseline total residential organic waste in Taman Pelangi per year
 - a. Assume that total waste generated is 876 000 kg/year
Based on the following assumptions (0.5 kg per capita/day x 5 persons/unit x 960 unit x 365 days)⁸
 - b. Assume that 35% of total waste is organic.⁹

⁷ Note: many of these costs are given to the highrise building developers and are not borne by the municipal councils, particularly in the case of Penang Island.

⁸ These numbers will come from each building's surveys and waste characterization studies

c. Therefore, Taman Pelangi's total organic waste generation is:

$$876\,000 \frac{kg}{year} * 35\% = 306\,600 \frac{kg}{year}$$

III. Determine the total potential cost savings for MPPP based on expected 100% achievement of organic waste diversion at Taman Pelangi:

$$306\,600 \frac{kg}{year} * \frac{MYR\ 120}{metric\ ton} * \frac{1\ metric\ ton}{1000\ kg} = MYR\ 36\,792\ per\ year$$

IV. Determine the potential cost savings per Taman Pelangi resident, per cycle (4 months):

$$\frac{MYR\ 36\,792}{year} * \frac{1}{4800\ residents} = MYR\ 7.7\ per\ resident\ per\ year$$

$$\frac{MYR\ 7.7\ per\ resident}{year} * \frac{year}{3\ cycles} = MYR\ 2.6\ per\ resident\ per\ cycle$$

Or with 5 persons per household, this would be MYR 13 per household per cycle

Therefore for Taman Pelangi, the minimum savings per person of about MYR 2.6 per person per cycle could be used as the basis for determining the PHI.

That is, if MPPP decides to make 100% of cost-savings the PHI (100% organic waste diversion) then the PHI for Taman Pelangi would be **MYR 12 480 per cycle**.

$$\frac{MYR\ 13\ per\ household}{cycle} * 960\ households = MYR\ 12\,480$$

It is clear from this example that the per household incentive payment is not large but if paid to the HMC for a collective community project, it is a more substantial amount of money.

⁹ This number will come from waste characterization study for the building.

ANNEX 5: WASTE CHARACTERIZATION STUDY-- REQUEST FOR PROPOSAL (RFP)

Request for Proposal (RFP)

Terms of Reference (TOR) FOR WASTE CHARACTERISATION STUDIES

The World Bank, in collaboration with the Penang State Government, Penang Island Municipal Council, and the Seberang Perai Municipal Council, and UNEP-IETC, is inviting proposals from interested individuals or firms to perform waste characterisation studies for 6 highrise dwellings (3 Penang Island + 3 Mainland) in the state of Penang.

Tentatively, the 6 highrise dwellings are:

Penang Island

1. River Road Hardcore Poor Flats
2. Taman Pelangi Flats, Lebuhraya Macallum
2. Spring Condominium, Jelutong

SeberangPerai

1. Ampang Jajar Hardcore Poor Flats, Ampang Jajar
3. Taman Pandan Apartments, Butterworth
4. Harbour Place, Jalan Chain Ferry, Butterworth

NB: These locations are subject to confirmation by the Penang Island Municipal Council (MPPP) and the Seberang Perai Municipal Council (MPSP).

Objective

The objective of this study is to study the socio-economic profile and waste composition of each selected highrise dwelling.

Methodology

The appointed contractor shall:

1. Take a sample of 30 households per site, a certain number per floor to make up to 30.
2. Request participants' households to segregate their waste (wet & dry) and bring it down to a specified area on specified days.
3. These are then separated into the different categories; weighed and recorded e.g. paper, metal, bottles, plastics, food waste etc. Please refer to Annex 1.
4. Wrap and discard weighed waste samples back into the proper bins.
5. Clean up area.
6. Repeat Steps 1-3 for 4 days over a period of two weeks. Total number of waste samples should be 720 samples (30 units x 6 sites x 4 days = 720 samples for all 6 sites).
7. Each participant will also be required to fill up a simple **1-time only questionnaire** to document their **socio-economic profile**.

8. Each participant may be rewarded with a small token of appreciation for their participation. e.g. a shopping voucher (borne by successful contractor for the study - will have to factor this in as miscellaneous.)
9. Analyse and submit report for the socio-economic profile and waste composition analysis.
10. All steps and processes should be supported by documentation and photographic evidence for verification.
11. Spot checks will also be conducted to ensure compliance with the stipulated conditions.

Summary:

Waste Samples = 30 households x 6 sites x 4 days = 720 samples

Questionnaire survey = 30 households x 6 sites = 180 samples

Alternative methodology:

In the event that the above methodology cannot be implemented, then the contractor may:

1. Remove waste from the common dumpsters / bins at a specific time on specific days.
2. Remove all waste from the common dumpsters / bins and pour out the waste on plastic ground sheets for separation into the different categories. Please refer to Annex 1.
3. Weigh and record each category.
4. Wrap and discard weighed waste samples back into the proper bins.
5. Clean up area.
6. Repeat steps 1-5 for 4 days over a period of 2-weeks. Total is 4 days x 6 sites = 24 samples.
7. Take a sample of **30 households** per site and separately conduct a **socio-economic profile study**. Determine the number of units per floor to make up 30 units.
8. Each selected household will also be required to fill up a simple **1-time only questionnaire** to document, their socio-economic profile. (30 units x 6 = 180 samples per site and for all 6 sites)
9. Analyse and submit report for the socio-economic profile and waste composition analysis.
10. All steps and processes should be supported by documentation and photographic evidence for verification.
11. Spot checks will also be conducted to ensure compliance with the stipulated conditions.

