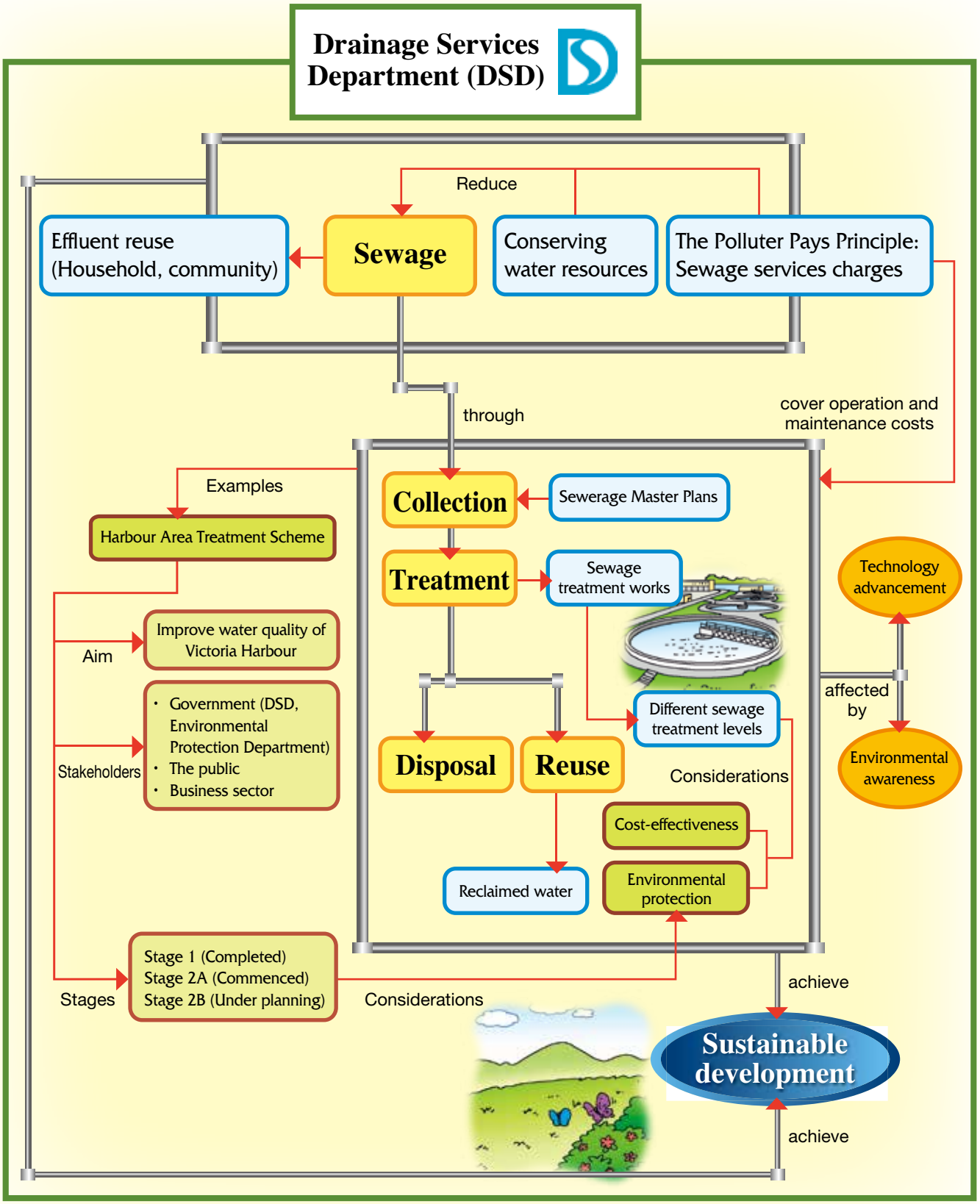
2. Sewerage

Concept Map

Sewerage covers several aspects: collection, treatment, disposal and reuse of effluent. Government policy and considerations regarding sewerage are shown in this concept map and will be explored in detail under this theme.



How much do you know about sewerage?

The growing population and economic activities in Hong Kong generate huge amounts of sewage every day. How much do you know about sewage treatment in Hong Kong? Try the quiz below and find out the correct answers in DSD's website (http://www.dsd.gov.hk).

1. How much sewage is generated in Hong Kong every day?

   A. 0.9 million m^3 B. 1.9 million m^3
   C. 2.9 million m^3 D. 3.9 million m^3

2. How many public sewage treatment facilities are there in Hong Kong?

   A. About 180 B. About 270 C. About 360 D. About 450

3. How many sewage catchment areas are there in Hong Kong?

   A. 16 B. 17 C. 18 D. 19

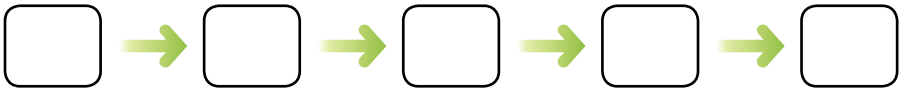
4. Apart from preliminary and primary treatments, what other sewage treatment levels are also adopted in Hong Kong?

   A. Chemically-enhanced primary treatment B. Secondary treatment
   C. Tertiary treatment D. All of the above

Quiz Do you know how sewage treatment facilities are classified?

5. What are the processes involved in sewage treatment? Using the Stonecutters Island Sewage Treatment Works as an example, arrange the following processes in the correct order.

   A. Transfer of sewage from deep tunnels
   B. Chemicallly-enhanced primary treatment of sewage
   C. Conveyance of sewage to Stonecutters Island via deep tunnels
   D. Discharge of treated sewage
   E. Collection of sewage



6. Which of the following types of renewable energy are used in the sewage treatment works in Hong Kong to protect the environment?

(i) Solar energy
(ii) Geothermal energy
(iii) Biogas (such as methane)

A. (i) B. (ii) C. (i), (iii) D. All of the above

7. Decide whether the following statement is true or false:
The Stonecutters Island Sewage Treatment Works is built on a 10-hectare reclaimed area. It is one of the largest and most intensive sewage treatment works in the world.

A. True B. False C. Partly true

8. Which of the following are the applications of 'reclaimed water' in Hong Kong now?

(i) Swimming pool water
(ii) Irrigation
(iii) Flushing toilets
(iv) Rearing aquarium fish
(v) Bathing
(vi) Drinking water

A. (i), (ii), (iii) B. (ii), (iii), (iv)
C. (i), (ii), (iii), (iv), (v) D. All of the above

9. Which of the following measures has the Drainage Services Department adopted to deal with the odour nuisance caused by sewage treatment works?

