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《中高課程指引》(2007)的建議而制定。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木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本小冊子、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。

土木工程處的「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。

我相信這款教材套對各位負責新高中地理科目的老師在編制教材時提供合適的參考。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。

陳健樺
土木工程署署長
土木工程處處長
2008年12月

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.

Raymond K S Chan
Head, Geotechnical Engineering Office
Civil Engineering and Development Department
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。

地形學是指對地形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表表面形狀（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）。人類活動例如填海及築堤工程等，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.
Geology and the Hong Kong Country Parks

About 40% of the land area of Hong Kong is designated under the Country Parks Ordinance (Figure 1), which protects large areas of the natural landscape from the pressures of urbanisation, and preserves them for posterity. These areas encompass most of the wild upland regions, extensive sections of scenic coastline, and large segments of the outlying islands, making them ideal outdoor laboratories for geological and geomorphological studies.

Access to, and within, the Country Parks is unrestricted. However, it should be emphasised that the damaging of rock outcrops, for collecting rock samples or searching for fossils, is prohibited. Studies should be carried out purely by observation, description, measurement, sketching and photography. In this way, irreplaceable geological features will be left intact and undamaged for future generations of students and visitors to observe.

Tai Lam Country Park – Granitic Terrain, Weathering & Faults

The Tai Lam Country Park presents an excellent opportunity to examine a major fault-controlled valley, features of granite weathering including tors, boulders, resistant quartz veins, the effects of severe gully erosion, and erosion-control planting.

The Tai Lam Country Park is underlain by the Jurassic Tai Lam Granite, a medium- to fine-grained porphyritic granite, which has given rise to contrasting landscapes of rounded and eroded hills, and rocky tors with boulder fields.

The Country Park is traversed by the northeast to southwest trending Tai Lam Fault. Deep weathering and preferential erosion along this extensive, linear fault trace has resulted in the straight master valley that today contains the Tai Lam Reservoir (Figure 2).
位於大欖郊野公園中央的花崗岩經過深層風化，以及長期多次受嶺腳砍伐樹木，使該地區受到嚴重的侵蝕而形成「劣地」的地貌，其中有極度侵蝕的斜坡、以及沙泥暴露的山頂（圖3）。

在1980年代控制風化措施實施之前，區內活躍的侵蝕觸發形成果樹形態現象在山頭。當中包括了在山頂窩處環狀的溝溝，這些樹溝山塊下方發散並進入深邃的風溝。這些情況，風溝多從風口開始被侵蝕，以致風口部分非常危險的斜坡。樹溝的支流進入較深地方，實際上是瀑布。

穿過山峰及山腳，會發現具抗風化及抗侵蝕的石英質，與一種時間石英。這些岩脈的表層是由粗面較軟、受風化後的花崗岩經侵蝕後被移除。

在大欖郊野公園的其他範圍，花崗岩的峭壁，屹立於山峰上。常見風溝及山谷兩旁，或是形成山腰的小塌堤。在兩邊，可見巨巖覆蓋山峰及山腳，而巨巖的溝溝則圍繞山谷（圖4）。

西貢郊野公園——火山岩範圍及海岸帶

西貢郊野公園的東南部提供了一個理想的機會，以研究遠古時代於火山岩內形成的，迷人的含柱狀節理的岩石。

西貢郊野公園的東南部蘊藏自第三紀時代的破火山口的火山岩脈。

破火山口別具特色，含柱狀節理的岩石，於大型的西貢破火山口內形成。西貢破火山口是一個龐大的火山盆地，當而形成的火山中心倒塌後剩下的火山口邊緣。

來自破火山口西北面的線路顯示，西貢破火山口的直徑長約20千米。然而，從南及東的破火山口遠緣的位置，相信已遠於今天的海底。

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來自破火山口內的風化顯示，西貢破火山口的直徑長約20千米。然而，從南及東的破火山口遠緣的位置，相信已遠於今天的海底。

The granite in the central areas of the Country Park is deeply weathered and, following several periods of deforestation by successive waves of settlers, the area has been severely eroded to create a ‘badlands’ landscape of deep erosion gullies and exposed sandy soils on the hill summits (Figure 3).

