明 愛 陳 震 夏 郊 野 學 園
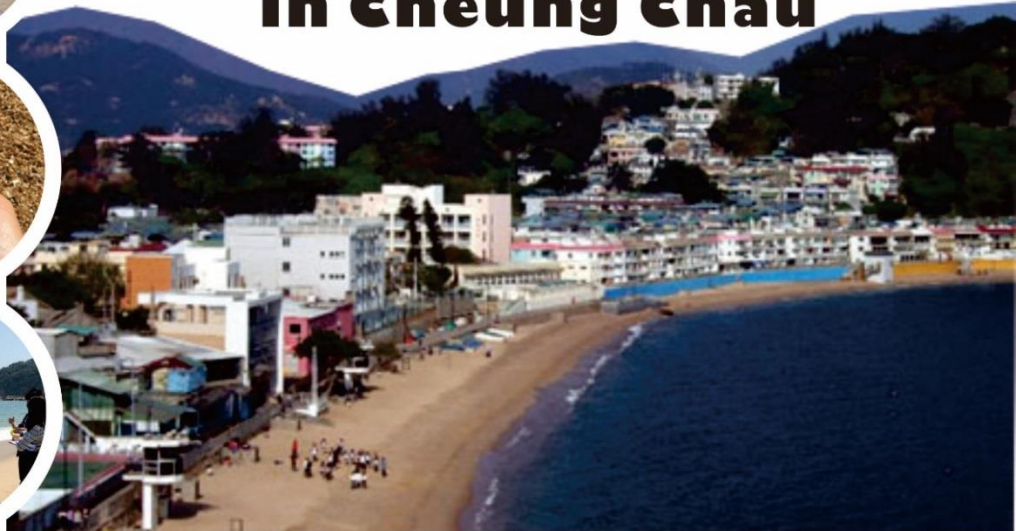Caritas Chan Chun Ha Field Studies Centre

Exploring the Coast in Cheung Chau

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

Course Date: _____

OBJECTIVES

➢ Knowledge:
- To identify the characteristics of coast and the coastal landform features
- To examine the factors and processes in shaping the coast

➢ Skills:
- To exercise the sampling methods
- To apply various data collection methods e.g. drawing field sketches and using field equipment for measurement
- To draw beach profile for processing and presenting the morphological data

➢ Value:
- To appreciate the beauty of the coast
- Be aware the importance of managing marine resources sustainably and maintaining the safety of marine resources.

Relevance to the DSE geography curriculum

Compulsory Module 2: Managing Coastal Environment—A continuing challenge

STAGE 1   PLANNING & PREPARATION

➢ **Key point of fieldwork:**   Coastal System

➢ **Prior knowledge**

Refer to the module of "Coast and Coastal Processes" in the textbook. List the elements of the coastal system in the table below.

Coastal System		
Inputs	**Processes**	**Outputs**

➢ **Enquiry question**

Refer to the Cheung Chau Map *(P.13-14)*. Link up with the factors affecting coastal process mentioned in the textbook. According to the locations of Kwun Yam Wan Beach and Tung Wan Beach, infer the differences of outputs between them. Thus set an enquiry question.

From the secondary data, it appears that the wave energy in **Tung Wan / Kwun Yan Wan** is higher.

I infer that...

- The beach profile in **Tung Wan / Kwun Yan Wan** is more undulating.
- The beach sediment in **Tung Wan / Kwun Yan Wan** is coarser.

➢ **When to collect data?**

Date: _____   Season: _____

Time: _____ to _____

Why is tide information important?

1. Tidal level:

Water level at the time of fieldwork: _____m (time:)

Water level of the previous high tide: _____m (time:)

2. Any weather warnings & signals issued by the Hong Kong Observatory **in the past two days**?

    ☐ Tropical cyclone warning signals   ☐ Rainstorm warnings

    ☐ Strong monsoon signal   ☐ Cold weather warning

    ☐ Very hot weather warning   ☐ Other:_____

3. Precipitation **in the past 2 days**:

    ☐ heavy rain   ☐ drizzle   ☐ never rain

4. Is today ideal for fieldwork of this topic? Why?

What factors would you consider in choosing the fieldwork date?

