土木工程拓展署
土力工程處
Geotechnical Engineering Office
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地質與地貌的相互作用
INTERPLAY OF GEOLOGY AND GEOMORPHOLOGY

地質與地景 GEOLOGY AND LANDSCAPE 2

前言

教育局於2005年公布，三年新高中學制將於2009年9月在中四級實施。地理科是其中一個重點的選修科目。

新高中地理科課程是根據2005年教育局出版的一份文件和課程發展議會《高中課程指引》(2007)的建議而制訂。在此課程中，地理被視為一門學科讓學生可以從空間的角度了解自身所處的地球。

土木工程拓展署轄下的土力工程處應教育局的請求，在天然災害及地球科學兩個新高中地理科課程內容上製備了一份「教學支援教材套」。其中有關香港岩石及礦物的資料亦適用於部份化學科的課程。

「教學支援教材套」包括了14本小書冊、4張海報、3片光碟及其他一些補充資料。此教材套在香港的斜坡安全、山泥傾瀉、地質及地貌等課題上提供了合適及最新的資料並同時符合新高中地理科課程的水平。

土力工程處的「香港地質調查組」負責編寫有關香港地質及地貌方面的內容，而「斜坡安全部」則負責香港斜坡安全及山泥傾瀉的部份，「斜坡安全部」的同事亦負責整個項目的策劃與安排。我謹向各位參與這項工作的同事致謝。

我相信這教材套對各位負責新高中地理科目的老師在擬備教材時能提供合適的參考。此教材套亦給予有興趣於這些課題的廣大讀者一些有用的資料。

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Foreword

In 2005, the Education Bureau (EDB) announced that a three-year New Senior Secondary (NSS) curriculum would be implemented at Secondary 4 in September 2009. Geography is one of the elective subjects under the NSS curriculum.

The NSS curriculum has been developed on the basis of the recommendations made by an EDB document in 2005 and a Senior Secondary Curriculum Guide of 2007. Within the curriculum, geography is seen as a key educational discipline that provides students with a spatial understanding of the Earth on which we live and work.

At the request of the EDB, the Geotechnical Engineering Office (GEO) of the Civil Engineering and Development Department have prepared support teaching materials for the NSS Geography curriculum under the topics of Natural Hazards and Earth Science. The materials written on rocks, minerals and ores in Hong Kong are also suitable for part of the Chemistry curriculum.

The "Teaching Support Materials Kit" consists of 14 booklets, 4 posters, 3 CDs and other supplementary information sheets. This teaching kit contains pertinent and up-to-date information on slope safety, landslides, geology and geomorphology in Hong Kong, written at a level that is suitable for the NSS Geography curriculum.

Hong Kong Geological Survey of GEO have compiled the teaching materials that describe the geology and geomorphology of Hong Kong. The Slope Safety Division of GEO have prepared the teaching materials on Hong Kong slope safety and landslides. Colleagues in the Slope Safety Division are also responsible for the overall planning and coordination of this project. Their contributions are gratefully acknowledged.

I am confident that, for years to come, secondary school geography teachers will find the kit invaluable for preparing their classroom teaching materials. The contents will also be of interest to the more general readers who may wish to learn more about these topics.

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December 2008

引言
Introduction

我們的地球是一個由大氣圈、水文圈、生物圈及岩石圈四個主要部份組成的動力體系。這四個部份在漫長的地球歷史中，持續互相影響。地質學為一門研究岩石圈的科學，並且包含岩石圈與其他三個部份相互作用的研究。

地形學是指對地貌的性質及成因的研究，特別是在大氣圈及水文圈中的風化及侵蝕過程。這些過程不斷改變地球表面形狀**(地質與地景之一)**，並且產生岩石循環中的沉積物。地形是岩石圈、大氣圈及水文圈互動產生的結果**(地質與地景之二)**。香港的天然地景是基於地質及地貌作用而形成，並多見於香港的郊野公園**(地質與地景之三)**。人為活動例如填海及築建水塘等，都改變了天然的地貌。

Our Earth is a dynamic system that comprises four main components: the atmosphere, the hydrosphere, the biosphere and the geosphere. These four components have been continuously interacting throughout the Earth's long history. Geology is the science that studies the geosphere, and encompasses the interactions between the geosphere and the other three components.