Prior to the implementation of erosion control measures in the 1980s, an intricate pattern of active erosion channels scarred the hills in this area. These comprised dendritic networks of small rills on the summit areas, which converge downslope to enter deep and narrow gullies. Headward erosion of the gullies has, in most cases, resulted in a very steep scarp at the head of the gullies. Tributary rills enter the gully at this point over what is, in effect, a waterfall.

Over recent years, trees have been planted over much of the area to control the damaging erosion, although the gullies are still preserved in the landscape.

Traverses of the hills will reveal a surface covered with a sandy, silty, slightly clayey soil. This material is the residue of granite weathering, comprising silt/clay derived from decomposition of the feldspars and sand derived directly from the quartz. The soil is crumbly and easily displaced, hence is very susceptible to erosion if not clothed with a protective cover of natural vegetation.

Traversing the summits and slopes, like low stone walls, are weathering- and erosion-resistant veins of white quartz. These veins have been exposed as the softer surrounding weathered granite was removed by erosion.

In other areas of the Country Park, granitic bedrock is exposed as blocky tors on hill summits, spur ends or valley sides, or as small cliffs on hillsides. Towards the southern margins, boulder fields mantle the summits and hillsides, and boulder streams choked the valleys (Figure 4).

The southeastern part of the Sai Kung Country Park presents an excellent opportunity to examine fascinating columnar-jointed volcanic rocks that formed in an ancient volcanic depression.

The southeastern part of the Sai Kung Country Park is underlain by volcanic rocks of the Cretaceous High Island Formation.

The distinctive columnar jointed rocks of this Formation were formed in a large caldera, the Sai Kung Caldera, a large, low-rimmed volcanic depression that survived after the original volcanic centre had collapsed.
含柱状節理的岩石屬玄武岩，原本乃一層亙久又炎熱的火山灰堆積覆蓋於破火山口盆地上。火山灰緩緩冷卻，並隨著冷卻而收縮，形成與冷卻面垂直的冷縮節理（冷縮面是指出灰層的底部，破火山口的地面，及灰層上部的大氛圍）。

大部分的柱石都是垂直或近乎垂直，然而，從遠處觀察岩石的表面，會在某些地方發現柱石傾斜，或成漸S形的彎曲（圖6）。在冷卻過程期間，火山灰經歷著冷凝階段，期間持續發生的火山活動，引發地震或破火山口地面下陷，導致火山灰層以緩慢的蠕動在火山盆地沉積下來，而其柱石彎曲的形狀一般顯示向東南方的蠕動。

在藥園群島至鰲頭灣一帶出現的柱石發展得尤為完善。

海浪侵蝕導致部分柱石崩塌，在崖壁留下筆直的槽溝，如沒有柱石的下部崩塌，上部會保持巖壁。在其他地方，柱石的上段則沿斜軸崩塌，造成多面傾向海邊的斷裂。

在部分地方，較脆弱及抗侵蝕力較弱的岩石被侵蝕，導致柱石集體倒塌，並形成海蝕洞。較罕見的是海蝕洞在狹窄的岬角兩側較軟的地方同時被侵蝕，最終連結一起形成海蝕拱。

觀察亦發現深色岩石條帶傾向地穿過石柱（圖6）。這是岩脈，是玄武岩質岩漿從絞纜（節理與斷層）迂迴地侵入石柱而成。岩漿侵入岩並非火山灰已凝結成堅硬的凝灰岩之後發生。這顯示在火山活動後的時期，岩漿邊上穿過已存在的岩石。

Evidence from the surviving fragments of the northwestern section of the caldera indicates that the Sai Kung Caldera was at least 20 kilometres in diameter. However, the locations of the former southern and eastern caldera rims lie somewhere out under the sea today.