➢ **Where to collect data?** *(refer to Map 1 on P.13)*

|	
Are Tung Wan Beach and Kwun Yam Wan Beach in Cheung Chau ideal field sites of this topic? Why?	What factors would you consider when choosing the field site?
Sampling method is used in setting the data collection points *(details on P.18)*: Refer to the figure below. The class has been divided into several small groups, with each group setting up sampling point/ line/ area in either Tung Wan or Kwun Yam Wan for data collection. Afterward, the data from the two beaches will be compared. ➔ _____ sampling is applied.	

Kwun Yam Wan Beach
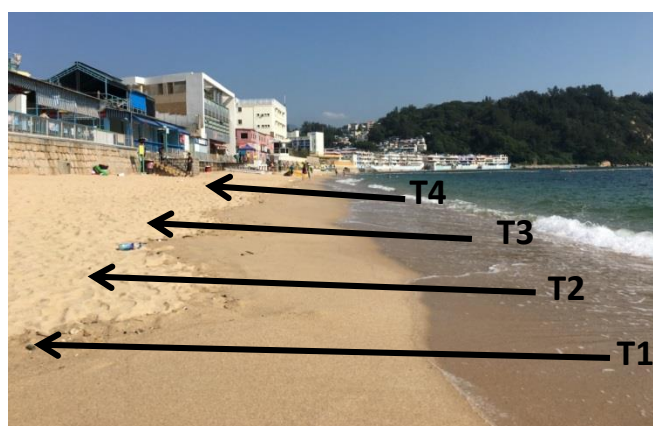
Tung Wan Beach

➢ What data to collect and how to collect the data?

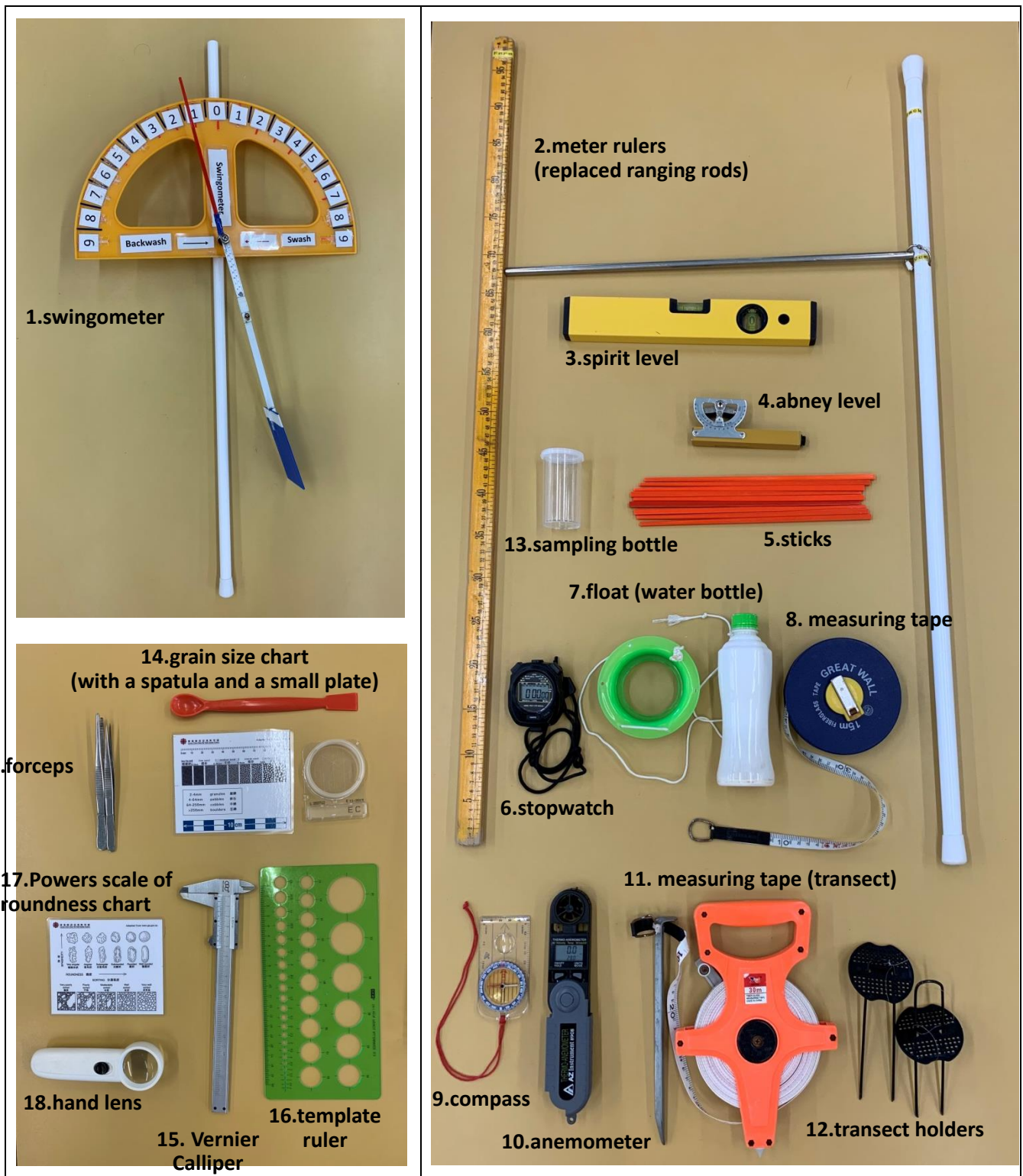| Items		Primary data collection methods [A-I] *(see Table 1)* （*may choose more than one options*）	Equipment [1-17] *(See Table 2)* *(if needed)*	Operational precautions
Wind	Wind direction			
	Wind speed			
Wave	Frequency of wave per minutes			
	Strength of swash and backwash			
	Direction and distance of longshore drift			
Beach morphology	Change of slope gradient (beach profile)			
Sediment	Size			
	Roundness			
Coastal landforms and coastal management strategies				