Geomorphology is the study of the nature and origin of landforms, particularly of the formative processes of weathering and erosion that occur in the atmosphere and hydrosphere. These processes continually shape the Earth's surface **(Geology and Landscape 1)**, and generate the sediments in the Rock Cycle. Landforms are the result of the interactions among the geosphere, atmosphere and hydrosphere **(Geology and Landscape 2)**. The natural landscapes of Hong Kong, displayed in many of the Country Parks, are determined by the underlying geology and geomorphological processes **(Geology and Landscape 3)**. Human activities, such as reclamation and the construction of reservoirs, have considerably modified the original landscapes.

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地形學是指對土地形成的研究。

地形學家研究地區的近代地質歷史，透過地形發展類別及階段，以及表土沉積物的性質及範圍(例如河階及山崩土石流)得來證據。

個別地區的地質(岩石種類及結構)基本上控制了其地形發展的類別(圖1)。

圖1. 傾斜的沉積岩形成突出陡崖。
Figure 1. A prominent escarpment formed by inclined sedimentary rocks.

香港的地質及地形

香港的兩大類主要岩石為火山岩及花崗岩。它們對區內亞熱帶風化作用展現了不同反應，而這些分別可從地形確認出來。

香港的沉積岩大多見於東北部，呈獨特鮮明和色彩繽紛的低地景致。

火山岩

香港的火山岩相對較能抵抗亞熱帶風化作用，因此形成較高的山峰(例如大帽山、鳳凰山及蚺蛇尖等)，而且含粉砂及黏土的風化層一般較薄，令地勢變得群石嶙峋，棱角分明(圖2)。

圖2. 由於火山岩較能抵抗風化，在新界大部份陡峻的山峰都是由火山岩組成。
Figure 2. Volcanic rocks, being more resistant to erosion, form the craggy tops to most of the mountains in the New Territories.

除了粗火山灰晶屑凝灰岩(例如蘊藏在大帽山)外(圖3)，火山岩不會形成岩石核。因此，一般的火山岩地形的表面大都沒有巨礫。

露出地面的火山岩大部分為陡峭的懸崖，舉例見於鳳凰山及馬鞍山。

花崗岩

香港的花崗岩相對較受亞熱帶風化作用影響，因此除獅子山外，花崗岩類岩石地貌多為較矮的山丘(例如九龍及大欖郊野公園)(圖4)，帶有較厚及含粉砂狀及沙質的風化層，地形較矮和渾圓，並有大量巨礫遺留在地面。

Geomorphology is the study of landforms.

Geomorphologists study the relatively recent geological history of an area through evidence provided by the type and stage of development of landforms, and from the nature and extent of the related superficial deposits such as river terraces and landslide debris lobes.

The underlying geology (rock type and rock structure) exerts a fundamental control on the type of landforms that develop in a particular area (Figure 1).

Geology and Geomorphology in Hong Kong

The two major rock types in Hong Kong, volcanic and granitic rocks, exhibit markedly different responses to the subtropical weathering processes that operate in this region today. These differences can be identified in the landscape.

The sedimentary rocks, which are largely restricted to the northeastern part of Hong Kong, form their own distinctive, low-lying and colourful scenery.

Volcanic Rocks

The volcanic rocks in Hong Kong have been relatively more resistant to sub-tropical weathering processes, so they produce the highest summits (*e.g.* Tai Mo Shan, Lantau Peak, Sharp Peak, *etc.*). Volcanic rocks give rise to a rugged, angular topography, generally with thin, silty, clayey weathered profiles (Figure 2).

With the exception of coarse ash crystal tuffs (such as underlie Tai Mo Shan) (Figure 3), volcanic rocks do not produce corestones, so volcanic landscapes generally tend to be devoid of surface boulders.

圖3. 大帽山的巨礫。
Figure 3. Boulders on Tai Mo Shan.

Surface outcrops in the volcanic rocks occur largely as cliff faces on the steep hillsides, such as are seen on Lantau Peak and Ma On Shan.

Granitic Rocks

The granitic rocks in Hong Kong have been relatively more susceptible to sub-tropical weathering processes, so (with the exception of Lion Rock) tend to produce lower hills (*e.g.* Kowloon and the Tai Lam Country Park) (Figure 4). Thus, they give rise to a lower, more rounded topography with thick, silty, sandy weathered profiles, and numerous boulders over the surface.