The columnar jointed rocks are tuffs, which originally accumulated as a very thick blanket of extremely hot volcanic ash on the floor of the caldera. The ash cooled slowly, gradually contracting and developing vertical joints that formed at right angles to the bounding surfaces (i.e., the floor of the caldera at the base of the ash layer, and the atmosphere at the top of the ash layer).

From above, the cooling joints display a tightly interlocking hexagonal network (Figure 5). Hexagons are the most efficient geometrical 'stacking' pattern.

Most of the columns are vertical, or subvertical. However, close observation along the rock faces will reveal that, at certain locations, the columns are inclined or have a shallow S-curve (Figure 6). During the cooling process, the ash body would have passed through a plastic state. Continued volcanic activity in the region would have periodically produced earth tremors or local subsidence of the caldera floor, causing the ash layer to settle into the depression by a process of slow creep. The shape of the flexures generally indicate that creep was towards the southeast.

Observations will also reveal that there are bands of a darker rock that traverse the columns obliquely (Figure 6). These features are dykes, discordant (i.e. not following the main structures) intrusions of basaltic magma that would have penetrated an oblique crack (joint or fault) across the columns, long after they had cooled to form hard tuffs. They indicate that in subsequent periods of volcanic activity, magma was forced up towards the surface through the pre-existing rocks.

Looking out to sea, the columnar-jointed tuffs can be seen displayed along the offshore islands, where they form very distinctive vertical cliffs that rise abruptly out of the sea. The adjacent columns give the cliffs a striated appearance.

The columns are also particularly well-developed on the Ninepin Group of islands to the south of the High Island area.

Erosion by the waves has resulted in the collapse of some columns, leaving vertical slots in the cliff faces. Where only the lower part of a column has collapsed, the slots are topped by overhangs. In other places, collapse of the upper sections of columns along inclined fractures has produced polygonal facets that slope towards the sea.

In some places, erosion along weaker, less erosion-resistant, zones has resulted in concentrated areas of column collapse, and the formation of sea caves. More rarely, caves developing along weaker zones from opposite sides of a narrow promontory or headland have merged to create sea arches through the cliffs.
八仙嶺郊野公園 — 沉積岩及結構

八仙嶺郊野公園呈現一個研究大型基座及相鄰的水系、瀑布及近期的天然山坡崩塌的理想機會。

八仙嶺郊野公園主要蘊藏白堊紀時代的八仙嶺組岩層，在此岩層之下是侏羅紀時代大灣山組的火山岩。

白堊紀八仙嶺組的岩石主要為紅褐色厚層粉砂岩、灰紅色的砂岩，以及紫紅色的粉砂岩。這些岩石在河床前大量地質環境，磨損及沖刷的砂岩礦量於河床，而磨損砂岩是在一個半乾燥的環境以片流形式沉積。

這些岩石向北傾斜約20°至25°，形成香港唯一的大型基座（圖7）。基座上的山脊形成顯著的山脈，由西面的黃崗（639米高）伸延至東面的觀音嶺（304米高）。

市區地形

因人類活動而改變的地形

過去數千年來，自然過程不斷地改變及塑造大地。近期的人類活動改變土地面貌的速度，遠比自然過程快。香港原来的地形大部份已因人類活動而改變，主要為供應額外的建築用地、建築物料及萼的水源。

香港可建樓宇的空間有限，亦沒有湖泊、基於基座的不對稱形状，在基座南面的山坡上是陡峭而短直的河道，只在降雨時有水流，這些河道稱為季節性或短暫性河流。相反，北面山上的溪流則較平順，溪流流向較長，因而發展成典型河網狀支流，全年川流不息。這些河道稱為永久性或常流河。結果，位於八仙嶺觀景臺以南的村落只能從山上獲取少量的供水，但在較平坦的北面山坡則可獲恆常的供水。

靠近陡崖的中心，第號的山頂之東（588米高），山脊被山谷分隔，是現時的.')

