GO TEAM • GREEN GOAL We-recycle@School



Primary 5

Where does Domestic Food Waste go

Topic: Natural Resources — Energy Source / Saving Energy

Learning time: 35 minutes

SCHOOL tet's learn about waste reduction!

GREENGOAL

General Studies Lesson PlanP.04-09Extended Activity Kit ①P.11-12Extended Activity Kit ②P.13-14Extended Activity Kit ③P.15-23Supplementary InformationP.25-27Poster ① - Food Waste Recycling InformationP.28

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Primary 5

Where does Domestic Food Waste go

General Studies Lesson Plan for Primary Schools

Topic: Natural Resources – Energy Source / Saving Energy

Learning time: 35 minutes

Prior knowledge

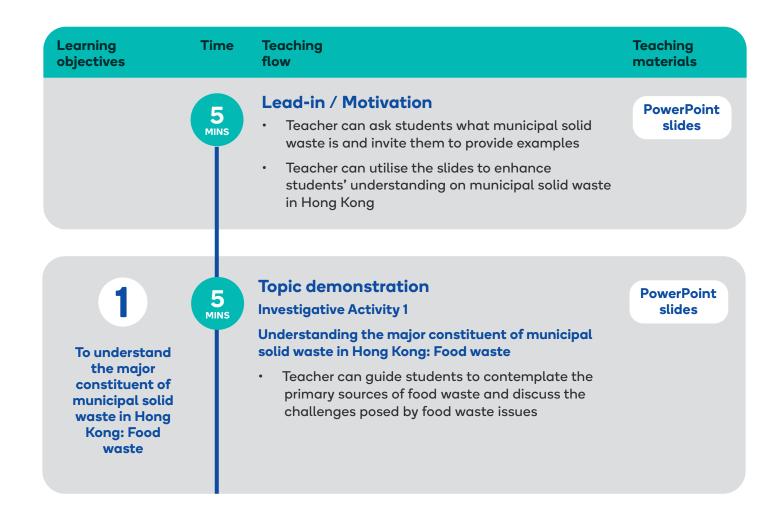
- 1. Basic concepts of municipal solid waste
- 2. Common types of domestic waste and source separation (including food waste and other recyclables)