圖4. 矮小而受侵蝕的丘陵，是深度風化的花崗岩的地貌特徵。
Figure 4. Low eroded hills characterise the landscape on deeply weathered granitic rocks.

風化使花崗岩類岩石形成明顯、渾圓(通常呈橢圓形)的岩石核。岩石核在一些天然山坡隆起，但較常見則是當風化層被侵蝕後，岩石核留在花崗岩的地形上(圖5)。

圖5. 巨礫散落的花崗岩地貌，巨礫集中在海岸線。
Figure 5. A boulder-strewn granite landscape, with boulders concentrated along the shoreline.

圖6. 受節理控制的花崗岩突岩兩側被彎曲的鱗剝外殼圍着。
Figure 6. A joint-bounded granite for flanked by curved exfoliation shells.

這些巨礫可能均勻地或隨意地散佈在整個地形，但較常見是集中在高地(巨礫田)及斜坡(巨礫層)，或集中於地勢較低的淺水河道(巨礫河)。

花崗岩類岩石的基岩常見露出於地面，它們以長形含節理的石柱(突岩)(圖6)聳立在山峰及山脊上，又或以彎曲的板狀(卸荷節理)(圖7)及在山坡及山脈盡頭的相連支撐石的姿態出現 (圖8)。

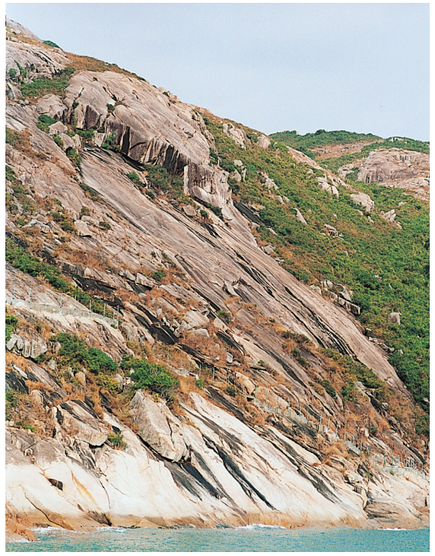

圖7. 由於壓力消減，花崗岩中形成平緩彎曲而平行於斜坡表面的節理。
Figure 7. Stress relief in granite rocks produces gently curved joints that parallel the slope surface.

沉積岩

在新界東北部的沉積岩大部分形成明顯的地層，而且色彩斑斕的地貌。它們一般表現較能抗拒風化，故只發展得極薄的風化剖面。

不論規模大小的崖壁皆是由於其傾斜的層理，一邊形成輕微至中度傾斜的斜坡(傾向坡)，而另一邊則變為非常陡峭的懸崖(崖坡) (例如八仙嶺峭壁) (圖9)。

沉積岩的其他特色包括天然海蝕拱(例如鴨洲)、石柱(例如吉澳海) (圖10)及海蝕平台(例如平洲) 。

Weathering of the granitic rocks produces distinctive, rounded (usually ellipsoidal) corestones. They protrude from some natural slopes, but are more commonly seen, following their exhumation (having been eroded out) from weathered profiles, littering the surface of granitic terrain (Figure 5).

These boulders may be scattered evenly, or randomly, across the landscape, but are more commonly concentrated as dense accumulations over upland surfaces (boulder fields) and on slopes (boulder sheets), or they may be concentrated in lines along topographic depressions such as shallow water courses (boulder streams).

Surface outcrops of bedrock are common in the granitic rocks. They occur as tall, jointed rock outcrops (Figure 6) protruding from hill summits and ridge crests, and as curved rock slabs (stress relief joints) (Figure 7) and jointed rock buttresses on hillslopes and at the end of spurs (Figure 8).

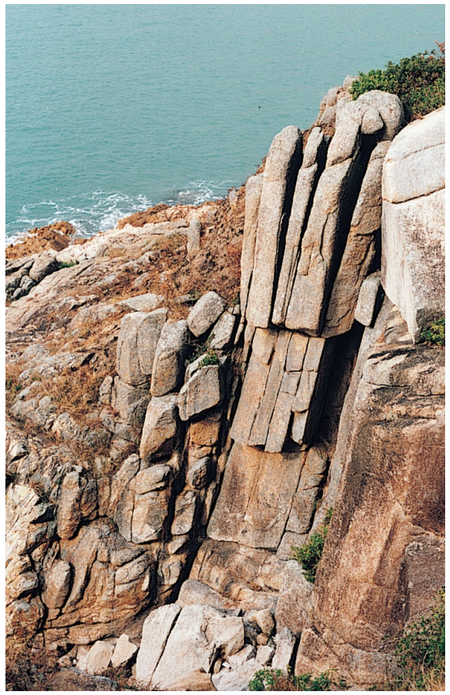

圖8. 花崗岩中密集而垂直的節理。
Figure 8. Closely spaced vertical jointing in granite.