(i) Adding chemicals to sewage
(ii) Installing air-tight windows for neighbouring residents
(iii) Adding oxygen to sewage
(iv) Enhancing ventilation
(v) Covering areas where there may be odour
(vi) Installing a deodorising system

A. (i), (iii), (v) B. (ii), (iv), (v), (vi)
C. (i), (iii), (v), (vi) D. All of the above

10. In which sewage catchment area is your school located? _____

'How much do you know about sewerage?'

Scoring: _____ correct answers

☹ 0 – 3 Room for improvement 😐 4 – 7 Average ☺ 8 – 10 Excellent

Where does the used water go?

Worksheet (1)

Warm up activity —— The uses of water

Read Mei-ling's diary and pay attention to the use of water in a day of her life. Complete the activities on the next page.

1 September 2010 Sunny

Today was the first day of my Secondary 4 year. I woke up early to get a fresh start. After brushing my teeth and washing my face, my stomach suddenly started aching, probably because I was nervous. So I rushed to the toilet immediately. The toilet is always short of flushing water. It's so troublesome. I washed my hands in a hurry after flushing the toilet, then put on a clean school uniform. I sat at the dining table, drinking the hot chocolate milk prepared by mum, and I felt so warm.

The bell rang shortly after I arrived at school. As it was the first day of the new academic year, the teacher said there would be no classes. We spent the whole morning arranging seats and distributing books. During lunchtime, I went to a noodle restaurant nearby with my classmate and ordered a bowl of fish ball rice noodles. But I only finished half bowl due to poor appetite. The waiter disposed of the rice noodles that were left over.

It was already 6 p.m. when I returned home. As it was a very hot day, I took a shower right away. Afterwards, I felt so tired that I went to sleep without having dinner.

Morning

Afternoon

Evening

Foundation

Water and Mei-ling

From the previous page, find out how Mei-ling uses water and think about where the 'used water' goes.

The uses of water (you may list more than one for each session)

Morning:

Afternoon:

Evening:

Where does the used water go? (you may list more than one)

Water and you

Advanced

Think about the uses of water in a single day of your life, starting from early in the morning till you sleep at night, and where the 'used water' goes.

The uses of water (you may list more than one for each session)

Morning:

Afternoon:

Evening:

Where does the used water go? (you may list more than one)

Worksheet (2)

Video watching——Let's Clean Up Our Water

Due to lifestyle changes and social development, the main sources of sewage are no longer the same. And the strategies for sewage treatment need to keep pace with the times. Watch the video clip *Let's Clean Up Our Water* to know how sewage affects us.

A. Introducing the video clip

Basic Knowledge

The video clip comprises three parts:

- Part 1: Describes the development of sewage treatment strategies in Hong Kong, from the so-called 'manual night-soil collection' in the past to the 'chemical sewage treatment' today and the economic rationale of the 'polluter pays' principle. Explains the importance of sewage treatment to the development of Hong Kong.
- Part 2[1]: Illustrates different sewage treatment strategies adopted by the Drainage Services Department at that time (produced in 2006), including preliminary, chemically-enhanced primary[2], secondary and tertiary sewage treatment. Explains different sewage treatment strategies adopted in different districts (like urban areas and new towns in the New Territories), and the Polluter Pays Principle.
- Part 3: Introduces the Government sewage treatment strategies in the future and explains its importance in facilitating sustainable development in Hong Kong.

Works of HATS Stage 2A – covered sedimentation tanks of Stonecutters Island Sewage Treatment Works. (computer simulated photo)

Shatin Sewage Treatment Works

[1] Only Cheung Chau and Tai O Sewage Treatment Works adopt primary treatment, though not covered in the video.

[2] Chemically-enhanced primary treatment is also named as Chemically-assisted primary treatment in Chinese translation.

B. Key messages of the video clip

Use the table below to present systematically the key messages of the video clip.

Years	Major sources of sewage	Major strategies for sewage treatment	Effectiveness of sewage treatment
Early days			
1970s	The volume of sewage has continued to increase since the 1970s because:	Preliminary treatment:	
1980s		Apart from the preliminary treatment strategies in the 1970s, it also adopted:	
1990s onwards		Apart from the strategies adopted in the 1970s and 1980s, it also introduced:	

Data-response Questions

Answer the following questions with reference to the video clip.

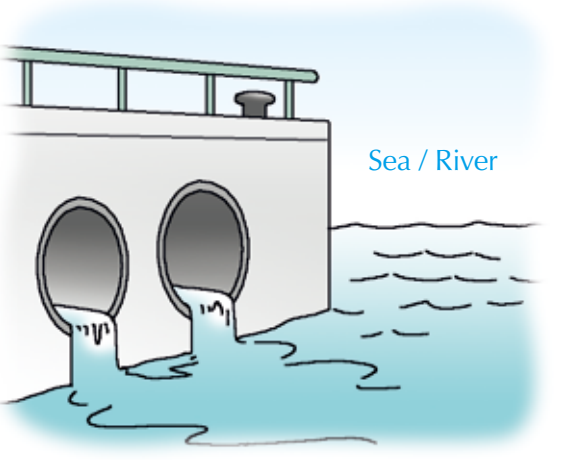
1. Which areas in Hong Kong produce the largest amount of sewage every day? Why?

2. Why must sewage undergo treatment before being discharged into nearby harbours or rivers?

3. What would be the impact on us if all sewage were discharged into the sea or Victoria Harbour without prior treatment?

Personal health	
Community environment	
Economic development	
International image	

4. The sewage treatment process mainly consists of three steps. They are:



5. What are DSD's major considerations in formulating sewage treatment strategies?

Worksheet (3)

Data-response Questions

Sewage treatment levels in Hong Kong

Read the following information

Source 1

Preliminary Treatment

It includes screening and de-gritting. Solids and grits larger than 6 mm in diameter are removed from sewage.

Primary Treatment

After screening and de-gritting, settleable suspended solids are removed from sewage in the sedimentation process. Typically, 70% of the Total Suspended Solids (TSS) and 30% of the Biochemical Oxygen Demand (BOD) are removed.

Sewage enters the primary sedimentation tank after preliminary treatment.