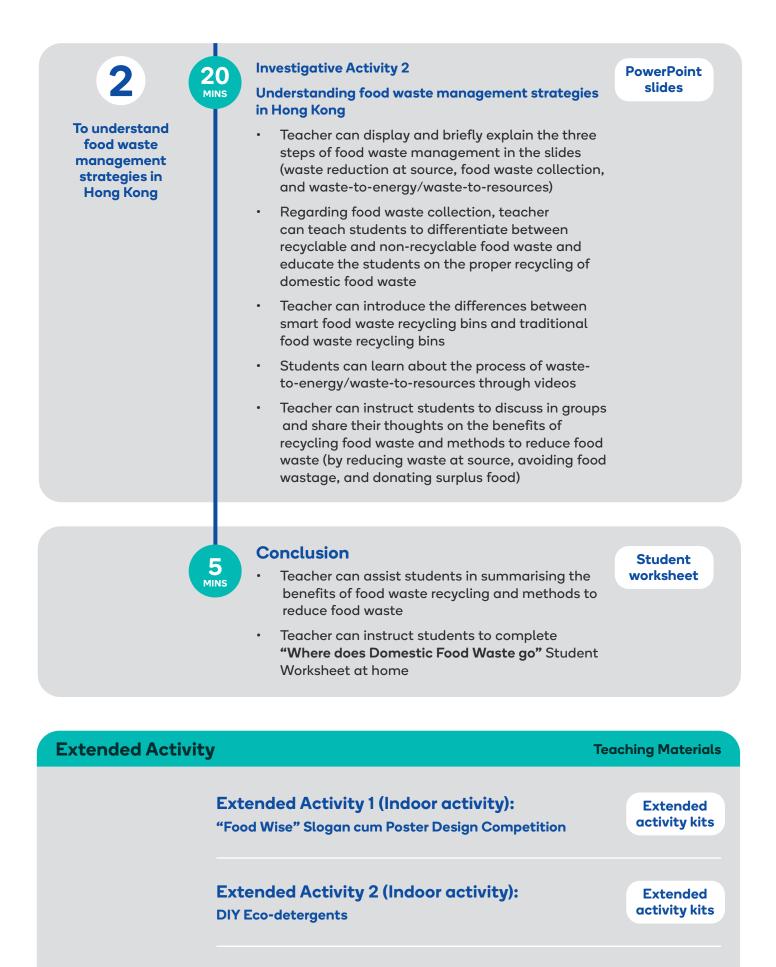
Learning objectives

- Skills
 - To properly handle domestic food waste

Knowledge

- 1. To understand the major constituent of municipal solid waste in Hong Kong: Food waste
- 2. To understand food waste management strategies in Hong Kong



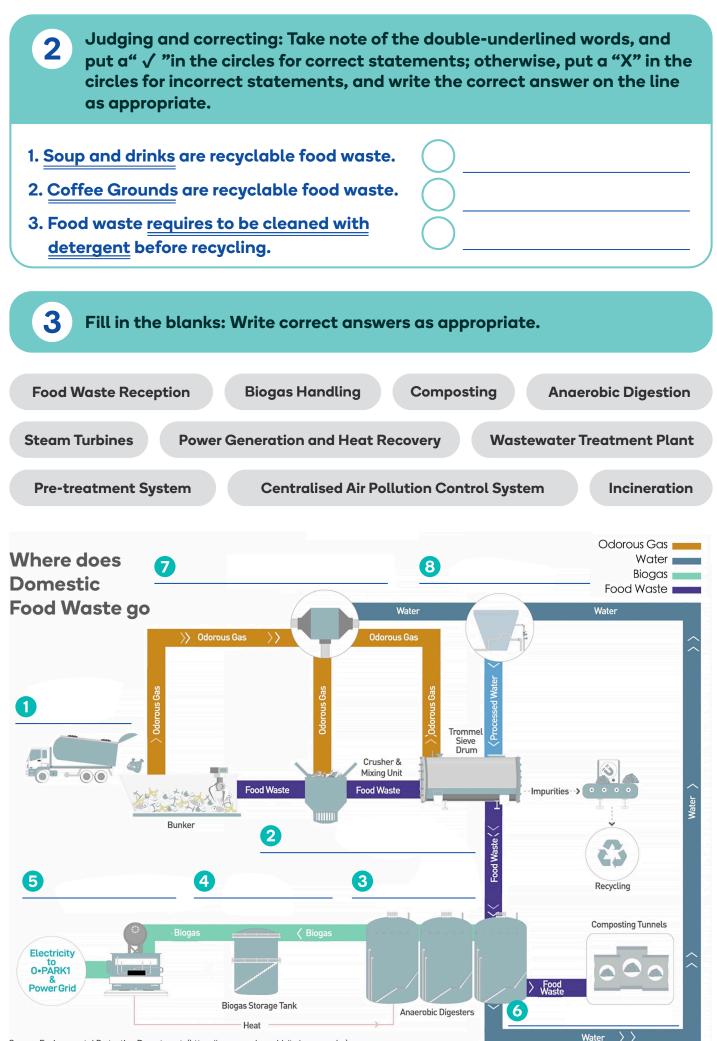


Extended Activity 3 (Outdoor activity): Visit to O·PARK1

Extended activity kits



Where does Domestic Food Waste go					
Student Worksheet Name					
1 Multiple choice: Put a " √ " in the circles for answer.	or the correct GREEN@@AL				
1. Which of the following is the major constituent Hong Kong?	of municipal solid waste in				
Yard Waste Paper Plastics	s Food waste				
2. Which of the following is the major source of fo	ood waste in Hong Kong?				
Market Restaurants Househ	old OSchool				
3. Which of the following is a food waste manage	ement strategy in Hong Kong?				
A Waste reduction at source					
B Food waste collection	A and C				
C Waste-to-energy	B, C and D				
D Waste-to-resources	All of the above				
4. Which of the following is the correct step to recycle food waste?					
A Drain liquid					
B Use a small container to bring food waste to collection point	$\bigcirc \bullet \bullet$				
C Remove non-food waste					
 Pour food waste into rubbish bin Pour food waste into food waste recycling bin 					



Source: Environmental Protection Department. (https://www.opark.gov.hk/tc/process.php)



Food waste	Quantity (units)	Avoidable food waste √ ×	Recyclable food waste √ ×
Example : Apple cores	26 (g)	×	\checkmark
1.	()		
2.	()		
3.	()		
4.	()		
5.	()		
6.	()		
7.	()		
8.	()		
9.	()		
10.	()		
11.	()		
12.	()		
13.	()		
14.	()		

Short question: Suggest two methods to avoid generating food waste.