Sedimentary Rocks

The sedimentary rocks, most of which are clearly bedded (layered), form distinctive and colourful landforms in the northeastern New Territories. They generally appear to be relatively resistant to weathering and develop only very thin weathered profiles.

Escarpments, at both small and large scales, occur when the beds are inclined so that they form a gently to moderately dipping slope (the dip slope) in one direction, with a very steep, near vertical slope (the scarp slope) in the other direction (*e.g.* the Pat Sin Leng escarpment) (Figure 9).

圖9. 在八仙嶺陡崖向北面傾斜的沉積岩。
Figure 9. Northward dipping sedimentary rocks form the Pat Sin Leng escarpment.

Other characteristic features developed within the sedimentary rocks include natural arches (*e.g.* Ap Chau), stumps (*e.g.* Kat O Hoi) (Figure 10), and wave-cut platforms (*e.g.* Ping Chau).

圖10. 受長時期的海岸侵蝕而成的海蝕平台。
Figure 10. An encircling wave-cut platform produced by prolonged coastal erosion.

岩石結構

岩石結構對區域性以至微型規模的地形都有巨大的影響。

南中國沿海的海岸線差不多成一直線，是受區域性東北-西南向的主要斷層所控制。

類似的東北-西南向的地質構造，亦同樣地控制着香港的地形，例子有沙田谷和北大嶼山海岸(圖11)。

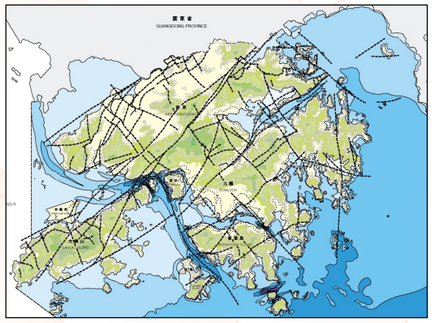

圖11. 香港的地勢與斷層格局。
Figure 11. The topography and fault pattern of Hong Kong.

就局部地區而言，斷層及岩石的節理決定小山谷的方向、山脊排列及平原地點。岩體的形狀和峭壁、突石及巨礫等特徵的方向，皆由岩石的節理控制。在巨礫中，風化造成的剝鱗及微小的裂痕，則與節理面平行發展(圖12)。

圖12. 細火山灰凝灰岩中高度發育的岩石核。
Figure 12. Advanced corestone development in a fine ash tuff.

仔細閱讀香港立體地形圖(圖13)，會清楚發現香港的地形，在不同規模上受到東北-西南及西北-東南向的構造支配，而南-北向的構造亦有較小程度的控制。

本港的整體形狀(如海灣、半島及海島的外型)，以及結構的細節(如個別外露岩石的形狀)，均受區域或局部的地質構造控制。

海岸及河流地形

香港現今的地形主要在過去數以萬年間，氣候與不同種類的岩石互動而致的成果。除了現今的人類活動外，香港最重要的地貌作用為重力營力(山崩)、河流營力(流水行動)及海岸營力。

河流及海岸營力包括破壞性(侵蝕)及建設性(沉積)兩部分，兩者共同塑造出今天香港的景致。有關山崩於另文處理(見地質與地景之一)。

河流營力

河流一般發展成明顯的樹枝狀系統，從地圖上可看見有如樹幹及樹枝的圖案。小溪漸漸在下流集合一起，形成較大的河流，直至最後流進主河。這主要河道匯集沿途各方支流，通常流進大海。

Rock Structure

The rock structure has a profound influence on the landscape at all scales, from the regional-scale to the micro-scale:

The almost straight coastline of the South China Coast is controlled by the dominant regional fault pattern, which is aligned in a northeast to southwest direction.

