明愛陳震夏郊野學園
Caritas Chan Chun Ha Field Studies Centre

Student Name: _____ **Group no.:** _____

Course Date: _____

Course Objectives

Knowledge:
1. To identify the characteristics of river courses and the associated landform features.
2. To relate the exogenic fluvial processes with the characteristics of river channel and the associated landform features.
3. To analyze how human factors (river management strategies and land use) affect the characteristics of river channel.

Skills:
1. To use different equipment to collect data of channel characteristics.
2. To draw the cross section.

Value:
1. To appreciate the natural beauty of rivers.
2. To respect and treasure the intimate relationship between rivers, ecosystem and settlement.
3. Aware the importance of water quality to water resources of China and H.K.

Relevance to DSE Geography Curriculum

✓ Managing river environment: A continuing challenge

Stage 1: Planning and preparation

➢ Key point of fieldwork: Fluvial processes in different river courses

➢ Hypothesis: propose some hypotheses about the differences between upper course and lower course of a river

Hypothesis relating to fluvial processes:

Channel gradient: it is _(steeper / gentler)_ in upper course

Average river velocity: it is _(faster / slower)_ in upper course

Channel width: it is _(wider / narrower)_ in upper course

Channel depth: it is _(deeper / shallower)_ in upper course

Size of bed load: it is _(larger / smaller)_ in upper course

➢ When to collect data?

Date		What factors would you consider in choosing the fieldwork date?
Time		
Season		
Precipitation three days before the fieldwork	Heavy Rain / Drizzle / No Rain	
Weather conditions		

What are the merits and demerits of conducting such a field study today?

➢ Where to collect data?

Field site	River Silver A / B / C / D and Wang Tong R / S
Sampling frame	Point / Line / Area

What factors are considered when choosing the field site?

➢ What data to be collected?

Refer to p.4 and match the appropriate primary data collection methods and equipment to the research items.

	Research items	Primary data collection methods	Required equipment / Tool (if any)	Operational precautions
Related to fluvial process	1. River bed			
	2. River velocity			
	3. Size of bed load			
	4. Channel width			
	5. Channel depth			
	6. Channel gradient			
River water quality	7. Water turbidity			
	8. Water and air temperature			
	9. pH value			
	10. Conductivity			
	11. Green algae			
Other	12. River management strategies			
	13. Fluvial landform features			
	14. Surrounding land use			

* A towel is given to dry up the equipment.

Primary data collection methods

A. Observation	**B. Measurement**	**C. Counting**	**D. Category**	**E. Distribution (Mapping)**
F. Scoring	**G. Field sketching**	**H. Questionnaire**	**I. In-depth interview**	

Equipment / Tools

1. digital thermometer

2. table tennis ball

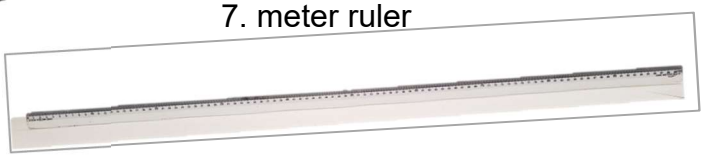
3. conductivity meter

4. pH meter

5. stop watch

6. measuring tape

7. meter ruler



8. Abney level

9. sampling bottle (transparent)

Stage 2: Data Collection

Site _____

Students are divided into groups. Within the group, some students measure fluvial process data in the river. The rest of the students are responsible for recording water quality, land uses and river management strategies.

A. Record of water quality data

1. **Water turbidity** : Clear / A little / Turbid / Very turbid
2. **Water temperature** : _____℃ **Air temperature** : _____℃
3. **pH value** : _____
4. **Conductivity** : _____ppm (parts per million)
5. **Green algae** : None (0%) / Some (1-20%) / Plentiful (21-50%) / Abundant (>50%)

What should you pay attention when taking samples?

B. Record of fluvial process data

1. River bed : Rocky / Sandy / Muddy / Weedy

2. Size of bed load: pick up 5 bed load with typical size in your site and measure the length of axis B. (Refer to Figure 1)

Which sampling method should be used to pick up representative bed load?