Primary 5
Extended Activity Kit

"Food Wise" Slogan cum Poster Design Competition

Objectives	 To guide students to think about the ways on food waste reduction To stimulate students' creativity in conveying the theme of "Food Wise" in visual form To cultivate students' language proficiency by requiring them to use concise and meaningful slogans to convey the message
Activity Arrangements	 Preparation a feacher can introduce the purposes of this competition and divide students into groups (2-3 students per group) Activity flow a Students can work in groups to discuss how to create a poster with the theme "Cherish Food, Avoid Wastage" b Students can create their own poster in any forms (electronic design or hand-drawn). The poster size requirement is A4 (210 mm x 297 mm) b Teacher can evaluate the posters based on three criteria: Relevance to the theme, creativity, and visual appeal b Relevance to the theme (5 points): Higher score for higher relevance between the poster / slogan and the theme c Creativity (5 points): Higher score for more creative slogan b Visual appeal (5 points): Poster with relevant graphic design, harmonious colours, vivid presentation of the theme custanding works will be displayed in the school campus Students will be invited to present their design concepts and share their experiences on "Food Wise"
Time	2 lessons
Materials	Marking Scheme

(1)

Marking Scheme

Criteria	Scoring indicators					
ontena	5	4	3	2	1	Score
Relevance to the theme	The content is totally relevant to the theme	The content is highly relevant to the theme	Relevance between the content and the theme is fair	Relevance between the content and the theme is weak	The content is not relevant to the theme at all	
Creativity	Extremely creative and unique	Strong creativity, high uniqueness	Average creativity, conventional expression	Low creativity, cliché expression	Lack of creativity, cliché and dull expression	
Visual appeal	Very high visual appeal	High visual appeal	Average visual appeal	Low visual appeal	Lack of visual appeal	
Total Score						

DIY Eco-detergents

	 To teach students to use food waste to make eco-detergents and cultivate their environmental awareness To encourage students to develop their creativity and imagination, stimulate
Objectives	their creative thinking and their ability to turn waste into treasure
	3. To encourage students to use eco-detergents at home instead of traditional chemical detergents and motivate their family members to practise environmental protection in their daily lives
	Preparation
	 Teacher should develop a clear activity flow and prepare necessary tools and materials
	 Teacher should read through the steps of production and precautions
	• Teacher should remind students to bring along a cleaned plastic bottle with a cap and fruit peels
	 Teacher is recommended to produce a finished product for classroom demonstration
	Activity flow
	• Teacher can introduce the current situation of food waste in Hong Kong (e.g. the amount of food waste, food waste problems, and ways to handle food waste) as an introduction to the activity
Activity	 Teacher can brief students on the uses and benefits of eco-detergents and remind students on the points to note in the production process
Arrangements	 Students can start the production process under teacher's guidance and assistance
	 After the production, teacher can remind students on the points to note in the fermentation period and the storage method
	Production steps
	 Prepare in proportion, 1 portion of sugar, 3 portions of fruit peels, and 10 portions of water
	 Cut the fruit peels into small pieces and put them into a plastic bottle (leave space in the bottle, do not fill it completely)
	• Dissolve the sugar in water and pour the solution into the plastic bottle
	 Label the plastic bottle with the date of manufacture, ingredients, and "do not drink"
	 Keep the eco-detergent in a cool place with good ventilation and avoid direct sunlight