Similarly, the same northeast to southwest structures control the shape of the topography in Hong Kong (*e.g.* the Sha Tin Valley and the North Lantau coast) (Figure 11).

Locally, faulting and jointing patterns in the rock determine the orientation of minor valleys, the alignment of ridges, and the location of plains.

Within rock masses, the shape and orientation of features such as cliff faces, tors, and boulders are controlled by the jointing pattern in the rocks.

Within boulders, weathering produces a pattern of exfoliation shells and microfractures that develop parallel to the joint faces (Figure 12).

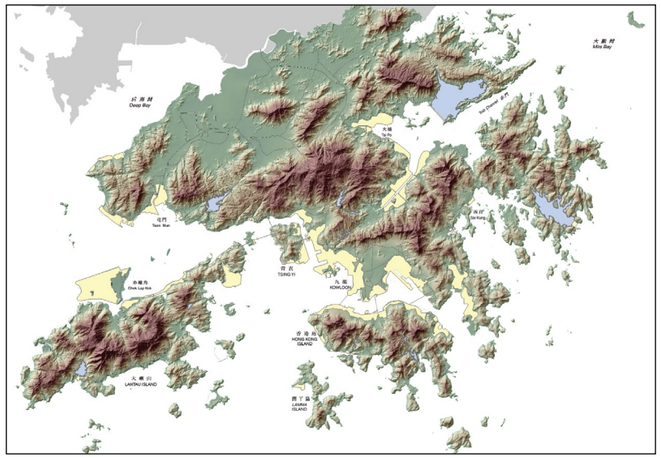

圖13. 香港高程數字模型 (DEM) 特顯受地質構造控制的地勢。
Figure 13. A Digital Elevation Model (DEM) of Hong Kong emphasising the structural control of the topography.

Careful examination of the Shaded Relief Map of Hong Kong (Figure 13) clearly shows how the topography of Hong Kong is controlled, at a variety of scales, by northeast to southwest and northwest to southeast structures, and to a lesser extent by north to south structures.

The overall shape of Hong Kong (such as the outlines of the bays, peninsulas and islands) and the details of structures (such as the shapes of individual rock outcrops) are controlled by the regional and local structures in the rocks.

Coastal and Fluvial Geomorphology

The development of the present day landscape of Hong Kong is primarily the result of the interaction of the climate and the different rock types over many tens of thousands of years. The most important landscape forming processes in Hong Kong, apart from human activity today, are gravitational processes (landslides), fluvial processes (the action of running water), and coastal processes.

Fluvial and coastal processes comprise both destructive (erosional) and constructive (depositional) components, which together have led to the spectacular scenery that characterises Hong Kong today. Landslides are dealt with elsewhere (See Geology and Landscape 1).

溪流源頭的特色是其陡峭斜幅所造成的龐大力量，因此溪流會向下侵蝕河道(破壞性營力)。當山坡的斜度遞減，溪流的侵蝕能力亦相應減弱，沉積(建設性)營力則轉趨重要。

河流的垂直剖面受基準面控制，一般與海平面相同。湖泊及水塘也會暫時充當局部地區的基準面。隨著海平面的升降，河流的剖面亦會透過侵蝕(當水位下降)或沉積(當水位上升)，調整至新基準面。因此，基準面的改動會導致河流沿途的破壞性及建設性營力的界線有所變動。

海岸營力

海浪營力是影響海岸線的主要營力。海灘會根據其形態，以及水平位及海浪活動的位置(圖14)，而分為多個區域帶。

風在海面掠過形成波浪，因此波浪的類別和強度需視乎海岸線與盛行波相對的方向(朝向)，以及風吹過海面的距離(風距)。

海浪大致上可根據其造成的侵蝕或沉積，來劃分為破壞性及建設性。

破壞性海浪通常與高能量的環境和陡斜的海岸帶有關。岩石嶙峋的海岸線暴露於巨浪及高潮而受到侵蝕。在沙岸，破壞性海浪令沙灘退減(降級)，因為回流(向海)較沖流(向陸)更有力，能運送更多物質回到海中。

建設性海浪會建成海灘，因為沖流在運送物質時比回流更有效。建設性波浪通常與平坦的海岸帶和低能量的海岸有關。

值得注意的重要一點是，海岸地形不但受地貌營力控制，同時亦受到地質情況影響(如岩石類別及地質構造)，例子有鶴咀及萬宜水庫。地質構造加上岩石不同的抗風化及侵蝕能力，令海岸出現不規則的形態，例如岬角、港灣、海蝕柱及海蝕拱。

