Stream Pollution

Enquiry Skills Approach, Version 1.0

A. Planning and Preparation

Objectives
1. To examine the water quality in the study area.
2. To locate and identify the sources of pollution, and discuss the remedial measures of the problems.
3. To examine the environmental quality of rural landscape affected by nearby land uses.

Scope of the Study
1. Chuen Lung
2. Tai Tso Stream

Field Work Plan

Field Work

1. Refer to Map 1.1.
2. In figure 1.2
   a) mark the land uses in the vicinity of the sites with color pencils,
      i) Green - Agricultural   ii) Red - Commercial   iii) Blue - Residential   iv) Yellow - Industrial
      (Students are advised to go about 100m - 200m upstream to see what the land use is.)
3. At each site,
   a) complete Table 1.1.
   b) conduct water tests (including temperature, pH value and total dissolved solids) in each site and record the data in Table 1.2.
   c) collect a bottle of stream water back to the laboratory for tests (including dissolved oxygen (D. O.) and ammonia content).

Laboratory Work

L1   Dissolved Oxygen Test
1. Pour the water samples into corresponding conical flasks provided.
2. Put the probe of the Dissolved Oxygen meter into the conical flask.
3. Turn on the switch and wait for the reading.
4. Record the reading in Table 1.2.

L2   Ammonia Test
1. Collect a filtered 25 ml water sample into a boiling tube. (Use filter paper, beaker and measuring cylinder.)
2. Add 1 ml of solution C (Nessler's reagent) in it.
3. Agitate the mixture for 30 seconds.
4. A YELLOW colour indicates the presence of ammoniacal nitrogen.
5. Assess the concentration of ammonia by using the spectrophotometer provided.

> **Think About**
> List the safety risks when conducting river fieldwork.

B. Data Collection

Data Items
1. Characteristics of stream appearance (including water level, floating matter, turbidity, etc.)
2. Other properties of stream water (including pH, total dissolved solids, dissolved oxygen, etc.)

Data Collection Method
1. Subjective Sampling

Equipment List(Field Work)

Items	Quantity	Checked	Returned
1. Base map (Individual)	x1	❏	❏
2. Clipboard (Individual)	x1	❏	❏
3. Compass (Individual)	x1	❏	❏
4. Cloth	x2	❏	❏
5. Deionised water (Wash bottle)	x1	❏	❏
6. Forcep	x1	❏	❏
7. pH meter	x1	❏	❏
8. Beaker	x1	❏	❏
9. plastic bottle	x1	❏	❏
10. Rubber gloves	x4	❏	❏
11. Sampling bottle	x4	❏	❏
12. Total dissolved solids (TDS) meter	x1	❏	❏
13. Test tube	x1	❏	❏
14. Thermometer	x1	❏	❏
15. 'X' mark paper	x1	❏	❏
16. Colour Pencils	x1	❏	❏

Equipment List (Laboratory Work)

1. Beakers	6. Measuring cylinder
2. Boiling tubes	7. Solution C
3. Dissolved oxygen meter	8. Spectrophotometer
4. Filter funnel	9. Test tubes
5. Filter paper	

Think About
List possible errors when collecting data.

Data Recording Sheet

Data Sheet:

Group: _____   Date:_____   Time: _____

Site: _____   Observable sewage discharge point(s): Yes/ No

Present weather:

1. Day before the study: Sunny / Rainy / Cloudy / Windy / _____

2. Today: Sunny / Rainy / Cloudy / Windy / _____

General description of the site: _____

_____

Table 1.1 - Characteristics of Stream Appearance

1.	Water level	❏ Full	❏ Normal	❏ Low	
2.	Floating matter Type: _____ [1]	❏ None	❏ Some	❏ Plentiful	❏ Abundant
3.	Suspended sediments	❏ None	❏ Some	❏ Plentiful	❏ Abundant
4.	Green algae[2]	❏ None	❏ Some	❏ Plentiful	❏ Abundant
5.	Sewage fungi[2]	❏ None	❏ Some	❏ Plentiful	❏ Abundant
6.	Colour	❏ Clear	❏ Less clear	❏ Brown	❏ Black
7.	Turbidity[3]	❏ Clear	❏ Fairly low	❏ Moderate	❏ High
8.	Smell	❏ None	❏ Some	❏ Moderate	❏ Strong

Remarks:
1. Oil, foam, faecal matter, plastic bags, etc.
2. Note the location and quantity.
3. Fill a test tube with stream water and view from above to see how clearly visible the cross drawn on the white paper is.

Table 1.2 - Other Properties of Stream Water

1. pH: _____   2. Temperature: _____ $^\circ$C

3. Total Dissolved Solids (TDS): _____ ppm   4. Dissolved Oxygen: _____mg/L

5. Ammonia Content: _____ ppm

C. Data Processing, Presentation and Analysis

1. According to Table 1.3, convert the findings on characteristics of stream (Table 1.1) into 4-point-scale marks.
2. According to Table 1.4, convert the properties of stream water (Table 1.2) into 5-point-scale marks.
3. By referring to Table 1.5, mark the findings of all sample points in Table 1.6, and then assess the degree of stream pollution at each sampling point.
4. Using an appropriate method, show the degree of pollution along the stream on base map.

Think About

List the differences between qualitative and quantitative data.

Table 1.3 - 4 -Point Scale (on characteristics of stream)

Items	0	1	2	3
Floating matter	None	Some	Plentiful	Abundant
Suspended sediments	None	Some	Plentiful	Abundant
Green algae	None	Some	Plentiful	Abundant
Sewage fungi	None	Some	Plentiful	Abundant
Colour	Clear	Less clear	Brown	Black
Turbidity	Clear	Fairly low	Moderate	High
Smell	None	Some	Moderate	Strong

Table 1.4 - 5-Point Scale (on other properties)

Assessment Unit	0	1	2	3	4
Ammonia Content (ppm)	<1 (very low)	1 - <10 (low)	10 - <20 (moderate)	20 - <30 (high)	>=30 (very high)
Dissolved Oxygen (mg/L)	>7.5 (very high)	7.5 - >5.0 (high)	5.0 - >3.5 (moderate)	3.5 - >2.0 (low)	<=2.0 (very low)
Total dissolved solids (ppm)	<50 (very low)	50 - <100 (low)	100 - <200 (moderate)	200 - <400 (high)	>=400 (very high)

Table 1.5 - Degree of Pollution

Assessment Unit	Pollution level
less than 5	clean
5 -10	slightly polluted
11-15	moderate polluted
over 15	severely polluted

Table 1.6 - Summary of Scores of Sampling Points

	Site 1	Site 2	Site 3	Site 4
Floating matter				
Suspended sediments				
Green algae				
Sewage fungi				
Colour				
Turbidity				
Smell				
Ammonia content				
Dissolved Oxygen				
Total dissolved solids				
Total score				
Pollution level				

Table 1.7 - Summary of Total Scores of Sampling Points

Group	Site 1	Site 2	Site 3	Site 4
1				
2				
3				
4				
5				
6				
7				
8				

D. Interpretation and conclusion

1. From the aspects of channel characteristics and landuse, explain the causes of stream water quality in site 1.

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2. From the aspects of channel characteristics and landuse, explain the causes of stream water quality in site 2.

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3. From the aspects of channel characteristics and landuse, explain the causes of stream water quality in site 3.

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4. From the aspects of channel characteristics and landuse, explain the causes of stream water quality in site 4.

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E. Evaluation

1. Other than the data collected in this course, suggest other data and information you might need to further investigate the stream pollution in Chuen Lung. Explain your answer.

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