DIY Eco-detergents

 Fermentate for three months (As the fermentation process will produce gas, the bottle should be opened every day. In the first two weeks, it is reminded to release the gas or twist the cap to halfway) After fermentation, you should pour out the solution as well as separating the residue, and put it into a plastic container / spray bottle for use. Dilute as needed for use. Eco-detergent can be used to clean table surfaces, dishes, windows, etc. Conclusion Teacher can discuss with students for the possible ways to reduce food waste and encourage them to think of other feasible examples of upcycling in their daily lives
1 lesson
 Sugar Fresh fruit peels Water A plastic bottle with a cap Tools (measuring cups, electronic scales, plastic bottles, fruit knives, funnels, markers, and labels)
 Teacher should ensure that students use fruit knives carefully to avoid accidents Teacher should remind students that the fermentation process of eco-detergents produces gas, therefore space must be left in the bottle when putting fruit peels into the bottle, and the bottle should not be filled completely. The plastic bottle should be opened every day, and they should release the gas or twist the cap to halfway in the first two weeks All uncooked plant-based food waste, such as fresh vegetable leaves and fruit peels, can be used to make the eco-detergent. Orange peel has a fresher aroma

Visit to Organic Resources Recovery Centre Phase 1 (O·PARK1)

Objectives	 To understand O·PARK1 which is an Organic Resources Recovery Centre To understand the process of turning food waste to energy To instill behavioural changes and to cultivate the habits of reducing food waste at source
Activity Arrangements	 Preparation Teacher can make an online reservation or call 2143 7510 to book a visit one month in advance Teacher can prepare a list of participants with contact information, an activity schedule and activity details, including transportation arrangements, pick-up and dismiss time, and rundown of activity, etc. Before the visit, teacher can notify students and parents about the purposes, details, and points to note of the activity through school notice Teacher can prepare relevant learning materials, such as information about O·PARK1 Teacher can ask students about the amount of food waste in Hong Kong, its major sources and common types of food waste, and discuss the current food waste problems and the challenges in the future Requirements Students should stay safe, follow the visiting instructions and safety guidelines set by O·PARK1 Students should actively participate in the activities, ask questions and share opinions Students should dress appropriately and bring a jacket or rain gear according to the weather conditions Activity flow Students gather at school in the morning and take shuttle bus to O·PARK1 Upon arrival at O·PARK1, students are given a brief introduction and then a guided tour Students learn the process of waste-to-energy The teacher can wrap up the activity with a Q&A session at the end of the guided tour Return to school after the guided tour

Visit to Organic Resources Recovery Centre Phase 1 (O·PARK1)

Activity Arrangements	 Conclusion After the activity, teacher can ask students about the steps and knowledge of food waste treatment, e.g. pre-treatment procedures, anaerobic digestion process, and by-products generated during food waste treatment, for reviewing the use of food waste and the treatment process Teacher can discuss with students about the methods for reducing food waste to emphasise the problems of food waste in Hong Kong and to promote "Food Wise, Waste Less" culture 		
Time	One lesson : Pre-activity preparation (distribution of notices, activity briefings, and collection of reply slips) Half-day : Visit to O·PARK1 One lesson : Post-activity discussion		
Materials	 School Notice Activity Details List Introduction of O·PARK1 Student Worksheet 		
Remarks	 All visits to O-PARK1 must be booked in advance. Booking for schools is available from 31 to 365 days prior to the date of visit. Applicants are required to provide valid "Certificate of registration of a school" issued by the Education Bureau or letter issued using official institution letterhead with stamp for proof along with the form submission Guided tours have specific reservation time slots and normally last for 1.5 hours An organisation can book for a group up to 20 people, including accompanying staff and caretakers If the number of visitors exceeds 20 people, applicants need to submit two or more applications separately. If there is more than one application, visitors will be arranged to make a visit on different days or at different time slots on the same day Coach licence plate number shall be provided for registration prior to the visit. Vehicles without registration are not allowed to enter O-PARK1. Coaches can only drop-off and pick-up passengers. No parking space is provided in O-PARK1. Cancellation of organisation booking should be made at least 7 days prior to the date of visit by email booking@opark.hk. Late cancellation will be regarded as no-show 		

Visit to Organic Resources Recovery Centre Phase 1 (O·PARK1)

Remarks

7. Should you require to amend your personal information, please call 2143 7510 or email booking@opark.hk to update the details. Amendment is generally not allowed unless there is a need in reduction of number of visitors / facilities reservation. New booking application is required for extra visitors, additional facilities reservation or change of activity