Research item that requires sampling: _____

Table 1 Primary data collection methods *(details on P.17)*

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

Table 2 Equipment for fieldwork *(Make sure you know how to use them correctly before fieldwork.)*

1.swingometer

2.meter rulers
(replaced ranging rods)

3.spirit level

4.abney level

13.sampling bottle

5.sticks

7.float (water bottle)

8. measuring tape

6.stopwatch

11. measuring tape (transect)

9.compass

10.anemometer

12.transect holders

14.grain size chart
(with a spatula and a small plate)

19.forceps

17.Powers scale of
roundness chart

18.hand lens

15. Vernier
Calliper

16.template
ruler

STAGE 2 DATA COLLECTION

Record the data on the data record sheet on P.19-23.

1. Beach morphology (profile)

a) Method 1: Levelling method *(refer to P.19)*

Equipment	✓ measuring tape (transect) ✓ transect holder ✓ meter ruler (with a 50 cm metal rod) ✓ spirit level
Procedures	i. Use a measuring tape to set a transect from swash and backwash zone to backshore. ii. Hold two meter rulers (foresight and backsight) upright on beach surface at **0.5m horizontal intervals**. iii. For easy calculation, fix a 0.5m long metal rod at 70cm mark of the backsight. iv. Record each segment along the transect, using a spirit level to ensure the metal rod is adjusted to a horizontal position between two rulers, and record the height of the foresight. v. According to the instructions on the table on P.19, calculate the height difference between each interval and the cumulative height from the sea level. *P.S.* ✪ *Never insert the meter rulers into beach sediments.* ✪ *Do not measure along slopes when using levelling method.*

b) Method 2: Angle measurement *(refer to P.20)*

Equipment	✓ measuring tape ✓ transect holder ✓ meter ruler ✓ Abney level ✓ sticks
Procedures	i. Use a measuring tape to set a transect line from swash and backwash zone to backshore. ii. Identify any breaks along slope. Mark each break of slope with a stick and divide the beach profile into several segments. iii. Measure the length of each segment. iv. Hold two meter rulers upright next to the sticks of a segment. Place an Abney level on the top of a meter ruler and look at the top of another one through the sighting tube of an Abney level. v. Measure the slope angle and take the reading of each segment. Positive numbers indicate uphill slope, while negative numbers indicate a downhill slope. vi. Refer to P.20, describe the steepness of slope.

2. Particle size and roundness of beach sediment *(refer to P.21)*

Equipment	✓ sampling bottle　　✓ hand lens　　✓ forceps ✓ Vernier Calliper/ template ruler/ grain size chart (to be provided during laboratory work)
Procedures	**Collecting sample** 　i.　Take a core of beach sediment of about 5-8cm on swash zone by pushing a sampling bottle into the sand. Carefully pull the bottle out with the sediment in it to avoid spillage of sediments. **Laboratory work** 　ii.　Observe the particle size that is the most representative by the method of sedimentation. 　iii.　Take several grains from the bottle of beach sediment. Measure the size by using a Vernier Calliper, a template ruler or a grain size chart. 　iv.　Refer to "grain size chart" and "Powers scale of roundness chart", identify the type and roundness class of beach sediment. *P.S.* ✪　*Do not just scrap the surface of the beach which often represents the last few moments of deposition or erosion.* ✪　*If the beach sediments are too large to be collected by the sampling bottle, measure in the position where sediments deposited by a meter ruler.*