Chemically-enhanced Primary Treatment

Chemicals are added during primary sedimentation process to enhance the removal of TSS. This process can reduce the TSS and BOD by about 80% and 60% respectively.

Secondary Treatment

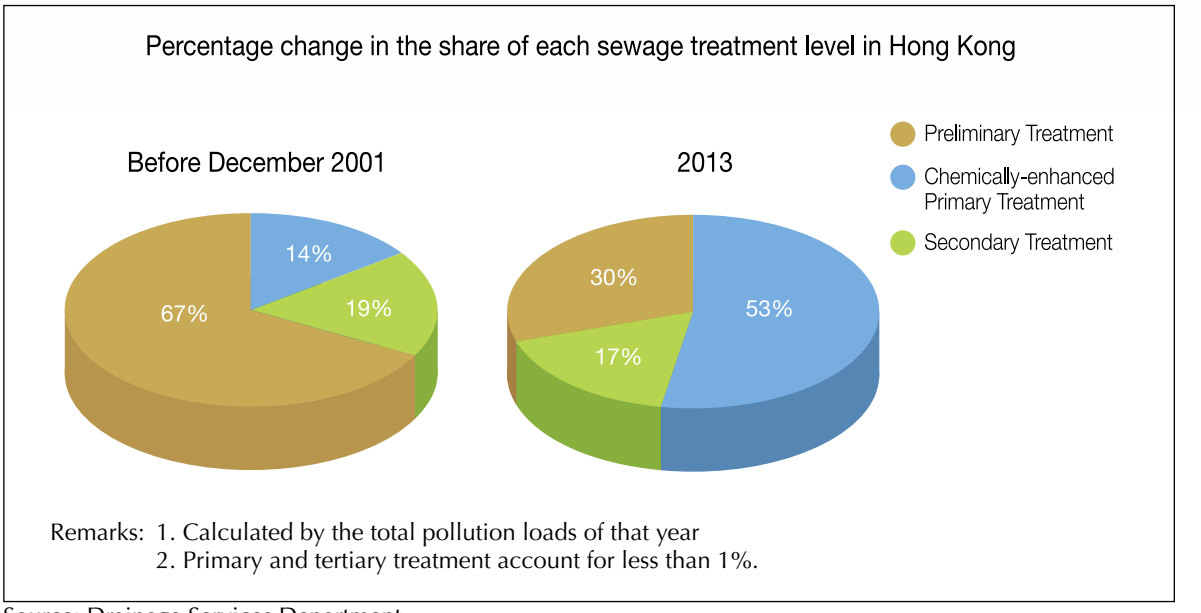
After primary treatment, organic pollutants in effluents, mainly the BOD and some nutrients, are decomposed by micro-organisms in the biological treatment process. Treated effluent after this process meets the discharge standards of 30 mg/l TSS and 20 mg/l BOD.

Tertiary Treatment

This is the highest level of sewage treatment. Organic pollutants, suspended solids and nutrients in sewage are reduced to a minimum by using bioreactors and filters.

Source: Drainage Services Department

Source 2



Remarks: 1. Calculated by the total pollution loads of that year
2. Primary and tertiary treatment account for less than 1%.

Source: Drainage Services Department

1. Identify the changes in the sewage treatment level in Hong Kong and analyse the reasons according to the above information. (Hints: Consider the quality of life and environmental awareness of the public, changes in the amount of resources invested by the Government and advancements in technology.)

   i. Changes in the sewage treatment level in Hong Kong:

   ii. Reasons for the changes in the sewage treatment level in Hong Kong:

2. 'Hong Kong should adopt tertiary treatment, the highest treatment level, across the territory.' Do you agree with this statement? Explain. (Hints: Consider cost-effectiveness, affordability of sewage charges to the public, and the use of sewage after tertiary treatment.)

3. Sewage collected in the rural New Territories requires higher level of treatment than in urban areas. Please explain with regard to cost-effectiveness and environmental protection.

Cost-effectiveness

(Hints: Consider the amount of sewage discharged in the rural New Territories and the urban areas.)

Environmental protection

(Hints: Consider the place where the treated sewage would be discharged and the impact brought about by the arrangement.)

How is sewage treated in sewage treatment works?

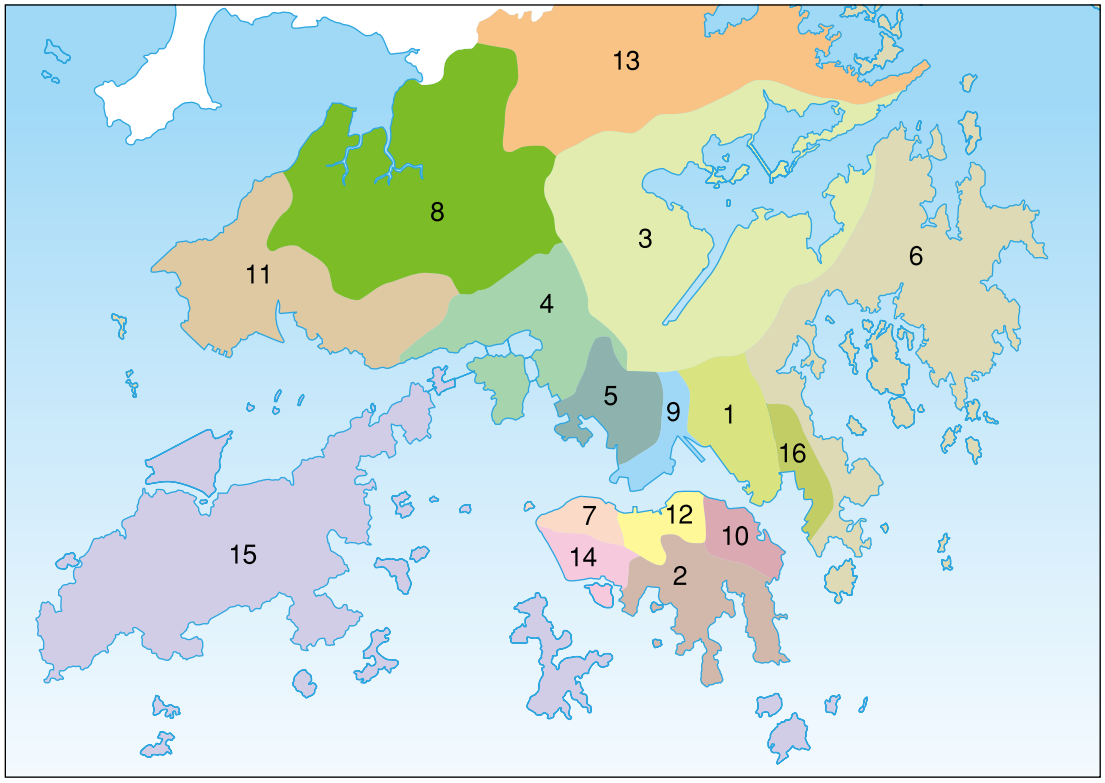
Worksheet (4)