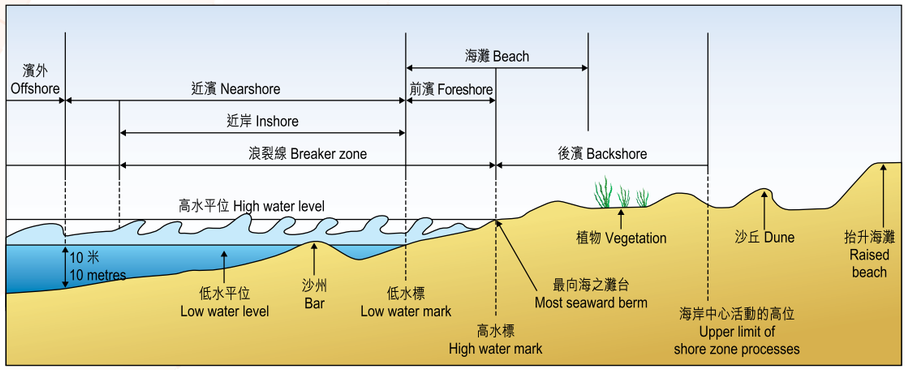

圖14. 沙灘詞彙。
Figure 14. Beach profile terminology.

Fluvial Processes

Rivers develop distinctive dendritic systems. Viewed on a map, dendritic systems form a pattern that looks like the trunk and branches of a tree. Small streams on hillsides gradually coalesce downslope to form progressively larger streams until, ultimately, they enter the master stream on the plains below. This master stream, which may receive other tributaries along the way, usually flows all the way to the sea.

The steep gradients of the headwater streams are characterised by their high energy. Consequently, they tend to erode, or downcut, their channels (destructive processes). As the gradient reduces lower down the hillside, the energy of the stream decreases and depositional (constructive) processes assume increasing importance.

The vertical profile of a stream is controlled by the base level, which is usually the same as the sea level. Locally, lakes or reservoirs may act as a temporary base level. As sea-level rises or falls, the stream profile will adjust to the new base level, either by eroding (in times of sea level fall), or depositing (in times of sea level rise). Thus, changes in base level will lead to migration of the boundary between destructive and constructive processes along the stream profile.

Coastal Processes

The primary geomorphological process along coastlines is wave action. Beaches are subdivided into several zones, which are based on their morphology, and on their position with respect to water levels and wave activity (Figure 14).

Waves are generated by winds crossing the sea, so the types and strengths of the waves are dependent upon the orientation of the coastline with respect to the prevailing waves (the exposure), and the distance of uninterrupted sea over which the winds can pass (the fetch).

Waves are broadly classified as destructive or constructive, depending upon whether they cause erosion or deposition.

Destructive waves are usually associated with high-energy conditions and a steeply sloping offshore zone. Rocky shorelines tend to erode when they are exposed to large waves and high tides.

On sandy shorelines, destructive waves result in the lowering (degradation) of a beach because the backwash (seaward flow) of the waves is more effective than the swash (the landward flow), which results in more material moving seawards than landwards.

Constructive waves result in the building up of a beach, because the swash is more effective in moving material than the backwash. Constructive waves are usually associated with low-energy coasts that have a gently sloping offshore zone, experience smaller waves, and have a limited tidal range.

It is important to note that coastal landforms are controlled not only by geomorphological processes, but also by the characteristics of the underlying geology, such as the rock type and geological structures (*e.g.* Cape D'Aguilar and High Island). The geological structures, combined with the different resistance of the rocks to weathering and erosion, lead to irregularities in the coast such as headlands, bays, sea stacks and arches.

具破壞性營力的河流地形
Fluvial Landforms Associated with Destructional Processes

地形的種類及例子 Type of Landform and Its Local Example	闡釋 Description	
山谷 Valley (*e.g.* 林村河谷 the Lam Tsuen Valley)	由於水流侵蝕及被河流佔據的線狀低地。	A linear topographical depression formed by the erosive action of flowing water and occupied by a stream or river.
瀑布 Waterfall (*e.g.* 新娘潭瀑布 the Bride's Pool waterfall)	河流縱面的台階，通常為堅硬及抗力強的岩石，通過此處的流水因而有落差，亦稱為坡折點	A step in the long profile of a stream, usually associated with a band of hard, resistant rock, over which the river falls. Also known as a knick point.