3. Wind direction and wind speed *(refer to P.22)*

Equipment	✓ anemometer　　✓ compass
Procedures	i.　Make sure you are not shielded from the wind in any direction. Hold a string over your head to observe the wind direction with a compass. 　ii.　Face directly to the wind direction and hold an anemometer in the air. Observe the anemometer for about 30 seconds and determine the **sustained wind speed**. It does not include sudden gusts or short calm periods of wind.

4. Wave frequency *(refer to P.22)*

Equipment	✓ stopwatch
Procedures	i.　Focus on the point where the first breaker of wave passes. As the crest of a wave passes, time by stopwatch. 　ii.　The next wave is wave number one. 　iii.　Counting the number of waves that pass a certain point in one minute. To be more accurate, count over a 5-minute period and take an average. Determine the wave type.

5. Evidence of longshore drift *(refer to P.22)*

Equipment	✓ a float (e.g. water bottle) ✓ stopwatch ✓ measuring tape
Procedures	i. Place a float along swash and backwash zone and mark the starting point. ii. Observe how the waves approach the shore. iii. Measure the distance and direction of longshore drift along the coast from the starting point towards the end point within 1 minute. *P.S.* ✪ *To fill the water to the marked level of the water bottle. This can reduce the influence of air current.*

6. Strength of swash and backwash *(refer to P.22)*

Equipment	✓ Swingometer (share)
Procedures	i. Insert a swingometer into the beach sediments in the swash and backwash zone. ii. Estimate the relative strength of swash and backwash by how far the arm is tilted by the two forces. iii. Record the balance of forces for 3 times and take an average.

7. Coastal landforms and coastal management strategies *(refer to P.23)*

Equipment	
Procedures	i. Observe coastal landforms and coastal management strategies of Cheung Chau. ii. Identify a frame for the field sketch according to the theme. iii. Divide a paper roughly into thirds. The upper (sky and horizon), the middle ground (central part of the "view") and foreground (lower part). iv. Draw the skyline and simple lines showing the foreground. v. Start by sketching the things furthest away, and work towards the foreground, adding detail as you go. vi. **Annotate the field sketch**, including the main features and details that might not be obvious in a photograph. vii. Remark the location and direction of view. viii. Take pictures of the view for reference.

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STAGE 3 　　DATA PROCESSING & PRESENTATION

Process the following data

1. Beach profile	▪ Process the data of levelling and angle measurement. I can use _____ (a diagram) to show the beach profile. ▪ Calculate the vertical exaggeration rate based on the horizontal and vertical scales of the Levelling Method graph, and explain the purpose of vertical exaggeration rate.	P.19-20
2. Sediment	▪ Calculate average diameter of beach sediment and classify its type. I can use _____ (a diagram) to compare beach sediments size of different transects. ▪ Evaluate roundness of sediments using Powers scale of roundness chart.	P.21
3. Swash and backwash	▪ Calculate the average level of swash and backwash.	P.22

Summarize the data of each transect in a table for easy comparison.

Transect	Kwun Yam Wan Beach				Tung Wan Beach			
	K1	K2	K3	K4	T1	T2	T3	T4
Size and type of sediment								
Roundness of sediment								
Wave frequency								
Strength of swash and backwash								
Direction and distance of longshore drift								
Wind direction and wind speed								
Coastal landforms and coastal management								

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strategies							

STAGE 4 INTERPRETATION & CONCLUSION

1. Hypothesis testing:　Is your hypothesis correct or not?　__Yes　/　No__

    Describe the differences of sediment size and roundness in Tung Wan Beach and Kwun Yam Wan Beach respectively. Explain the reason with reference to the locational factors.

2. Dose the data on wind and wave effectively reflect the magnitude of wave energy on the Tung Wan Beach and Kwun Yam Wan Beach?

    __Yes　/　No__　Why?

3. Based on the data collected in this field study, can you arrive the following conclusion?

    "Beach sediments become coarser from foreshore towards backshore"

    __Yes　/　No__　Please explain.

STAGE 5 EVALUATION

1. What kinds of tools did you use today to measure the size of beach sediment? Select one of the tools and explain its merits and demerits compared to other tools.