Sewerage Master Plans

A. Read the following information

Source 1

Distribution of various Sewerage Master Plans



1. East Kowloon Sewerage Master Plan
2. Hong Kong Island South Sewerage Master Plan
3. Tolo Harbour Sewerage Master Plan
4. Tsuen Wan, Kwai Chung and Tsing Yi Sewerage Master Plan
5. North West Kowloon Sewerage Master Plan
6. Port Shelter Sewerage Master Plan
7. Central, Western and Wan Chai West Sewerage Master Plan
8. Yuen Long and Kam Tin Sewerage Master Plan
9. North and South Kowloon Sewerage Master Plan
10. Chai Wan and Shau Kei Wan Sewerage Master Plan
11. Tuen Mun Sewerage Master Plan
12. Wan Chai East and North Point Sewerage Master Plan
13. North District Sewerage Master Plan
14. Aberdeen, Ap Lei Chau and Pok Fu Lam Sewerage Master Plan
15. Outlying Islands Sewerage Master Plan
16. Tseung Kwan O Sewerage Master Plan

Source 2

Treating sewage in a cost-effective way is a huge challenge. In 2010, about 93% of the population was served by the public sewerage system. The system comprises a sewerage network with a total length of about 1,600 kilometres, together with about 270 sewage treatment works and sewage pumping stations, which collect and treat 2.7 million cubic metres of sewage per day (about 2.9 million cubic metres of sewage is produced per day in Hong Kong).

Sewerage Master Plans (SMPs) are blueprints for the provision of sewerage infrastructure, aiming to collect sewage on a catchment-by-catchment basis and then transfer to sewage treatment works. At present, the entire territory has been demarcated into 16 catchments, and a SMP is formulated for each district. The proposed works for the SMPs are being implemented progressively to cater to the present and future development needs of Hong Kong. They are also reviewed and re-prioritised in accordance with revised population forecasts and related development proposals.

B. Class discussion

1. Your school is located in the _____ district.

2. According to the distribution in Source 1, indicate the sewerage master plan/catchment which would take care of your school.

   _____ (Write the corresponding number on the map.)

3. Referring to Source 2, discuss the background of the implementation of the Sewerage Master Plans. Why can't the sewage be directly discharged into the sea?

   _____

   _____

   _____

   _____

   _____

4. Describe the scope of works under the Sewerage Master Plans.

   _____

   _____

   _____

C. PowerPoint presentation: *Tuen Mun Sewerage System*

1. Watch the PowerPoint presentation. Please put down relevant information in the table below and answer the questions.

Tuen Mun Sewerage System

Objectives:

Improvement works include:

Effectiveness:

2. How do you think the Sewerage Master Plans can enhance our quality of life?

Worksheet (5)

I can treat sewage too

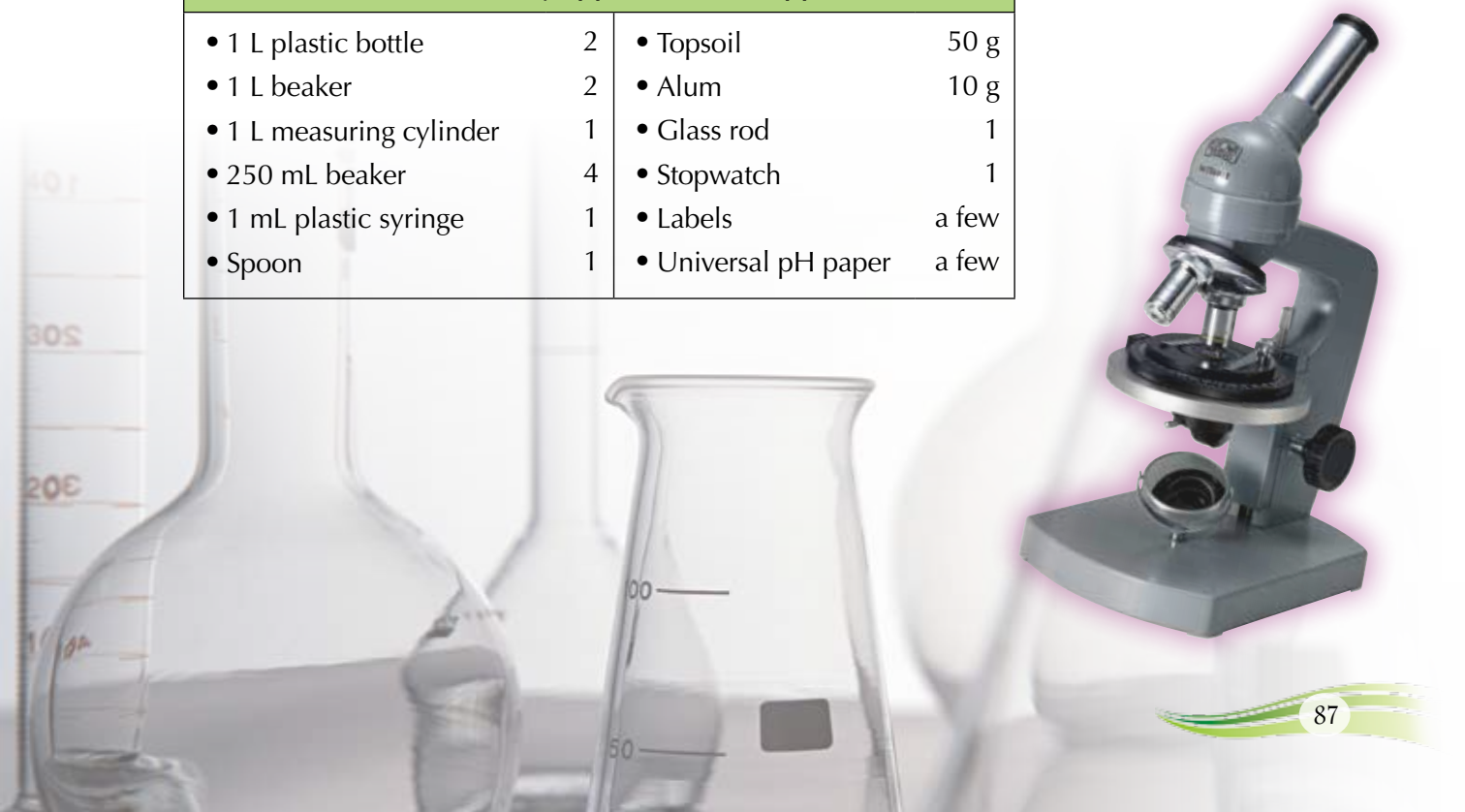
Think and practise —— A simple experiment