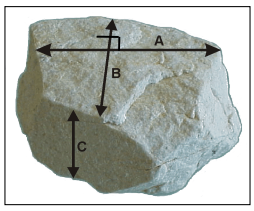
(Systematic / Convenience / Purposive / Stratified / Simple random) sampling

Sample	1	2	3	4	5	Average diameter (mm)	Major types of bed load
Diameter(mm) *							

* Mark as "<1mm" for those grains which have diameter of less than 1mm

Classification of bed load

Type of bed load	Boulder	Cobble	Pebble	Granule	Sand
Diameter(mm) *	>256	>64-256	>4-64	>2-4	0.06-2



←Figure 1: How to measure a bed load (appropriate for pebble or bigger)

Axis A is the longest axis.
Axis C is the shortest axis.
Axis B is the axis perpendicular to axis A.

What is the limitation of measuring small sizes of bed load by using the meter ruler?

_____

_____

Are there any other tools that can improve this limitation?

_____

3. Channel width: _____m

4. Channel depth: (0.5m per interval)

Location	Depth (cm)	Location	Depth (cm)	Location	Depth (cm)	Location	Depth (cm)	Location	Depth (cm)
0.0m		3.0m		6.0m		9.0m		12.0m	
0.5m		3.5m		6.5m		9.5m		12.5m	
1.0m		4.0m		7.0m		10.0m		13.0m	
1.5m		4.5m		7.5m		10.5m		13.5m	
2.0m		5.0m		8.0m		11.0m		14.0m	
2.5m		5.5m		8.5m		11.5m		14.5m	

The deepest depth (cm): _____

The average depth (cm): _____

What sampling method did you use in measuring the channel depth?