瀑布顯示出多項典型瀑布發展的特質，包括壁面呈斜方的石壁，清晰的裂點，在瀑布底部的軋礫，近觀的瀑布，受軋礫的河床岩石及壺穴。

多個近期的天然山坡泥石流可在南面較陡峭的山坡發現，大部分是較陡而長的滑坡。

pat sin leng country park — sedimentary rocks and structures

The Pat Sin Leng Country Park presents an excellent opportunity to examine a large escarpment, the associated drainage patterns, a waterfall, and recent natural terrain landslides.

The Pat Sin Leng Country Park is predominantly underlain by Cretaceous rocks of the Pat Sin Leng Formation, which are in turn underlain by volcanic rocks of the Jurassic Tai Mo Shan Formation.

The Cretaceous rocks are reddish-brown, thickly bedded conglomerates, greyish red sandstones, and reddish-purple silts that were originally laid down as beds in two main geological settings. Conglomerates and pebbly sandstones were deposited in river channels, and the overlying sheet-like sandstones were deposited by sheet floods in a semi-arid environment.

The rocks dip towards the north at about 20° to 25° to form the only large escarpment in Hong Kong (Figure 7). The crest of the escarpment forms a prominent ridge that extends from Wong Leng (639 metres high) in the west to Kwun Yam Tung (304 metres high) in the east.

Because of the asymmetrical shape of the escarpment, streams on the southern scarp slope have steep, linear, and very short courses, and only flow following rainfall. These are termed seasonal or ephemeral streams. In contrast, streams on the gentler northerly sloping slope have longer courses, so they have developed a typical dendritic pattern, and flow almost all year. They are termed permanent or perennial streams. Consequently, villages on the southern side of the Pat Sin Leng escarpment receive very little water supply from the hills above them, whereas villages located on, or near the foot of, the dip slope tap into an almost permanent water supply.

Towards the centre of the escarpment, to the east of the summit of Shun Yeung Fun (588 metres high), the ridge is breached by a valley that is now occupied by the waters of the Plover Cove Reservoir. Near the head of the valley at Bride's Pool is a very scenic waterfall that plunges over a rock shelf composed of the Pat Sin Leng Formation.

This waterfall displays many classical features of waterfall development including a hard, resistant rock band, a well-defined knick point, undercutting at the base of the fall, an almost circular plunge pool, scouring of the rock that forms the bed of the stream, and deep potholes.

Several recent landslide scars can be seen on the steeper southern scarp slope, most of which are shallow, short runout features.

The urban landscape

Modifications of the landscape by human activity

Natural processes have steadily eroded and shaped the land over thousands of years. More recently, human activities have changed the surface of the earth at rates far faster than those of natural processes. The original, pre-settlement, landscape of Hong Kong has been considerably modified by human activity, largely in order to supply additional building land, building materials, and reliable water supplies. Hong Kong has limited flat land for building, and no lakes, rivers, or major aquifers to provide drinking water. Consequently,
In the following years, reclamation has been carried out with increasing speed. By 1868, the area of reclamation had reached 80 square kilometers, and by 1870, it had increased to 130 square kilometers. The speed of reclamation continued to increase, reaching 200 square kilometers in 1875. The rate of reclamation in Hong Kong was among the highest in the world at the time.

Also, many of the notable developments in Hong Kong are located on reclaimed land, including the former Kai Tak Airport, the new Chek Lap Kok Airport (12.5 km²) (Figure 9), large areas of the Kowloon peninsula and Central District on Hong Kong Island, including the West Kowloon Reclamation (3.3 km²), as well as the Disneyland complex (2 km²).