Do you know where the sewage in Hong Kong goes? Right! Into the sea. However, if sewage is discharged directly into the sea without prior treatment, the sea will be seriously polluted. In order to protect the environment, the Drainage Services Department has put in place various sewage collection and treatment facilities in different locations in Hong Kong. These facilities provide different levels of treatment before discharging the sewage into the sea. You will understand how the Drainage Services Department treats sewage and the importance of sewage treatment through the following experiment.

(A) Objective of the experiment: By treating school sewage, to understand how the Drainage Services Department treats sewage and the importance of sewage treatment.

(B) Preparation of apparatus and materials

List of laboratory apparatus and supplies			
• 1 L plastic bottle	2	• Topsoil	50 g
• 1 L beaker	2	• Alum	10 g
• 1 L measuring cylinder	1	• Glass rod	1
• 250 mL beaker	4	• Stopwatch	1
• 1 mL plastic syringe	1	• Labels	a few
• Spoon	1	• Universal pH paper	a few



(C) Conduct the experiment

(1) Preparation of cloudy stock solution

In a 1L plastic bottle, place 50g of topsoil and 1,000mL of water. Screw the cap on the bottle and shake it well for one minute. Pour the cloudy water into a 1L beaker. Skim the suspended and undissolved dirt with a spoon. After removing the suspended dirt, pour the water back into the 1L plastic bottle for storage. Label it as 'cloudy stock solution'.

(2) Preparation of alum solution

Weigh 10g of alum and dissolve it in 1,000mL water to make the alum stock solution in a 1L beaker. 1mL of this solution should contain approximately 10 mg of alum. Keep the alum stock solution capped to prevent evaporation. Label it as alum solution.

(3) Testing of pH value

Use a 1L measuring cylinder to add 400mL cloudy stock solution into a 1L beaker. Use a piece of universal pH paper to test its pH value and fill in the table in Step (6).

(4) Determination of the most appropriate alum dosage

Add 100mL of the cloudy stock solution tested above to each of the four 250mL beakers. Add the prepared stock solution of alum to each beaker with specific amounts of the solution by using a 1mL plastic syringe. The following table shows the amount of alum solution in each beaker and the alum dosage.

Beaker no.	Amount of alum solution (mL)	Alum dosage (mg/100 mL cloudy stock solution)
1	0	0
2	0.5	5
3	1	10
4	1.5	15

(5) After adding the alum solution into each beaker, stir the solution with a glass rod for 30 seconds and allow it to settle. Use a stopwatch to measure the time taken for the settling process (around 30 minutes). Observe the formation of floc in the beakers. Write down your observations and determine which beaker has the best settling result (with clearest water above the floc). If no results are noticeable, increase the alum dosage (2mL each time) and use the table in Step (6) to record the conditions of four beakers. Please note that insufficient alum dosage cannot reduce the cloudiness of water in the beakers and may result in little or no floc and sediment.

Over dosage of alum will result in the formation of a dense fluffy floc which will not settle well and will stay in suspension. The beaker with an appropriate dosage of alum (coagulant) will cause pollutants to form a floc and settle to the bottom, and the water above it becomes clear.

(6) Record and analyse the results of the experiment:
Arrange the four beakers in order of the clarity of water:

A laboratory technician is adding the alum solution into the beakers.

pH value	Additional alum solution (mL)	The clearest → The cloudiest			
		Beaker no.	Beaker no.	Beaker no.	Beaker no.

Conclusion: Before discharging sewage into the sea, it is more appropriate to add _____ for treatment. The advantage is that _____

_____

_____ .

Worksheet (6)

Visiting sewage treatment works

A. Before the visit

You will visit the _____ Sewage Treatment Works.

What do you imagine the sewage treatment works in Hong Kong look like? (For example, What does the entrance of the treatment works look like? What are the essential processes of sewage treatment?)

B. During the visit

Information given in the presentation:

List five main points of the presentation.	1. 2. 3. 4. 5.
Do you have questions about sewage treatment? Prepare at least three questions.	1. 2. 3.

C. After the visit

Draw a simple flow diagram in the space below to illustrate the treatment process.

D. Discuss the following questions

1. Compare the actual sewage treatment process with those that you imagined before the visit. What procedures have you left out? Which of these you have imagined do not actually exist?