"Where does Domestic Food Waste go" Extended Activity 3:

School Notice

XXX Primary School

Activity Notice on P.5 General Studies Visit to Organic Resources Recovery Centre Phase 1 (O·PARK1)

Dear Parents / Guardians,

To comply with the curriculum of General Studies of Primary 5, a visit to O·PARK1 will be arranged for Primary 5 students. The details are as follows:

Date	:	XX XX 20XX (X)	
Venue	:	O·PARK1 (5 Sham Fung Road, Siu Ho Wan, North Lantau)	
Visiting hours	:	9:30 a.m. – 1:30 p.m.	
Transportation	:	Shuttle bus	
Teacher-in-charge	:	Mr. / Miss XXX	
Remarks	:	1. Students are required to wear school sports uniform	
		2. The visit will be led by the General Studies teachers	
		3. Students should bring along student worksheet and stationeries	

Students are required to participate in this activity in order to comply with the curriculum of their study. If there are any special circumstances, please discuss with the General Studies teacher. Parents are required to fill in the Reply Slip and submit it to the General Studies Teacher by XX XX (X). If you have any enquiry, please contact Mr. / Miss XXX at XXXX XXXX.

Yours sincerely, Mr. / Miss XXX Principal

XX XX 20XX

----- (Parents please keep the above notice for reference)

Reply Slip for Activity Notice on P.5 General Studies Visit to

Organic Resources Recovery Centre Phase 1 (O·PARK1)

To whom it may concern:

I agree to allow my child to attend the visit to O·PARK1 and have acknowledged the arrangements.

Student's Name:		
Class:	()

Parent / Guardian's Name:

Parent / Guardian's Contact No.:

Parent / Guardian's Signature:

(Please sign with a ball pen)

"Where does Domestic Food Waste go" Extended Activity 3:

Activity Details List

P.5 General Studies Visit to O·PARK1				
Date: XX XX 20	DXX (X)	Time: 09:30-13:30		
Venue: O·PARK	1 (5 Sham Fung Road, Siu Ho Wan	, North Lantau)		
Time	Events	Materials		
09:30-09:40	Roll call	Student List		
09:40-10:40	• Take shuttle bus to O·PARK1	/		
10:45-12:10	Guided Tour	/		
12:10-12:30	Conclusion	Worksheet		
12:30-13:30	• Return to school by shuttle bus	/		

P.5 General Studies Visit to O·PARK1 Student List

Teacher-in-charge: Mr. / Miss XXX

No.	Student no.	Student's name	Gender	Parent / Guardian's contact no.	Attendance
1.					
2.					
3.					
4.					
5.					
6.					
7.					
8.					
9.					
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11.					
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Introduction of O·PARK1

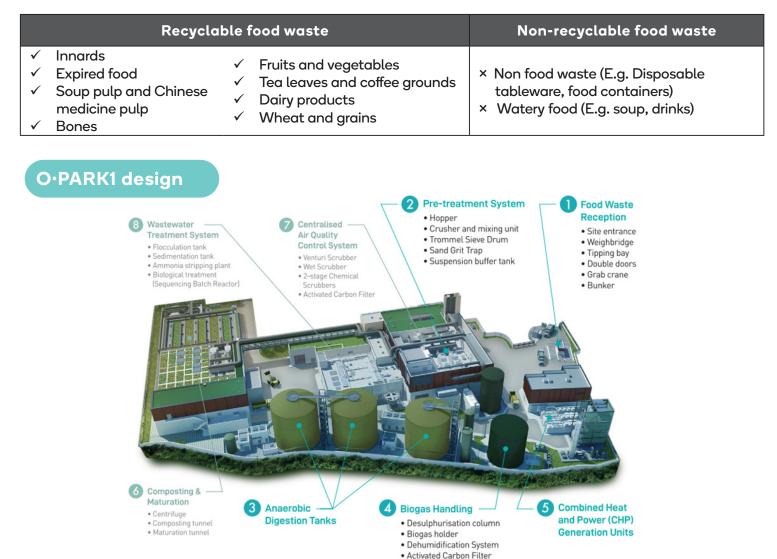
What is O·PARK1?