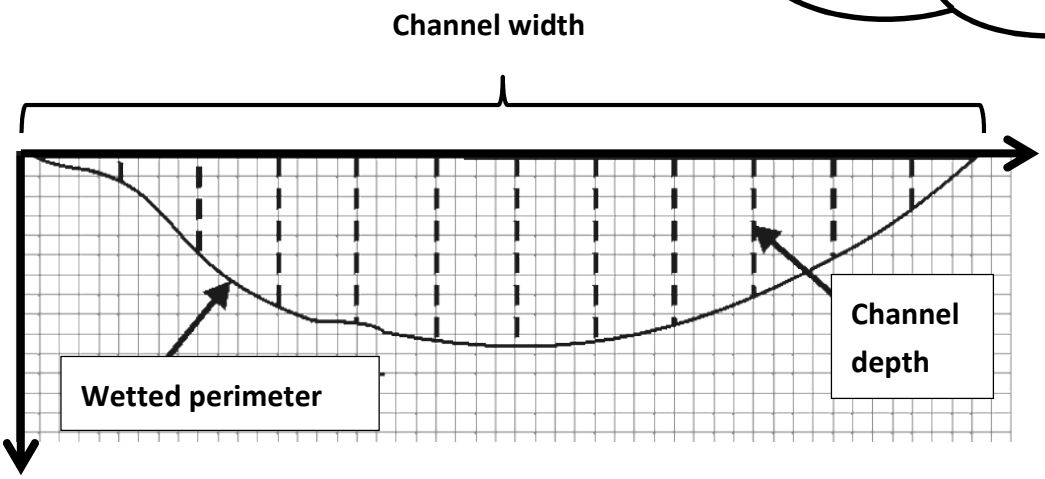
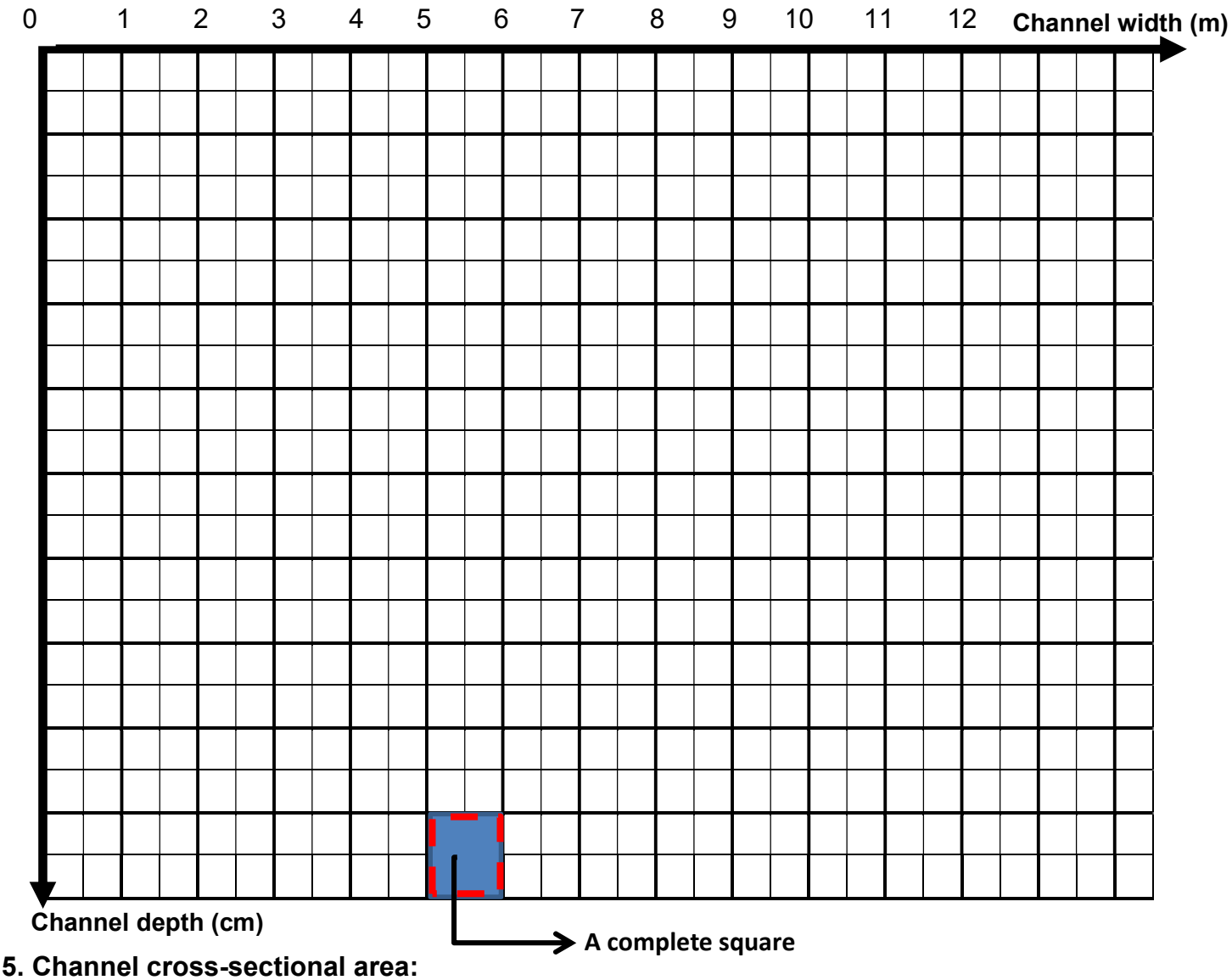


Figure 2: Cross-section of a river channel.

Shape of river bed

Draw a cross section of the channel for **Site** _____ (refer to Figure 2)：



5. Channel cross-sectional area:

(Method 1) Use "counting squares" method to find out the channel cross-sectional area.