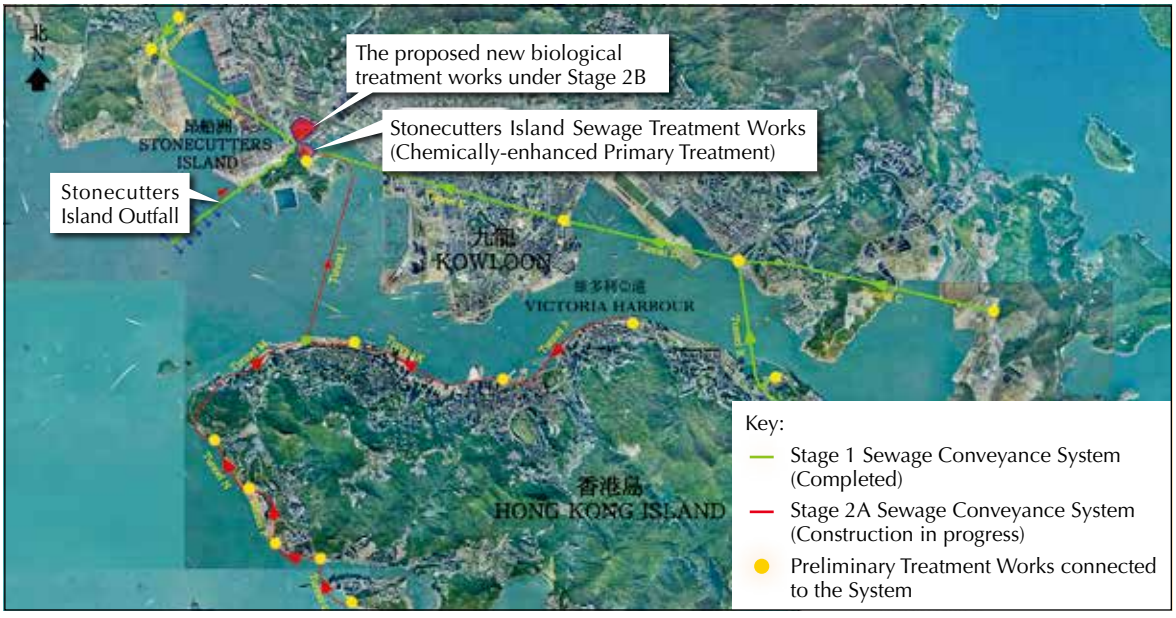
2. Do you think these procedures are important for sewage treatment? Explain.

Sewage treatment strategy: The Harbour Area Treatment Scheme

What is the Harbour Area Treatment Scheme?

Basic Knowledge

In order to improve the water quality of Victoria Harbour, the Government has launched the Harbour Area Treatment Scheme (HATS). The scheme coordinates the sewage collection and treatment on both sides of the harbour. Given the size of the catchment area, the implementation has been split into stages. The first stage was completed and commissioned in December 2001. Stage 2 projects are divided into two sub-stages. Stage 2A works commenced in July 2009, and the facilities are expected to be commissioned in 2014. Stage 2B works are still under planning by the Environmental Protection Department.



Distribution of facilities of the Harbour Area Treatment Scheme

Background of the implementation of the scheme

Like many Asian countries, the population of Hong Kong has been growing rapidly since the Second World War. In only sixty years, the population has increased nearly 12-fold to almost 7.2 million by the end of 2012. The continuous population growth has resulted in a dramatic increase in economic activities and the amount of sewage. Every day, Hong Kong produces about 2.9 million cubic metres of sewage, enough to fill up 1,160 standard-size swimming pools.

The Harbour Area Treatment Scheme is a massive project that collects and treats sewage generated from both sides of Victoria Harbour. Its objective is to improve the water quality of Victoria Harbour. Before the implementation of the Harbour Area Treatment Scheme, all sewage from Tseung Kwan O, urban areas in Kowloon, Kwai Chung, Tsuen Wan, Tsing Yi and Hong Kong Island only received screening treatment before being discharged directly into Victoria Harbour through the submarine outfalls. This was the main reason for deteriorating water quality of the Harbour.

The Harbour Area Treatment Scheme collects sewage generated from both sides of Victoria Harbour. Grit and relatively large solid waste are removed at preliminary treatment works. Then, the sewage is conveyed through deep sewage tunnels to the Stonecutters Island Sewage Treatment Works for chemically-enhanced primary treatment. The treated sewage is chlorinated for disinfection and is discharged into the western part of Victoria Harbour after dechlorination. The sludge produced in the process of sewage treatment is then transported to landfills after dewatering.

The construction of deep sewage outfall shafts at Stonecutters Island (left) and Sai Ying Pun (right) under the HATS Stage 2A

Costs of HATS Stage 2

Stage 2 has been divided into two sub-stages. The facilities of Stage 2A aim to collect the remaining sewage in the catchment area of Victoria Harbour and disinfect all effluent discharged from the Stonecutters Island Sewage Treatment Works to reduce pollution in the surrounding waters. The facilities of Stage 2B will provide a higher level of biological sewage treatment. Stage 2A works cost about HK$17 billion for construction and HK$420 million a year to operate.

A phased approach helps to ease the pressure on Government expenditure. The timing for implementation of Stage 2B will be subject to further review.

Reviewing the effectiveness of the Harbour Area Treatment Scheme Stage 1 and Stage 2A

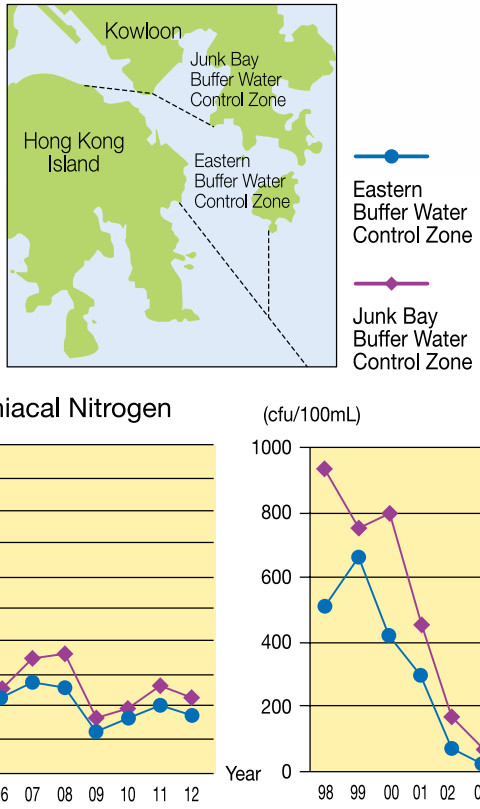
Basic Knowledge

Facilities built in Stage 1 collect about 75% of the sewage produced on both sides of Victoria Harbour, including Tseung Kwan O, all urban areas in Kowloon, Kwai Chung, Tsuen Wan, as well as Tsing Yi, Chai Wan and Shau Kei Wan on Hong Kong Island. It is then conveyed to the Stonecutters Island Sewage Treatment Works for treatment and discharge. Since the commissioning of Stage 1, the water quality of Victoria Harbour has gradually improved, especially in the eastern part of the harbour.

The Stonecutters Island Sewage Treatment Works commissioned under Stage 1 works

Currently, about 1.4 million tonnes of sewage from both sides of the harbour is collected and treated by the Stonecutters Island Sewage Treatment Works every day. This prevents about 600 tonnes of sewage sludge and its pollutants from being discharged into the harbour. Various harmful substances including Un-ionized Ammoniacal Nitrogen and E. coli have obviously been reduced, and the water quality continues to improve.