O·PARK1, the first organic resources recovery centre, locating at Siu Ho Wan of North Lantau adopts anaerobic digestion technology to convert food waste into biogas (a source of renewable energy similar to natural gas) for electricity generation whilst the residues from the process can be produced as compost for landscaping and agriculture use.

The O·PARK1 has a design capacity of 200 tonnes per day. It adopts anaerobic digestion and composting technologies to recycle source separated food waste into biogas and compost. The biogas will be used to generate electricity and apart from the internal use within O·PARK1, about 14 million kWh of surplus electricity, which is equivalent to the power consumption by some 3 000 households, can be exported each year.

What is recyclable food waste?

Food waste refers to any disposal, including raw and cooked food, edible and inedible portions, generated in the course of food preparation, distribution, storage and meal preparation, or meal consumption.



Source: Booklet on Food Waste to Energy, Environmental Protection Department.



Introduction of O·PARK1

Food waste to energy process and introduction

1. Food waste reception: Use less, waste less.

Food waste collection vehicle passes through the weighbridge for recording the weight of food waste received before discharging into the bunker at the tipping bay. The enclosed tipping bays are equipped with double doors and an advanced deodorisation system to prevent odour from escaping to surrounding areas.

2. Pre-treatment system: Separating inert materials and recyclables

A grab crane is used to transfer food waste to the crusher, which tears up the packaging materials, smashes and turns the food waste into suspension. Food waste suspension is then transferred to the Trommel Sieve Drum to remove the over-size impurities of about 16mm in size or greater, such as plastic bag fragments. Afterwards, the suspension passes through the Sand Grit Trap where heavy impurities, such as glass, stones, and sand are removed. Metals are also separated from the food waste for recycling.

3. Anaerobic digestion: Anaerobic digestion and waste-to-energy

The processed suspension firstly enters the buffer tank, followed by three digesters, each of approximately 4 300m³ in volume. The digesters operate at about 35°C under anaerobic condition, where mesophilic microorganisms convert the suspension into biogas in around 23 days.

4. Biogas handling: Desulphurisation of biogas and purification

Biogas collected is diverted to the desulphurisation column for biological oxidation of Hydrogen Sulphide (H_2S), to avoid corrosion of the downstream equipment. The column operates at a temperature of about 30°C, which converts H_2S into sulphate for removing 95% of the H_2S . Cleaned biogas is then stored in a 1 500m³ Double Membrane Gasholder housed inside a steel tank shell. Pressure relief device is also provided to ensure the safe operation of the system.

5. Heat recovery and power generation: Self-sustainable energy and electricity exportation

The combined heat and power generation units combust treated biogas to generate electricity to self-sustain the operation of the facility and export surplus electricity to the power grid, which is sufficient for the power consumption of approximately 3 000 households. Heat is recovered from the system to satisfy the heating demand within the facility.

6. Composting and maturation: Dewatering and composting

Digestate from the digester is dewatered by the centrifuge to achieve a solid content of about 25%, and then mixed with bulking agent before being transferred to the composting tunnels for stabilisation. The mixture is placed inside the composting tunnel for about 20 days to facilitate degradation of remaining organic matters. Air distribution system and irrigation system are installed in each tunnel for supplying air to the composting process and adjusting the compost moisture content. Heated air is delivered to the tunnel for maintaining the operating temperature at about 55°C. The mature compost can be used for landscaping and agriculture applications.



Introduction of O·PARK1

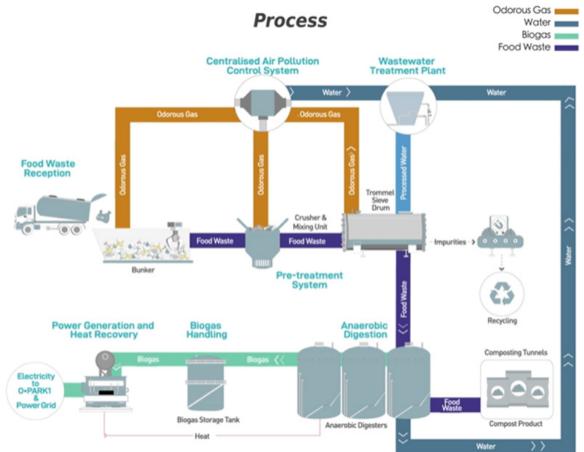
Food waste to energy process and introduction