Summary

Waste Samples = 6 sites x 4 days = 24 samples

Questionnaire survey = 30 households x 6 sites = 180 samples

The contractor must provide on-site safety equipment for the workers conducting the study.

The contractor shall sample twice a week over 2 weeks for each highrise dwelling, this means 4 times sampling in total for each highrise over the 2-week period.

The contractor shall also seek the cooperation of the highrise management committees and cleaning contractors for the Study. It is also mandatory that the contractor also cleans up the venue each time after work.

Please submit all quotations in the attached formats (see attached files) by 16 Dec 2013 to :

Mr Marcus Lee Email: mlee1@worldbank.org

Mr Farouk Banna Email: fbanna@worldbank.org

Attached files:

- Technical Proposal.docx
- Financial Proposal.docx
- Firm Qualification Questionnaire.docx
- Survey Questionnaire

All quotations should be in Malaysian Ringgit (RM).

The study is expected to commence by 5 January 2014.

Annex 1

Categories of Waste

1. Food & kitchen waste (food preparation trimmings, tea bags, leftover food etc)
2. Yard & Garden trimmings (green waste, tree cuttings, stems, leaves, branches, lawn clippings etc)
3. Paper & Paper Products (e.g. paper, books, magazines, cardboard, old corrugated cardboard, cartons, packaging etc)
4. Plastics (all types of plastics)
5. Ferrous Metal (Iron & steel products etc)
6. Glass (Bottles and glassware excluding window panes and mirrors)
7. Non-ferrous metals (Aluminum, Zinc, copper, brass lead etc)
8. Textile/Rubber
9. Household Hazardous Waste (E.G. Used Fluorescent Lamps, Dry Cell Batteries, Button Batteries, Other Types Of Batteries)
10. E-Waste (Electrical & Electronic products and appliances etc)
11. Others (Diapers, Sweet wrappers, Ceramics, Mixed Components E.G. Toys, Bulky waste, objects/products with composite material etc.)

ANNEX 6: WASTE CHARACTERIZATION STUDY QUESTIONNAIRE

WASTE CHARACTERISATION STUDY QUESTIONNAIRE

Name of Enumerator Date:

Venue:

I. BASIC DESCRIPTION OF RESPONDENT (Head of Household Only)

1.1 Name (Optional)

1.2 Address:

1.3 Contact (Optional)

1.4 Gender: Male ☐ Female ☐

1.5 Age Group:

☐ ≤17 ☐ 18~22 ☐ 23~35 ☐ 36~45 ☐ 46~55 ☐ 56~65 ☐ More than 65yrs old

1.6 Type of Employment: [Please tick ✓ 1 answer only.]

☐ Government

☐ Private Company

☐ School/Learning Institution

☐ Students

☐ Self Employed

☐ Others (Housewife, retiree, etc.)

1.7 Academic qualifications: Please tick ✓ the correct answer.

a. No schooling ☐

e. University Graduate ☐

b. Primary School ☐

f. Post Graduate ☐

c. Secondary School ☐

g. Others (Please specify)

d. Diploma/Certificate ☐

1.8 How many adults (above 18 years old) live in your household?

1.9 How many children (below 18 years old) live in your household?

1.10 Do you separate your recyclables at home? Yes ☐ No ☐

1.11 Are you willing separate food / kitchen waste at home? Yes ☐ No ☐

1.12 How much estimated organic waste (kitchen/garden) do you produce from your home daily?

☐ <250 gm ☐ 500 gm ☐ 750 gm ☐ 1 kilo ☐ >1 kilo

1.13 How much estimated total waste do you produce in your home daily?

☐ <250 gm ☐ 500 gm ☐ 750 gm ☐ 1 kilo ☐ >1 kilo

ANNEX 7: STATEMENT OF INTEREST FOR PARTICIPATING HIGHRISE BUILDINGS

STATEMENT OF INTEREST TO PARTICIPATE IN THE CLIMATE AND CLEAN AIR COALITION'S INITIATIVE:

Activity 4: Output-based programme to incentivize solid waste separation

The Highrise Management Committee of _____ as in the address, _____ expresses its interest to participate in the Climate and Clean Air Coalition's (CCAC) initiative, specifically Activity 4 on output-based incentives for solid waste separation.

We appoint (Name of Contact _____, (Contact No: _____) to coordinate with the CCAC, and agree to collaborate with the CCAC in this initial stage of work through information sharing and data collection, and participating in regular consultations, with a view to implementation and action in subsequent stages.

UNEP and the World Bank, in close cooperation with local partners including Penang State Government, Penang Island Municipal Council (MPPP);

SeberangPerai Municipal Council (MPSP) and civil society (private sector and non-profit organizations) will help design and develop an implementation plan, based on a results-based financing (RBF) programme to incentivize source separation of solid waste.

The roles that the Highrise Management Committee is expected to fulfill includes:

1. Promoting household-level waste separation.
2. Monitoring and keeping records of recyclables and food waste processed.
3. Outreach and mobilization to change residents' behavior to increase waste separation at source.
4. Facilitate and cooperate with the appointed contractor and the team in the waste characterisation study that will be conducted on site over a period of two weeks (2 samplings per week for each site).

HMC Partner:

Contact	Point of Contact:	Email:
Information:	Address:	
	Phone:	Fax:
	Website:	

CCAC Partner:

Contact	Point of Contact:	Email:
Information:	Address:	
	Phone:	Fax:
	Website:	

**World Bank
Partner:**

Contact	Point of Contact:	Email:
Information:	Address:	
	Phone:	Fax:
	Website:	