Square	The area of a square	Total no. of square(s)	Total area
A complete square:	_____X_____ =_____ m^2	_____ square(s)	(The area of a complete square X total no. of square(s)) =_____ m^2
An incomplete square:	The area of a complete square/2 = _____ m^2	_____ square(s)	(The area of an incomplete square X total no. of square(s)) =_____ m^2

■ The channel cross-sectional area is

Total area of complete square(s) + Total area of incomplete square(s) =_____m^2

(Method 2) Another method to calculate the channel cross-sectional area:

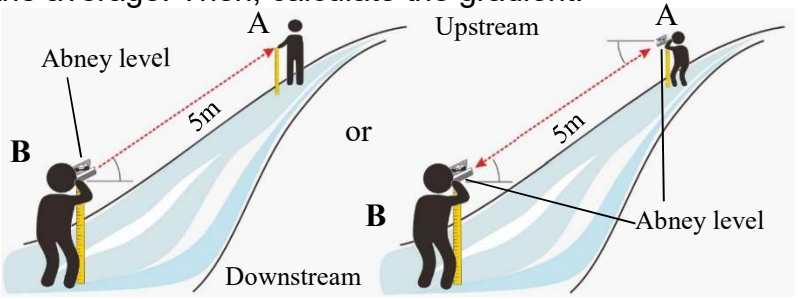
Channel width _____(m) X Average channel depth_____ (m) = _____m^2

Which method is more accurate?

6. Channel gradient

Student A and student B find a five-meter interval by the measuring tape. Holding the Abney level on the top of meter rule, student B at downstream finds out the slope angle by observing the top of another meter ruler held by student A. If there are two groups in the same field site, one group measures the angle of elevation from downstream and another group measures the angle of depression from upstream and then takes the average. Then, calculate the gradient.

Angle	tan θ	Channel gradient
		1 : _____



Gradient = tan θ

e.g. if $\theta = 8^o$, gradient = tan 8^o

$= 0.14 = \frac{0.14}{1} = \frac{0.14 \div 0.14}{1 \div 0.14} = \frac{1}{7.14}$

$= 1 : 7.14$

Are there any difficulties in measuring river velocity?

7. River velocity:

Table tennis ball traveling time for 1 meter (seconds)		River velocity (m/sec) (rounded off to 2 decimal places)	Adjust the result by the "float fudge factor"
e.g.	20 seconds	1m / 20sec = 0.05m/sec	
1			**Average river velocity** =Average X 0.8 =_____m/sec×0.8 = _____m/sec *(Rounded off to 2 decimal places)*
2			
3			
4			
5			
	Average =	m / sec	

Why does the result need to be adjusted?

8. River discharge

Calculate the river discharge by using the channel data collected. Show your calculation steps.

■ The river discharge = river velocity (m/s) X channel cross sectional area (m^2)

= _____ m^3/s

C. Record of river management strategies and land uses

1. River management strategies (for (a-h) put a '✓' where appropriate) 2. List the landform features in (i) that are found	River Silver				Wang Tong	
	A	**B**	**C**	**D**	**R***	**S***
a) Channeli-sation 						
b) Weir 						
c) Concrete frame with soil sacks 						
d) Gabion 						
e) Fish ladder 						
f) Remote monitoring system 						
g) Monitoring and warning signs						
h) Others: River management strategies (if any, please specify)						
i) Fluvial landform features (if any, please specify)						

*** Can be adjusted according to time available**

D. Land use along the field route (✓ the appropriate land use)

	River Silver				Wang Tong	
Land use	**Around Site A**	**Site B to Site A**	**Site C to Site B**	**Site D to Site C**	**Site R to Site S***	**Around Site S**
Commercial						
Residential						
Industrial						
GCI#						
Recreational						
Agricultural						
Abandoned						
Vacant						
Work in progress						

*** Can be adjusted according to time available**

#GCI stands for government, community and institution

Stage 3: Data Processing and Presentation

1. Calculate the average river velocity (p.8) and the average size of bed load (p.5)

2. Draw the channel cross section (p.7) and calculate the channel cross-sectional area (p.7) and the river discharge (p.8)

3. Calculate the channel gradient (p.8)

4. Fill in the following data summary table

Summary of Data

Group									Compare with typical river (✓=similar ×=different)
Site									
Course (Upper /Middle/ Lower)									
River bed									
Average diameter of Bed load (mm)									
Channel width (m)									
Channel average depth (cm)									
Cross sectional area (m^2)									
River velocity (m/s)									
River discharge (m^3/s)									
Channel gradient									
Water turbidity									
Water temperature (℃)									
Air temperature (℃)									
pH value									
Conductivity (ppm)									
Green algae									

Based on the hypothesis and primary data collected, what types of diagram should we use to present?