Name of instruments	Merits	Demerits

2. Today, we used both levelling method and angle measurement to measure the beach morphology. What are the merits and demerits of these two methods used in this measurement operation?

	Merits	Demerits
Levelling method		
Angle measurement		

3. Reflect on the fieldwork planning. Discuss the factors that may cause data bias. What can be done to improve the reliability and validity of data of this fieldwork?

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?		

4. **Further study:**

   Besides Kwun Yam Wan Beach and Tung Wan Beach, suggest another location in Cheung Chau *(refer to the map on P.14)* for further study on **wave energy** or **coastal management strategies**. Explain your planning of the field study in detail.
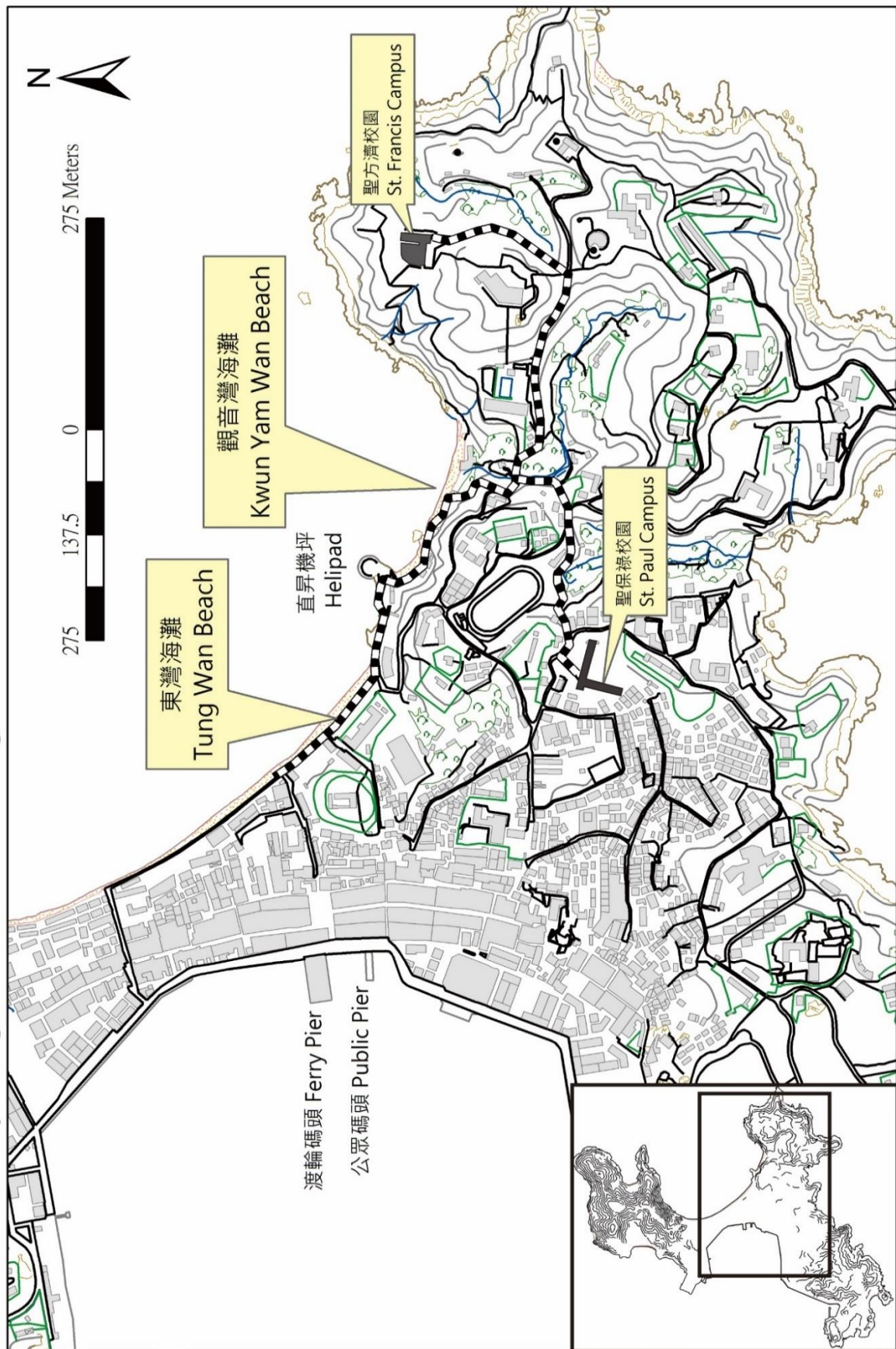

Homework:

After the fieldwork, please organize this fieldwork experience in field trip diary on p.15-16, as a

reference for the revision of field-based question.