具建設性營力的河流地形
Fluvial Landforms Associated with Constructional Processes

地形的種類及例子 Type of Landform and Its Local Example	闡釋 Description	
曲流河 Meandering Channels (*e.g.* 錦田河 the Kam Tin River)	於平原上，河道發展成彎曲的路線，過程稱為曲流作用。在河道上出現個別的彎位或圈，稱為曲流。曲流河一般較接近底層，斜幅較小，流速緩慢，並一般含較細小的粗粒的床載。	On plains, river channels develop sinuous courses, a process that is termed meandering. An individual curve or loop in the channel is a meander. Meandering streams are usually close to base level, have low gradients, low velocities, and generally contain little coarse bedload.
氾濫平原 Floodplain (*e.g.* 元朗平原 the Yuen Long Plain)	曲流河向下流動，一邊侵蝕外彎，另一邊在內彎堆積沉積物，形成曲流沙洲，慢慢將堆積成氾濫平原。	Meandering streams migrate down gradient by a process of eroding on the outer bank and depositing on the inner bank (the point bar), slowly building up a sheet of sediment that is termed a floodplain.
河階 River Terraces (*e.g.* 林村河谷 the Lam Tsuen Valley)	當河流不斷侵蝕其河床，如海水平下降或陸地抬升，河道會低於原有的氾濫平原。這些較高及已被荒廢的氾濫平原稱為河階。連串發生海水平下降或陸地抬升，會形成一系列的河階。	As a river continues to erode its bed, if sea level falls, or if the land level is raised, the river channel will be below the original floodplain. This higher, abandoned floodplain is termed a river terrace. Successive events may create a series of river terraces.
自然河堤 Natural Levee (*e.g.* 錦田河 the Kam Tin River)	河堤是河流兩旁的堤圍。當週期性河水氾濫時，導致沙質沉積物積聚於河道附近，而粉砂則沉積越過氾濫平原。由於河堤使河道兩側升高，形成自然抗洪的堤圍。	An embankment that develops on both sides of a stream or river channel when periodic flooding causes deposition of sandy sediments close to the channel, with silt deposited on the floodplain beyond. Levees form natural flood protection defences as they raise the height of the channel sides.
沼澤 Swamp	出現在氾濫平原的低窪地，它可能是已廢棄的曲流。由於水位高而排水差，因而形成一個長滿植物的濕地。	A hollow or shallow depression on a floodplain, which may be an abandoned meander curve, in which the water table is high and drainage is poor, so a wetland is formed in which vegetation thrives.

具破壞性營力的海岸地形
Coastal Landforms Resulting from Destructional Processes

地形的種類及例子 Type of Landform and Its Local Example	闡釋 Description	
岬角 Headland (*e.g.* 伙頭墳洲 Town Island)	屹立在岸邊受到猛烈波浪沖擊的石岬。	A rocky promontory along a coastline that is exposed to strong wave action.
海蝕洞 Sea Cave (*e.g.* 吉澳 Crooked Island)	岩石的節理受海浪沖擊而擴大，形成沿海崖的洞穴。	A cave is an opening developed in a sea cliff by wave action exploiting joints in the rocks.
海拱 Sea Arch (*e.g.* 鴨洲 Ap Chau)	當狹窄的岬角或山脊受來自兩方的侵蝕，形成橋狀地貌。通常是從海蝕洞的兩邊，在同一線較弱的地方開始侵蝕而發展。海拱可在水面或水平面以上出現。	A bridge-like feature that results when erosion penetrates a narrow headland or ridge from two directions, most commonly when caves developing from two directions along a line of weakness meet. Arches may be at, or above, sea level.
海石柱 Sea Stack (*e.g.* 平洲 Ping Chau)	經由海浪沖擊而形成的塔狀或石柱殘骸。通常是海拱崩塌後的殘骸。海石柱可以接近、或現今海平面之上出現。	A tower, or residual stump, of rock, which is formed by wave action, commonly by the collapse of a sea arch leaving the seaward end isolated. Stacks may be near, or above, the present sea level.
浪蝕平台 Wave-cut Platform (*e.g.* 平洲 Ping Chau)	通常出現於懸崖底部的岩架，由海浪磨蝕而成。浪蝕平台可位於高潮水位之上或之下。	A rocky ledge, usually at the base of a sea cliff, that is formed by wave abrasion. Wave-cut platforms may be located above or below high tide level.
浪蝕龕 Wave-cut Notch (*e.g.* 平洲 Ping Chau)	由海浪侵蝕懸崖底部而成的切口，通常出現於浪蝕平台的後面。	A slot cut at the bottom of a cliff, usually at the back of a wave-cut platform, formed by wave action eroding the base of the cliff.