In Hong Kong Island, an area of 25 square kilometers was redeveloped, with a significant increase in the number of buildings and population. Flat land has been created by coastal reclamation and site formation, quarrying has provided building materials and concrete aggregates, and water has been stored by building dams and impounding reservoirs. Together, these activities have had a profound effect on the onshore topography, the shape of the coastline, and the drainage pattern of Hong Kong, not only in the urban areas, but also in many of the New Territories villages.

Coastal Reclamations

The first proposal for land reclamation in Hong Kong was made in 1855 for the Western Praya Scheme in the area of Kennedy Town. The scheme eventually began in 1868 and was completed in 1873, adding 50 acres (0.2 km²) to the waterfront.

A second reclamation scheme commenced in February 1890 and was completed in 1904, using about 3.5 million tons of material to create 65 acres (0.3 km²) of new land.

Over the succeeding years, the rate of reclamation increased almost exponentially. Between 1868 and 1967 a total of 10.0 km² had been reclaimed, between 1967 and 1991 an additional 30.5 km², and between 1991 and 1995 a further 19.0 km² were reclaimed. In total, more than 60 km² of land have been formed by reclamation (Figure 8).

Most of the New Towns in Hong Kong, including Tin Shui Wai, Ma On Shan, Tsuen Wan, Sha Tin, Tuen Mun, Tsuen Wan, and Tung Chung, comprise large areas of coastal reclamation.

Today, reclaimed land makes up about 6% of the onshore area of Hong Kong, development land that now supports housing for about 20% of the population.
今天，香港约有百分之六的土地面積来自填海，足以应付约百分之二十的人口興建住宅。

首項填海工程以傾倒公共廢物進行，包括建築及家居廢料。方法是先興建堤壩，然後將城市廢物緊於洞湖中。遠隔離法進展緩慢，需數年時間才能完成。

多個早期的填海工程採用海沙作原料，項目包括興建維基（1929-1931及1956-1959）、銅鑼灣避風塘、維多利亞公園及屯門新市鎮的填海工程。

許多大型填海工程，則從山邊挖取風化岩石作為填海物料。此方法的優點是較使用棄置公共廢物的方法快捷。同時，開挖而得的新土地可用於建屋發展。

然而，選用風化岩石的缺點是由於風化岩石的粒狀大小不規則，並含有豐富的砂礫，加上含鹽份成份阻止排水，同時，挖掘、破壞工程及重型車輛運載物料，都會對市區帶來環境滋擾。


重大土方工程

主要土方工程

除進行填海工程外，亦可將填海山頂或將斜坡切割成平台，以增加發展土地。採用這種方法以獲得土地的例子眾多，包括不同規模由興建小型村舍以至發展大型屋苑。

隨著九龍半島的發展逐漸北移，多個大型屋苑（例如馬雲山及竹園）及將九龍山腳興建發展用地。同樣地，在香港島的主要項目，如愛民花園，也涉及將龍山部分的山坡。近年在新界土地發展工程中亦適用地大量岩石（圖10）。

The first reclamation was carried out using material provided by public dumping, including construction and household waste. Bunds were built, and city waste was deposited in the lagoons. This method was slow, taking many years to complete.

Several early reclamation projects were carried out using sand from offshore sources. These included the Kai Tak extensions (1929, 1931 and 1956-1959), the Causeway Bay Typhoon Shelter, Victoria Park, and Tuen Mun New Town.

Many large reclamation projects were carried out using weathered rock obtained by cutting back into hillsides. This method had the advantages of being faster than public dumping, and also created new land for housing developments in the "Borrow Areas".

However, there were several disadvantages to using weathered rock. The placed fill required a long period to settle because of the irregular particle sizes, which included large rock fragments, and the material drained slowly because of the clay content. Importantly, severe environmental disturbance was created in city areas during excavation and blasting, and by heavy vehicles transporting material to the coastline.