長洲海岸探索 Exploring the Coast in Cheung Chau

聖方濟校園 St. Francis Campus
觀音灣海灘 Kwun Yam Wan Beach
東灣海灘 Tung Wan Beach
直昇機坪 Helipad
聖保祿校園 St. Paul Campus
渡輪碼頭 Ferry Pier
公眾碼頭 Public Pier
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Whole Map of Cheung Chau

大貴灣
Tai Kwai Wan

東灣仔
Tung Wan Tsai

5

5

10

長洲灣
Cheung Chau Wan

東灣
Tung Wan

觀音灣
Kwun Yam Wan

西灣
Sai Wan

南氹灣
Nam Tam Wan

10

鯆魚灣
Po Yue Wan

5

白鱔灣
Pak Tso Wan

圖例：
── 海底等深線（米）
submarine contour (m)

南大嶼
郊野公園

喜靈洲
Hei Ling Chau

大嶼山
Landtau Island

長洲
Cheung Chau

南丫島
Lamma Island

南丫島
Lamma Island

石鼓洲
Shek Kwu Chau

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My Field Trip Diary

Exploring the Coast in Cheung Chau

➤ Related modules: __C2 Managing 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)

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➢ 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 during data collection of	Merits☺/ Demerits☹

➢ Data processing and presentation:

Type of graph/ chart	Content 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	

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 the surrounding environment 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 natural hazards of Cheung Chau • 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 main reasons for tourists to visit Cheung Chau • The level of satisfaction among residents regarding a 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	Non-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.*	➤ *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).*

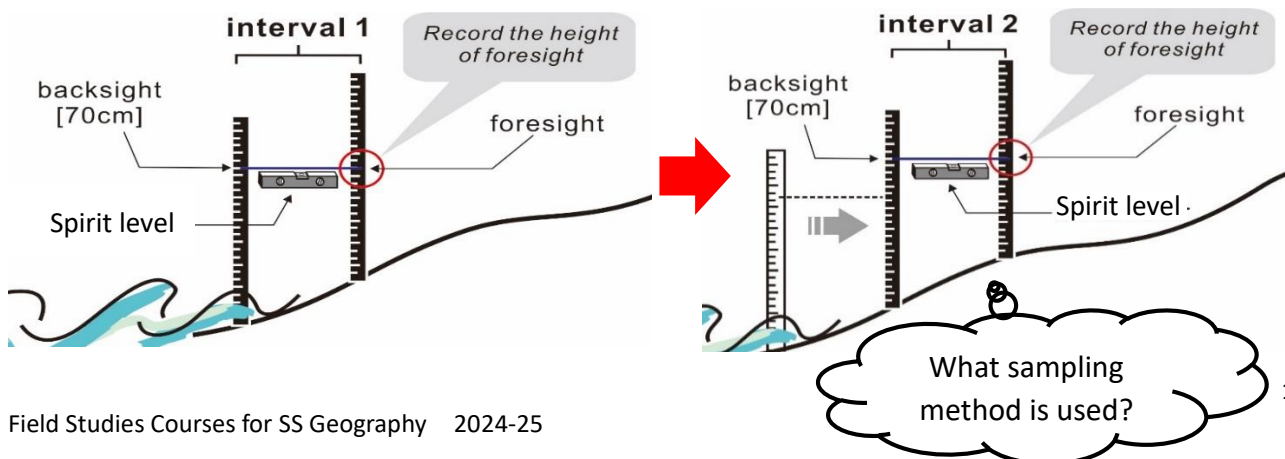| Sampling methods	Simple random sampling (簡單隨機抽樣)	Systematic sampling (系統抽樣)	Stratified sampling (分層抽樣)	Quota sampling (配額抽樣/ 定額抽樣)	Convenience sampling (便利抽樣/ 方便抽樣)	Purposive sampling (立意抽樣)
Explanations	To select sample from the **whole population randomly**. (using computer program, bamboo slip or 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)