1. Hypothesis relating to fluvial processes (P.2)	▪ I can use _____ (a diagram) to present the changes of fluvial process from site A to site D.

2. Land use related data (P.10)	▪ I can use _____(a diagram) to display the distribution of land use.

After completing the data processing for the above items, please select one item and describe your data processing steps.

Stage 4: Data Interpretation & Conclusion

Discussion Questions

1. With reference to the summary of data (p.11), explain whether the hypotheses in p.2 are correct:
   a) Channel gradient
   b) Average river velocity
   c) Channel width
   d) Channel average depth
   e) Size of bed load

2. Describe the differences of river management strategies in the following field sites. Explain.
   a) Site A and B vs Site C and D
   b) Site C and D vs Site R and S

Stage 5: Evaluation

1. Does the data collected respond to the enquiry question?
   i. Analyze the drawbacks of the data collection process and how such drawbacks affect the validity and reliability of data.
   ii. Propose ways to tackle the influences brought by the above drawbacks.

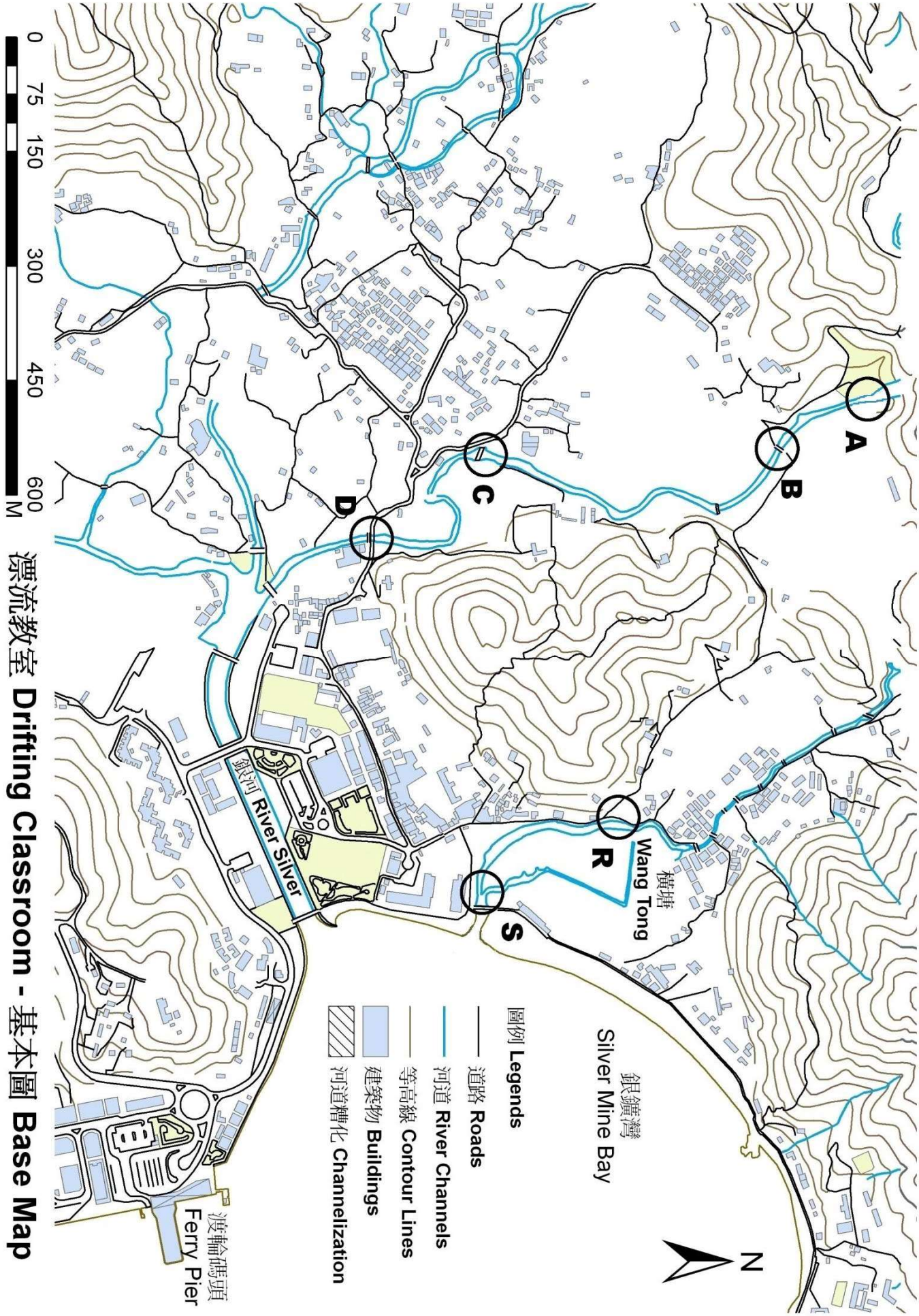
Factors affecting the data reliability and validity		Suggestion for improvement
Fieldwork date/ time ◆ Fieldwork date and time representative? ◆ Any impact by today's weather condition?		
Field site/ study area ◆ Field sites match with research topic? ◆ Field study area adequate?		
Location of data collection (Sampling) ◆ Sampling method in choosing field site appropriate? ◆ Location of measurement representative? ◆ Sample size sufficient?		
Data collection items/ methods ◆ Data collection items adequate to respond the enquiry questions? ◆ Are the data obtained from the data collection method(s) objective and without bias? ◆ Any inadequacy about the equipment/ instruments? ◆ Measurer using the equipment/ instruments correctly?		