7. Centralised air pollution control system (CAPCS): Highly effective deodorisation system

All facilities within O·PARK1 are confined and maintained under negative pressure to avoid odour dispersion. The odorous gases within the facilities are extracted to the deodorisation system. The system comprises of Venturi Scrubber, Wet Scrubber, 2-stage Chemical Scrubber, and Activated Carbon Filter to remove dust particles and odorous chemicals (mainly H₂S and NH₃). The system can achieve a minimum of 95% NH₃ and 99% H₂S removal efficiencies. The performance of the CAPCS is continuously monitored to ensure the compliance with statutory requirements.

8. Wastewater treatment plant (WWTP): Purification of wastewater for reuse

The wastewater treatment plant is divided into three stages: Pre-treatment, Ammonia Stripping Plant (ASP) and the biological treatment. The pre-treatment involves flocculation and sedimentation to remove a majority of Total Suspended Solids and Phosphorus. Wastewater is then pumped to the ASP for ammonia removal. The ASP column is filled with polypropylene packing to facilitate the ammonia transfer between gas and liquid phases. Sequencing Batch Reactor with anoxic and aerobic stages is adopted as the biological treatment for the removal of the organic pollutants and nitrogen. A portion of treated effluent is reused on site. The remaining volume is discharged to sewage treatment works for further treatment. Discharge of effluent is closely monitored to ensure its full compliance with statutory requirements.



Where d	loes C	omestic	Food W	laste qo

Name

1

Student Worksheet

What was the most memorable experience during the visit? (30-50 words)



Have you learnt how food waste can be turned into energy after the visit? (30-50 words)



What are the possible ways to reduce food waste in our daily life? (30-50 words)

Primary 5

Supplementary Information

1. Food waste management strategies in Hong Kong

At present, most of Hong Kong's food waste is disposed of at landfills together with other municipal solid waste. In 2022, there were some 11 130 tonnes of municipal solid waste disposed of at landfills each day. Of these, about 3 300 tonnes (30%) were food waste, constituting the largest municipal solid waste category. Among the food waste disposed of at landfills daily, some 1 000 tonnes were generated from commercial and industrial sources, such as restaurants, hotels, wet markets, food production, and processing industries. Food waste is any waste, rather raw, cooked, edible, and associated with inedible parts generated during food production, distribution, storage, meal preparation or consumption of meals. Below are the strategies in food waste management in Hong Kong:

Food waste management strategies	Methods	Initiative
Waste reduction at source	Prevent and reduce food waste at source, and donate surplus food to others	Food Wise Hong Kong Campaign promotes a food wise and waste less culture through various schemes and activities, e.g. Food Wise Charter, Food Wise Eateries Scheme, and publicity of the Big Waster Through the Environment and Conservation Fund (ECF), the Environmental Protection Department (EPD) has been supporting non-governmental organisations in implementing food recovery projects, under which surplus food is collected from the commercial sector and donated to the needy to achieve the goal of caring for society and reducing food waste
Food waste collection	Source separation and recycle to gainful resources	 Pilot scheme on food waste collection: Focusing on food waste generated from the private (commercial and industrial sector) and public premises, source-separated food waste are collected under the Pilot Scheme Food waste collection in public rental housing estate: The EPD launched a programme to collect domestic food waste using food waste smart bins in public rental housing estates under the Housing Department and the Hong Kong Housing Society Funding support to food waste collection and recycling: Under the Community Waste Reduction Projects of the Environment and Conservation Fund, the Government supports non-profit making organisations to carry out food waste reatment. Under various project schemes of the Recycling Fund, the Government also subsidises the recycling industry and eligible organisations to carry out food waste related projects; and supports the adoption of smart bin technology at residential buildings to collect food waste for recycling Public food waste collection point: Setting up at suitable Government premises (such as refuse collection points, wet markets, GREEN@COMMUNITY facilities) to collect food waste generated by restaurants and households nearby Food waste recycling spots: Setting up in single-block residential buildings, and clusters of restaurants to provide night-time food waste collection services in the form of kerbside collection booths at fixed time and locations