Data Record Sheet

Field site: _____
Transect: _____

1. Beach morphology (Profile)

a) Levelling method

Cumulative value

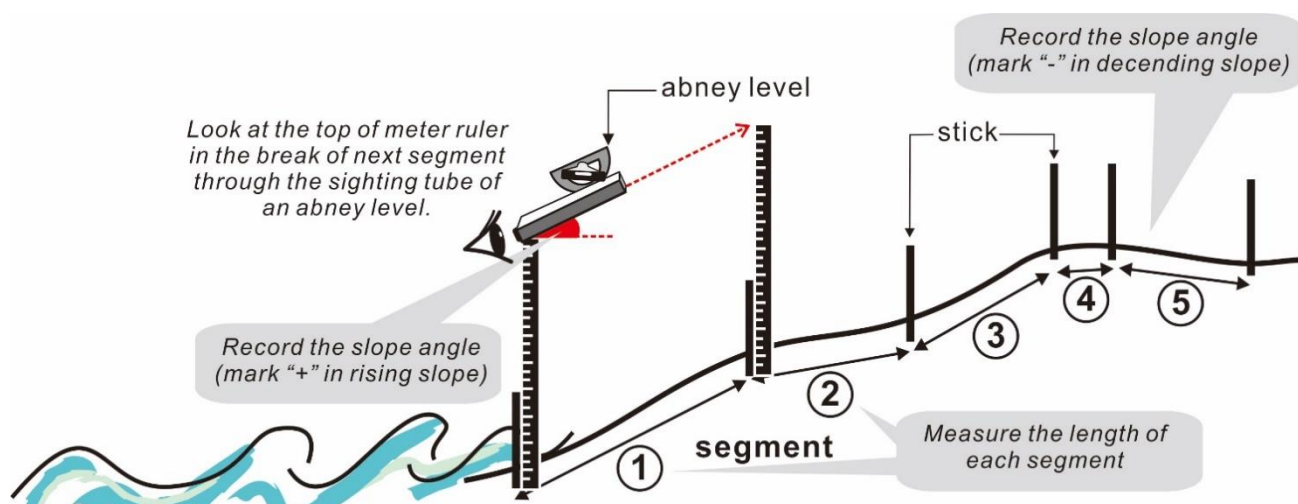| Segment (**Horizontal** distance towards backshore)	Gradient		
	Height of foresight (cm)	Height difference (+/- cm) (=backsight – foresight)	**Vertical** height above sea level* (cm)
Starting point			0 cm
1		70 - _____ = _____	
2		70 - _____ = _____	
3		70 - _____ = _____	
4		70 - _____ = _____	
5			
6			
7			
8			
9			
10			
11			
12			
13			
14			
15			

What sampling method is used?

b) Angle measurement

Segment (Slope segment towards backshore)	Position of transect (e.g.2m to 3.8m)	Actual distance of segment along slopes (cm)	Distance of segment represent on the graph*(cm)	Angle of slope segment(°)	Description of steepness
1	to				
2	to				
3	to				
4					

Refer to the scale shown in the corresponding graph: 1cm to 0.5m

Description of slope steepness

Slope angle (°)	Typical gradient	Description of steepness
< 1°	---	Level
1°-3°	1 in 60 (1.7%)	Flat
3°-6°	1 in 20 (5%)	Gentle
6°-12°	1 in 10 (10%)	Moderate
12°-20°	1 in 3 (33%)	Fairly steep
20°-35°	1 in 2 (50%)	Steep
35°-45°	1 in 1	Extremely steep

2. Particle size and roundness of beach sediments

❑ have sediment sample been taken?

> What sampling methods are applied today to collect the data about sediment size?

-------------------------------------- Laboratory work --------------------------------------

Through sedimentation, observe the particle size that best represents the sample, and then take several grains for measurement and observation.

Sample						
Diameter (mm)						Average diameter (mm):_____ Type of sediment:_____ *(refer to the "Classification of beach sediment table")*
Roundness class						Average roundness class: _____ *(refer to "Powers scale of roundness chart")*

Classification of beach sediment

Type of beach sediment		Diameter (mm)
gravel 砂礫	boulders 巨礫	>256
	cobbles 中礫	>64-256
	pebbles 卵石	>4-64
	granules 顆粒	>2-4
Sand 砂粒	very coarse sand 顆粒	>1-2
	coarse sand 粗砂	>0.5-1
	medium sand 中砂	>0.25-0.5
	fine sand 細砂	>0.125-0.25
	very fine sand 極細砂	>0.06-0.125