2. According to today weather and season, point out one advantage and one limitation of the fieldwork about “fluvial processes” today. How can you overcome this limitation?

3. Today, the data collected is focusing on “the fluvial process”. We need to have further study for a better understanding about the river environment. Choose one of the following topics and elaborate your study plan (e.g. field site / date / time / data collected / field methods / sampling methods):
   a) River management strategies
   b) Water quality

4. What water monitoring items can help us further study river water pollution in Mui Wo?

Homework:
After the fieldwork, please organize this fieldwork experience in field trip diary on p.16-17, as a reference for the revision of field-based question.



漂流教室 Drifting Classroom - 基本圖 Base Map

My Field Trip Diary

- Related modules: **Managing River and Coastal Environment : A continuing challenge**
- Key point of fieldwork/topic: _____

▪ Date:_____ (Weekday/ Public holiday) ▪ Time:_____ ▪ Field site: _____	▪ Weather condition:
Is the above planning appropriate for the fieldwork?	

- Primary data:

Data collection method	Data collected	Equipment/ Material (if any)	Merits☺/Demerits☹ of the data collection method (give examples)	Suggestion for improvement (give explanations)

➢ Secondary data:

Data collected	Use	Data obtained from
Apart from the above, what other secondary data could be used for further investigation?		

➢ Sampling method (if any):

Sampling method	Applied in the following	Merits☺/ Demerits☹

➢ Data processing and presentation:

Type of graph/ chart	Content shown and function of graph/chart	Merits☺/ Demerits☹

➢ For deeper learning or further study, I suggest modify the following aspects.