具建設性營力的海岸地形
Coastal Landforms Resulting from Constructional Processes

地形的種類及例子 Type of Landform and Its Local Example	闡釋 Description	
沙灘 Beach (*e.g.* 大浪灣 Tai Long Wan)	土地經風化及侵蝕後形成的沉積物，被河流運送至海岸。較細微的沉積物通常會被帶入海中，而較粗糙的沉積物(如沙)則留在近岸。建設性海浪及水流將沿岸的沉積物重新分佈，形成不同類形的沙灘。	Sediment is derived from the land by weathering and erosion, and is transported to the coast by rivers. The finer sediments are commonly carried out to sea, and the coarser sediments, such as sand, tend to remain near the coast. Constructional waves and currents redistribute the sediment along the coast forming different types of beaches.
沙壩 Sand Bar (*e.g.* 往灣洲 Double Island)	呈山脊狀的沉積物，一般為沙及含泥質的沙，受建設性海浪送到岸上，形成與海岸線平行的長堤，於潮退時暴露出來。	A ridge-like accumulation of sediment, usually sand or muddy sand, that forms parallel to the coastline where constructive waves drive sediments up towards the shoreline to form elongate bars that are exposed at low tide.
灘脊 Beach Ridge (*e.g.* 大浪灣 Tai Long Wan)	通常乾燥而位處較高的內灘，處於春潮最高位與海岸營力高位之間的地區。灘脊只受強烈風暴或不尋常的高潮影響。	An higher, usually dry, raised zone of sand located between the high-waterline of mean spring tides and the upper limit of shore-zone processes. Beach ridges are affected, or covered, by the sea only during exceptionally severe storms or unusually high tides.
抬升沙灘 Raised Beach	舊而不再活躍的沙灘，位於現今海岸線之上，與目前的海灘分開。於較高海平面時形成，或因地殼運動而遭抬升。	An old, inactive beach, above the present shoreline and separated from the present beach, that was formed during a period of higher sea level, or was raised by local crustal movements.
三角洲 Delta	呈葉狀的沉積物，一般為沙及泥，從河流運送，積聚在湖或海的入口。	A lobate body of sediment, usually sand or mud, that accumulates where streams or rivers enter a body of water such as a lake or the sea.
沙咀 Spit	呈手指形的狹長沉積物，由建設性海浪及水流，重新分佈沿岸的沉積物，這過程稱為沿岸漂沙。	A narrow ridge of sediment forming a finger-like projection that extends from the shoreline. Spits are formed by constructional waves and currents that redistribute sediment along the shoreline by a process called longshore drift.
連島沙洲 Tombolo (*e.g.* 長洲 Cheung Chau)	狹長沙脊將小島與大陸，又或兩個小島連成一起。	A narrow ridge of sand that connects an island with the mainland, or that connects two islands.
潮區 Estuary (*e.g.* 后海灣 Deep Bay)	為寬闊的河口，此處淡水流進海水，混成一體。潮區的特點是清水與鹹水混合和廣闊的，呈現一個清晰的潮汐圖案。在香港的潮汐灘地常見被紅樹林覆蓋，有助於沉積作用。	The wide mouth of a river where fresh water comes into contact with saline water. Estuaries are characterised by distinctive tidal current patterns, by fresh water/salt water mixing, and by extensive mudflats, which in Hong Kong are commonly covered with mangroves, a type of plant that encourages sedimentation.
瀉湖 Lagoon (*e.g.* 谷埔 Kuk Po)	位於河谷下游地帶的一個被沙咀或沙洲分隔的岸邊水體。	A coastal body of water in the lower part of a river valley that has been isolated from the sea by a sand spit or sand bar.

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