Instruments needed for sedimentation
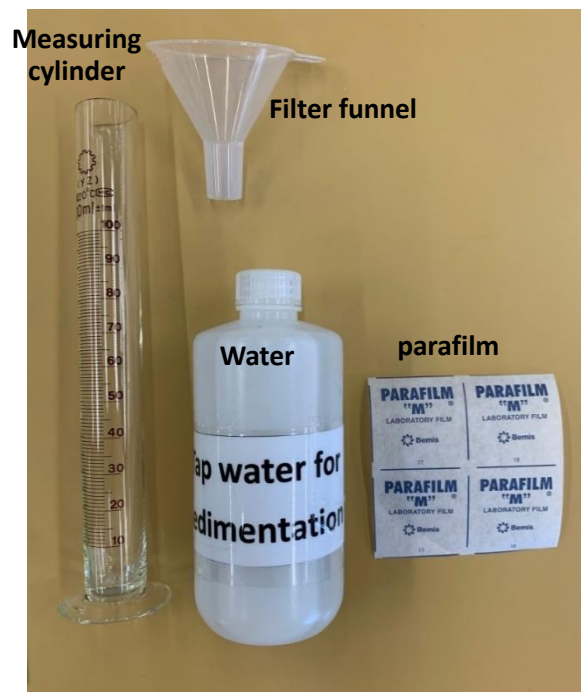
3.   Wind direction and wind speed

Orientation of the beach (refer to Map on P.13)	Wind direction	Average wind speed (m/s)*

*It does not include sudden gusts or short calm periods of wind.

4.   Wave frequency

| Number of wave (per minute)	
Wave type	☐ Constructive wave (≤ 8 waves per minute) ☐ Destructive wave (≥ 12 waves per minute) ☐ Undefined (9-11 waves per minute)

5.   Evidence of longshore drift

Distance of longshore drift (cm)	Direction of longshore drift

6.   Strength of swash and backwash

Wave	1	2	3	Average level
Strength of swash				
Strength of backwash				

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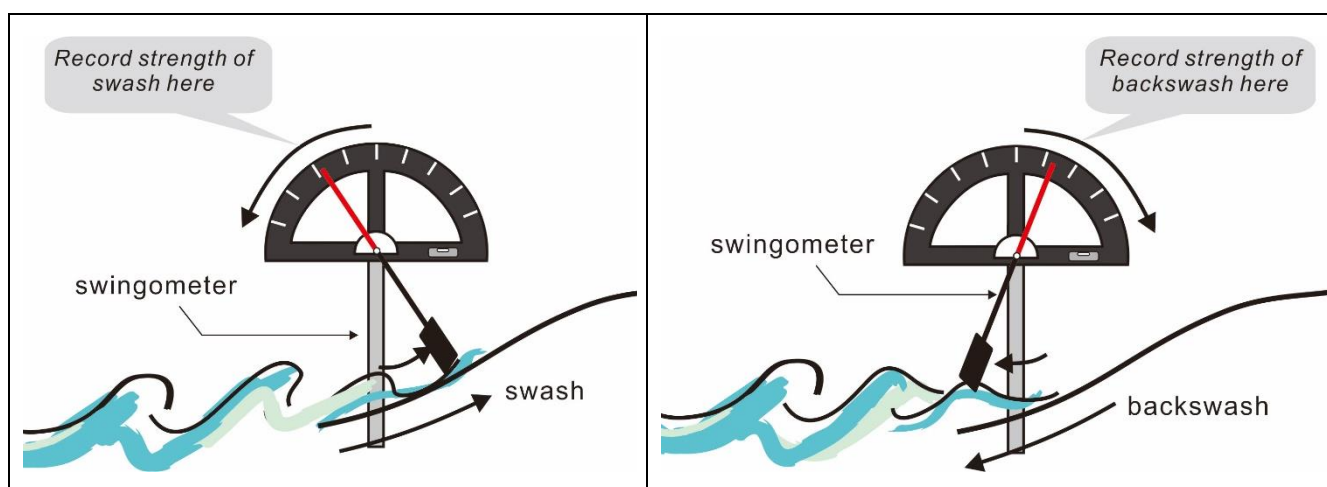
7. Coastal landforms and coastal management strategies

Field sketch of the coastal landforms and coastal management strategies
along   Kwun Yam Wan   /   Tung Wan (East Bay)   at Cheung Chau

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