To further comprehensively improve the water quality of Victoria Harbour, the remaining 25% of sewage from northern and southwestern Hong Kong Island must be collected and treated. This is the major objective of the Harbour Area Treatment Scheme Stage 2A. Upon the completion of Stage 2A, all sewage from both sides of Victoria Harbour will be screened and the grit will be removed in preliminary treatment works. Afterwards, the sewage will be conveyed through deep sewage tunnels to the Stonecutters Island Sewage Treatment Works for chemically-enhanced primary treatment and disinfection before being discharged into the sea.



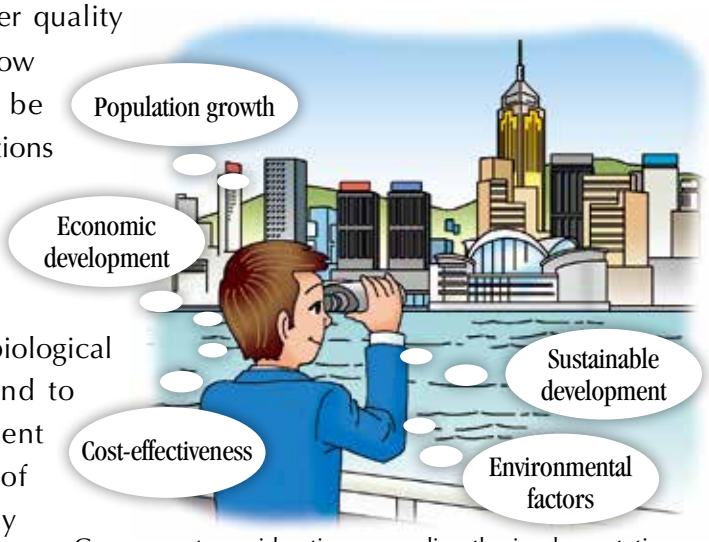
Since the commissioning of the HATS Stage 1, the water quality of Victoria Harbour has been improving continuously, particularly in the eastern region.

Source: Environmental Protection Department

The planning of the Harbour Area Treatment Scheme Stage 2B

Basic Knowledge

The Government will review the water quality trends, growth in population and sewage flow before deciding when Stage 2B should be implemented. In the review, public aspirations for a cleaner harbour and how to implement the Polluter Pays Principle will be taken into account.



Government considerations regarding the implementation of the Harbour Area Treatment Scheme

Stage 2B will involve the addition of biological treatment facilities on Stonecutters Island to achieve a higher level of sewage treatment and further improve the water quality of Victoria Harbour. When the scheme is fully implemented, we will be able to achieve sustainable improvements in the water quality of Victoria Harbour.

Worksheet (7)

Should the Harbour Area Treatment Scheme Stage 2B be implemented?

1. Using the information below, discuss from different perspectives whether the Harbour Area Treatment Scheme Stage 2B should be implemented. Draw a mind map or a concept map in the space below.

	Factors	Explanation
Economy	Effectiveness	How the community will benefit from the project
	Cost	The cost and land required by the project
Environment	Positive impact	Environmental improvement
	Negative impact	Impact on the environment and ecology
Society	Demand	How the project can satisfy social demand
	Social concern	The concerns and worries of different stakeholders in the society

2. Different stakeholders have different views on the Harbour Area Treatment Scheme Stage 2B. Use the following table to organise the ideas.

Stakeholders	Views on the scheme*	Reasons
 Residents on both sides of Victoria Harbour	Worried / A wait-and-see attitude / Support	
 Harbour protection groups	Worried / A wait-and-see attitude / Support	
 Government departments	Worried / A wait-and-see attitude / Support	
 Legislative Councillors	Worried / A wait-and-see attitude / Support	
 University academics	Worried / A wait-and-see attitude / Support	

* Circle the views that you think they have on the scheme.

3. Do you think the Harbour Area Treatment Scheme can facilitate a sustainable future for Hong Kong? Make an analysis using the framework below. If you think it can bring a positive contribution to a particular aspect, put a '✓' in the box. If not, put a '✗'. If both are possible, put a '▲'. If there is no direct relationship, put a 'O'. Students can give a brief explanation under the symbol.

Impact on sustainable development		Aspects that could be impacted upon		
		Economy	Environment	Society
Quality of life	Basic necessities			
	Economic development			
The use of resources				
Monitoring				

Extension

Draft a proposal on the topic 'We can all benefit from a clean Victoria Harbour'.

Sewage treatment strategy: Wastewater reuse

Worksheet (8)

Reuse of domestic wastewater

1. How to reuse domestic wastewater? Write in the spaces below.

Method 1

Method 2

Method 3

Method 4

2. Referring to the information below, discuss with your classmates how untreated wastewater can be reused in the community. Write the results of your discussion in the spaces below.

Apart from reusing water (grey water) drained away from wash basins for toilet flushing, eco-friendly toilets in Kadoorie Farm have introduced a waterless urinal system to save water. Natural microscopic organisms (microbes) are captured in small cubes that kill odour-causing bacteria without water.

Source: Kadoorie Farm
http://www.kfbg.org.hk/kfb/introwithreport_txt.xml?fid=168&sid=308&lang=en

Method 1

Method 2

Method 3

Method 4

3. Referring to the information below, discuss with your classmates how wastewater can be reused after sewage treatment and disinfection. Write the results of your discussion in the spaces below.

The Ngong Ping Sewage Treatment Works (NPSTW), which came into operation in late 2005, has introduced a pilot scheme of reclaimed water use. Being the first tertiary treatment plant in Hong Kong to reuse effluent, NPSTW makes use of advanced physical, biological, filtering and disinfection processes. The treated sewage is clear, odourless, high quality and can be used for a wide range of non-potable uses.

This fish pond inside the Ngong Ping Sewage Treatment Works uses 'reclaimed water' to rear fish.

Method 1

Method 2

Method 3

The Polluter Pays Principle

To treat sewage and maintain the water quality of Victoria Harbour, the Drainage Services Department has adopted different levels of sewage treatment and introduced other strategies to facilitate a more sustainable future. For example, the 'Sewage Services Charging Scheme' was introduced to implement the Polluter Pays Principle.

According to the principle, in addition to water charges, users must also pay for sewage treatment. In this way, the public will become more aware of the sewage load on the treatment system and the toll on the natural environment; and thus, to cut down on water use and the strength of effluent so as to pay less charges.