Offshore sand became the preferred fill option in the 1980s, pioneered by two important projects: Container Terminal 6 was constructed between 1986 and 1989 using about 8.6 million m³ of marine dredged sand, and the Tin Shui Wai New Town was constructed between 1986 and 1988 using about 24.0 million m³ of sand. This method had the advantages of being rapid, creating minimal environmental disturbance onshore, and the placed fill drained and consolidated rapidly.

重要填海工程

大規模填海工程

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Major Site Formations

In addition to reclaiming land from the sea, development land is also created by levelling the tops of hills, by completely removing hills, and by cutting platforms back into steep hillsides. There are many examples of this kind of site formation, at all scales from the erection of small village houses to the construction of vast housing complexes.

As urban development on the Kowloon peninsula gradually spread northwards, several large housing sites, such as Tsz Shan Shan and Chuk Yuen, were developed by cutting back into the Kowloon foothills. Similarly, major projects such as the Kam Kok development involved cutting into the hills on Hong Kong Island. More recently, the Jordan Valley site formation included the removal of large quantities of rock (Figure 10).

Several projects, such as the the Tsuen Kwan O New Town development, involved both major site formation and reclamation. Large-scale rock removal created housing platforms on the hillsides surrounding the bay, and much of the excavated rock was used as fill for extensive areas of coastal reclamation.
**Quarrying**

Quarrying is an important activity, providing both dressed building stones and aggregates for concrete. However, quarrying, which is an accelerated form of artificial erosion, dramatically changes the appearance of the landscape, both by producing ‘erosion scars’ (quarries), and by redistributing and ‘depositing’ vast quantities of, largely granitic, material.

Prior to 1966, there were numerous small ‘permit’ quarries scattered around Hong Kong, largely producing dressed building stone. The last ‘permit’ quarry closed in 1974 in favour of larger, licensed quarries.

Until 1978, all processed stone was obtained from quarries in Hong Kong. Subsequently, importation of stone began, so that by 1987 about 44% of the demand was met by imports from the Shenzhen and Zhuhai Special Economic Zones. This change reduced the pressures on the limited land area of Hong Kong, and many quarries were closed.

In 1980, two large Government quarries and seven contract quarries were operating, which produced 15 million tonnes of aggregates. By 1988 the number was reduced to one Government quarry and five contract quarries.

As the population of Hong Kong grew, the demand for aggregates grew. There was a significant increase in the consumption of aggregates between 1980 and 1990, from 3 million tonnes to 18 million tonnes. Despite a 50% increase in population over the period, this represented an annual increase of 0.75 tonnes per head to 3.4 tonnes per head of population.
水塘及引水道

香港的面積共1,105平方公里，其中約
百分之三十三的土地是水塘，以引導
雨水從山上流入15個原是山谷的水塘，
以及船灣淡水湖及鯉魚門水塘的原是海洋的
水槽（圖11）。

香港的水塘是首個原是山谷的水塘，
於1877年落成。其餘14個現存的山谷
水塘於其後的八十八年接踵完成
（圖12）。於1965年完成的下城門水塘是
最後一個山谷水塘。十五個水塘的儲備
水量為7,500萬立方米。

多個小型水塘包括蘇屋谷及黃泥涌
水塘，已不可再使用。被填平或已遭棄。

船灣淡水湖及鯉魚門水塘均以興建水壩
來阻擋海水進入（圖13）。船灣淡水湖於
1967年初步落成，當時的儲水量為1.7億
立方米。其後，水壩於1973年加高，
令儲水量提升至2.3億立方米。船灣
水壩於1978年竣工，儲水量共2.81億
立方米。

全港17個運作中的水塘總儲水量為5.86
億立方米，足夠支撐全港222天用水，
即全年的百分之六十的用水。

環繞香港山旁建築的引水道網絡
（圖11），將山上或萬地水塘的天然
水源，直接引到水塘。

這些引水道成功地引導天然溪流，經過
隧道，分流至鄰近的水庫。香港的
天然排水系統已被廣泛改造，包括在
市區的下水道及市區外的引水道。