		Suggestion (give examples)
❑	Key point of fieldwork/ topic	
❑	Data to be collected and method of data collection	
❑	Date and time of fieldwork	
❑	Field site	

Additional resource:

Rivers of our country

Primary data collection methods

Data collection methods	Explanations		Examples
A) Observation	● Using sensory observation to explore the details of research subject (people, things or environment) in a purposive and planned way. Data are recorded using text, photos, sketch, map, etc. (Refer to other data collection methods listed below)		● Identification of surrounding environmental of a field site
B) Measurement	● To estimate or measure the physical quantity of the research subject. It usually requires the use of equipment or tools. Data are usually shown in certain standard, weights or measures.		● Measurement of the width of street and the building height
C) Counting	● To record the number of occurrence of a single item.		● Statistics of pedestrian flow at the pier
D) Category	● To classify based on the nature, characteristics and uses: ◆ to group the same or similar things; ◆ to separate different things.		● Types of goods sold in supermarket ● Customers (serving local residents and tourists) of different shops
E) Distribution (mapping)	● To group similar things according to the research topic (similar to "**D. Category"**); ● Only suitable for spatial representation (different from category); ● Useful in showing the mode of occurrence of research subject in a complex environment.		● Distribution of shops selling big fish balls in Cheung Chau
F) Scoring	● To quantify abstract or subjective concepts; ● To merge various data for easy comparison; ● Scoring items should include different aspects.		● Risk index of Cheung Chau to natural hazards ● Air Quality Health Index (AQHI)
G) Field sketching	● To make simplified drawing of the field site to show what the data collectors observed. Annotations related to the research subject are added to provide key feature or additional information.		● Draw the characteristics and formation of weathering landforms
H) Questionnaire	● Forms: face-to-face, telephone, written, etc.; ● Using questionnaire to understand the opinion of research subject; ● Larger sample size than "**I. in-depth interview"**; ● Mainly closed questions (with options available).	● To collect information by questioning; ● To obtain information which is difficult to be obtained through observations; ● To understand the rationales and opinions of interviewees.	● The major reasons for tourists to visit Cheung Chau ● The level of satisfaction among residents regarding the revitalization project
I) In-depth Interview	● To obtain information through face-to-face/ telephone interview; ● Smaller sample size than "**H. Questionnaire"**; ● Mainly open questions and forthcoming questions will change upon the answer of respondents.		● Opinions of District Council members on the future development of that district

Sampling Methods

	Probabilistic sampling methods ➢ *Need to know the size of population;* ➢ *Few differences among individuals;* ➢ *Individual has equal chance of being selected;* ➢ *Representativeness of data depends on sampling percentage.*			**Non-probabilistic sampling methods** ➢ *Size of population might not be relevant to the research objective;* ➢ *Chance of individual being selected is unknown;* ➢ *Representativeness of the results depends on the judgment of researcher in sample selection (Such as the correlation between samples and research targets).*		
Methods	**Simple random Sampling** (簡單隨機抽樣)	**Systematic sampling** (系統抽樣)	**Stratified Sampling** (分層抽樣)	**Quota Sampling** (配額抽樣/定額抽樣)	**Convenience Sampling** (便利抽樣/方便抽樣)	**Purposive sampling** (立意抽樣)
Explanations	To select sample from the **whole population randomly**. (using computer program, bamboo slip or random number table)	Each member of the whole population is sequentially numbered, then selected according to a **fixed, periodic interval**.	The whole population are classified according to the variable and divided into separate stratum. Then samples are selected randomly by proportion from each stratum.	The whole population are classified according to the variable and divided into separate stratum. Then desired number (quota) of samples are selected from each stratum.	Research subjects are selected due to convenience of recruitment.	Samples are selected according to research objectives and special requirements.
Examples	To choose a certain number of students to conduct questionnaires/ surveys according to the class number.	To measure the noise level of a street in a regular interval.	To group buildings according to their ages (e.g. above or below 50), and select a certain number of buildings in each group randomly.	To select a certain number of male and female customers, then record the amount spent in a shop.	To interview a certain number of relatives who work in mainland China To interview a certain number of passersby on the street	To conduct an in-depth interview with a district councilor about the social problems of that district.
Remarks	Suitable for small population and few variations among samples (for relevant research objectives).	Suitable for large population (hidden cyclic ordering which may affect the representativeness of data).	Effectively show the relationship / effect between variables.	Effectively show the relationship / effect of variables, but the characteristics and size of samples are judged subjectively.	Should not generalize the data to larger population	Suitable for qualitative research (data is easily influenced by the subjective judgment of researcher)