Implementation of the charging scheme

Basic Knowledge

The Polluter Pays Principle was first widely discussed at the United Nations Conference on Environment and Development held in Rio de Janeiro, Brazil in June 1992. The principle was endorsed by the representatives of attending countries. The Sewage Services Charging Scheme was later introduced in Hong Kong on 1 April 1995. The scheme comprises two components——a Sewage Charge and a Trade Effluent Surcharge, the calculation of both is based on the volume of water consumed.

Sewage Charge —— The aim of introducing Sewage Charge is to recover the cost of collecting and treating wastewater at or below domestic strength. Water users, whether residential or industrial and commercial users, whose premises are connected to public sewers, are required to pay Sewage Charges. Like the water tariff, domestic consumers receive an exemption of the first 12 cubic metres of water consumed for every four monthly consumption period. Also, flushing water accounts are exempted from the Sewage Charge.

The Sewage Charge is listed on the water bill.

Trade Effluent Surcharge (TES) —— TES is levied on industrial and commercial consumers who discharge effluent at a strength stronger than that of domestic sewage. The TES rate, based on the Chemical Oxygen Demand values, aims at recovering the cost of treating such wastewater. Currently, the number of trades which are required to pay the trade effluent surcharge has been reduced from 30 to 27. Members of a trade may enjoy a revised TES rate and pay less if they can demonstrate the strength of the effluents they discharged is weaker than that prescribed.

Restaurants have to pay the Trade Effluent Surcharge

To maintain a modest charging level that the public can afford, the Government has only considered the operating and maintenance costs of public sewage facilities when setting the charge; while the construction costs of these facilities continued to come from the public purse. Currently, most big cities have introduced the sewage charge. According to a Sewage Charges Study in 2003, the Sewage Service Charges in Hong Kong are much lower than that of Europe, North America and Tokyo.

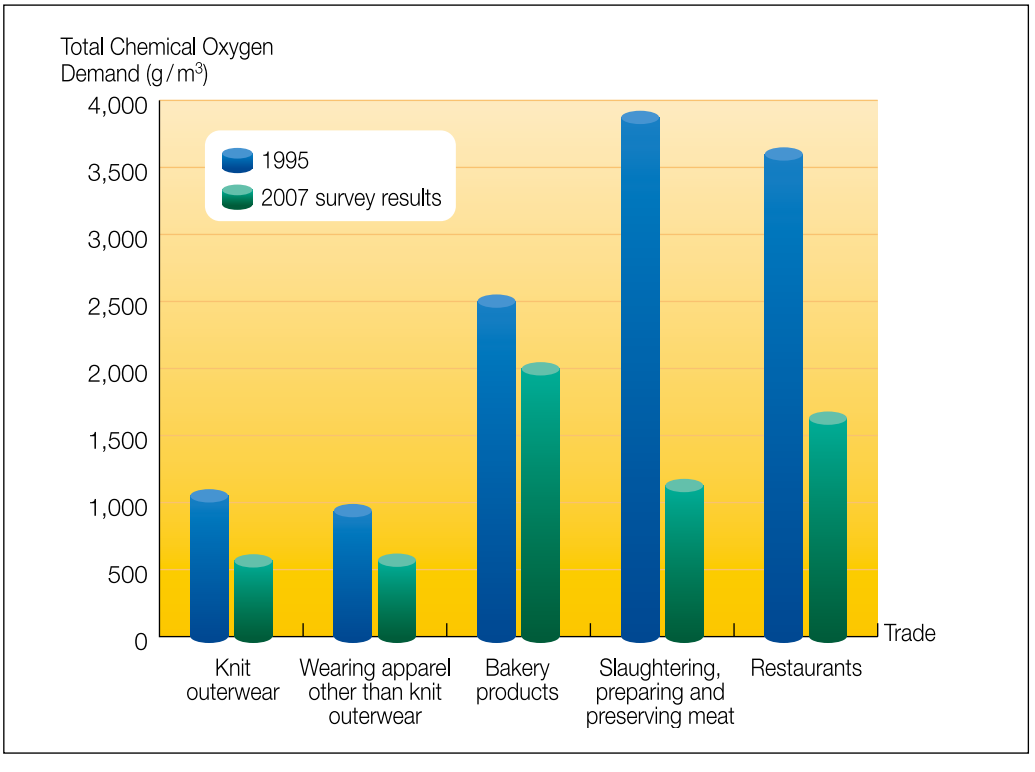
Results of the implementation

Basic Knowledge

In recent years, with the rising environmental awareness of people from all walks of life, the Government has also organised workshops and talks for different trades to assist them in controlling the sewage load and reducing the effluent strength. In 2007, the Government completed a sample survey on the effluent strength of 30 trades required to pay the trade effluent surcharge. Results have shown that the effluent strength of most industrial and commercial users has been reduced, when compared with the situation before the legislation was promulgated. Among them, the effluent discharged by the 'restaurant trade' (which accounts for 80% of all TES paying trade) has been greatly improved. The operators of 'Bleaching and dyeing of garments', 'Textile stencilling and printing' and 'Laundries' are no longer required to pay the trade effluent surcharge, as the strength of sewage was not stronger than that of domestic sewage.

Trade, business or manufacture	Total Chemical Oxygen Demand (g / m^3)	
	1995	2007 survey results
Knit outerwear	1,051	566
Wearing apparel other than knit outerwear	990	566
Bakery products	2,500	2,000
Slaughtering, preparing and preserving meat	3,870	1,129
Restaurants	3,600	1,630

The strength of the effluents of the five major industries has improved.



Comparison of the effluent strength of the five major industries in 1995 and 2007

In addition to the implementation of the Sewage Services Charging Scheme, the Government is committed to further raise the environmental awareness of the public and the commercial and industrial sectors through education, publicity, and cooperation with green groups and environmental consultants. The objective is to encourage active reduction in water consumption and the strength of effluent, as well as rational use of natural resources, so as to facilitate the sustainable development of Hong Kong.

Let's Think

1. What do you think about the effectiveness of the Polluter Pays Principle? What are the pros and cons of using economic incentives to reduce pollution?
2. Are you willing to bear the cost of sewage treatment?

Worksheet (9)

Sewage reduction starts with me

State your goals and actions to reduce sewage.

Sewage reduction starts with me	
Goals	Actions