1. Food waste management strategies in Hong Kong

Food waste management strategies	Methods	Initiative
Waste-to- energy / Waste-to- resources	Turning food waste into energy/ resources	The food waste collected will be delivered to O·PARK1 for treatment and conversion into energy and compost, alleviating the pressure of the landfills The first organic resource recovery centre (O·PARK1) was opened in 2018 and the second phase of the organic resource recovery centre (O·PARK2) has commenced operation in 2024 for turning waste into energy / resources In addition, the first trial scheme on the food waste / sewage sludge anaerobic co-digestion was also launched at the Tai Po Sewage Treatment Works and Shatin Sewage Treatment Works in 2019 and 2023 respectively

2. Information on food waste recycling

Domestic food waste collection measures

Citizens can recycle food waste at food waste recycling bins in public rental housing and private housing estates, food waste recycling spots, food waste recycling points at refuse collection points, and other Government premises.

Smart Food Waste Recycling Programme (Public rental housing)	The EPD launched a programme to collect food waste using smart bins in public rental housing estates under the Housing Department and the Hong Kong Housing Society. The collected food waste is delivered to the EPD's food waste recycling facilities for turning into energy or resources. <u>https://www.foodwasterecycling.hk/wp-content/uploads/2024/08/Smart-Bin- locations_0816.pdf</u>
Food waste smart recycling bins in private housing estates	Private housing estates can apply for funding through Recycling Fund and Environmental Campaign Committee to install smart food waste recycling bins.
Food waste recycling spots	Provide night-time food waste collection services in the form of kerbside collection booths at fixed time and locations. <u>https://www.wastereduction.gov.hk/sites/default/files/food_wise/Food_Waste_</u> <u>Recycling_Spots.pdf</u>
Food waste recycling points at refuse collection points	The EPD is progressively setting up Food Waste Recycling Points at refuse collection points (RCP) under the Food and Environmental Hygiene Department to collect food waste generated by restaurants and households nearby. <u>https://www.wastereduction.gov.hk/sites/default/files/food_wise/Food_Waste_ Recycling_Points_at_RCPs.pdf</u>
GREEN@COUMMITY facilities	The EPD has already installed FWSRBs at five GREEN@COMMUNITY facilities (including GREEN@SHAM SHUI PO, GREEN@EASTERN, GREEN@SAI KUNG, GREEN@SHA TIN, and GREEN@TUEN MUN) in proximity to residential areas for the use of residents who live in buildings without sufficient space to install food waste recycling bins (such as "3-nil" buildings).

Information on food waste recycling

Video on food waste recycling tips https://www.epd.gov.hk/epd/sites/default/files/epd/video/Food_waste_separation_tips.mp4

Video on food waste smart recycling bin operation https://www.epd.gov.hk/epd/sites/default/files/epd/video/FW_Smartbin_Video.mp4









⑤ 環境保護署 Environmental Protection Department

可回收 YES



穀物 Wheat & Grains



肉類 Meats



其他 Others

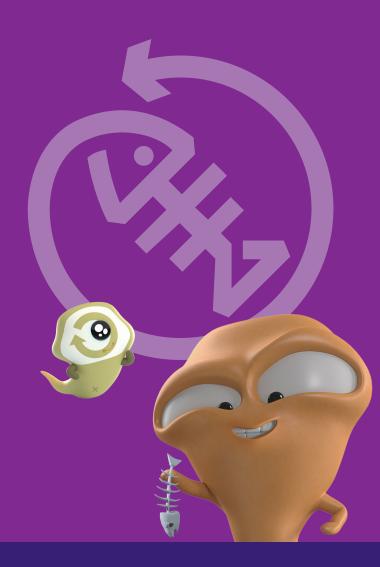


蔬果 Fruits & Vegetables



殘渣 Residues

生、熟、吃剩或變壞食物也是 「可回收廚餘」。 Raw, cooked, leftover or spoiled food is 'recyclable food waste'.







非廚餘物質 Non Food Waste



過多水分 Watery Food

如不確定能否回收,請詢問工作人員 或避免放入廚餘桶。

If you have doubt, please ask staff or avoid putting it into food waste bin.