CONSTRUCTION
INDUSTRY COUNCIL
建造業議會

Liberal Studies

HONG KONG CONSTRUCTION INDUSTRY

INFORMATION KIT

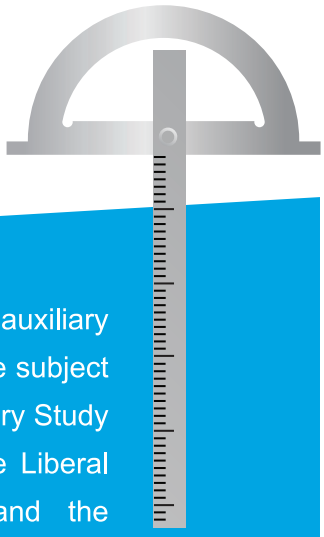
CONTENTS

Preface

Construction projects are generally complex in nature and involve various parties working together to complete. It is not straight forward to understand the full spectrum of the construction industry and its scope of work. While individual stakeholder groups or practitioners may have prepared information kits to elaborate their respective contribution to construction projects, the Construction Industry Council as the industry-wide co-ordination body set up under the Construction Industry Council Ordinance (Cap. 587) wishes to introduce this information kit to students as an overview of the whole construction industry so that students can understand the wide coverage of the construction industry and the important role it plays in the development of our society.

We would like to thank Ir Raymond WONG for contributing his valuable photos for inclusion in this information kit.

How to Use



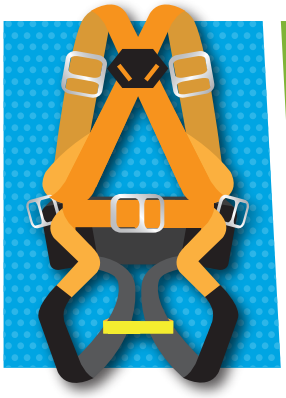
The information kit is intended for secondary students and provides auxiliary resources for teachers to encourage students to explore and reflect on the subject matter. Teachers can use the kit individually or with the Independent Enquiry Study module of the senior secondary school. The topics correspond with the Liberal Studies Modules “Hong Kong Today” and "Energy Technology and the Environment".

This information kit focuses on the following elements:

- Multi-angle analysis: Enhancing students' awareness and analysing problems from different angles in order to judge issues comprehensively.
- Critical thinking: Require students to access information from various resources and avoid the poor practice of accepting data sources indiscriminately.
- Cultivating attention to social issues: Strengthen awareness and focus of social development issues of the industry.

Notes for Teachers

- Use the teaching materials to encourage further thinking from students and guide discussions.
- Help students understand the roles of different stakeholders and their functions in the construction industry and social development of Hong Kong.
- Encourage students to understand the vision of future construction projects. Explore different viewpoints in order to analyse the benefits and costs of social development.



Chapter 1: Introduction to the Construction Industry

Introduction

Hong Kong was rated the most "liveable city" in the world by the Economist Intelligence Unit (EIU) in its Spatially Adjusted Liveability Index (2012). This accolade can be attributed to the city's highly developed infrastructure and urban planning that supports everyday activities, and its connectivity to the rest of the world. The city has also earned the title of "Asia's world city" due to its support of commerce, other industries, community facilities, heritage, culture and the environment.

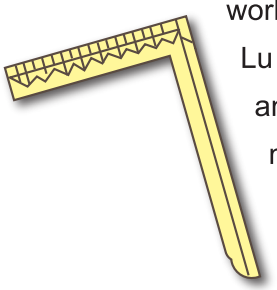
The construction industry, by partnering with its stakeholders, transformed Hong Kong from a small fishing village into a cosmopolitan city. Major developmental projects over the city's history include: transportation networks, industrial facilities, water and waste facilities, and residential estates. Recently, ten major infrastructure developments have been announced to continue Hong Kong's development in the 21st century. The industry is now pushing to utilise greener technologies and materials in developments.

History of the Construction Industry

The construction industry is one of the major pillars of Hong Kong's economy. With more cross-boundary co-operation in economic activities, there is a rising demand for the improvement of transportation and infrastructure developments. The industry engages in all activities for the development of major infrastructures and real estate properties which include planning, building, repairing and alteration. These activities involve many different stakeholders such as real estate developers, professionals, academics, contractors, workers and Government officials. The industry has immense potential in generating more employment opportunities, particularly for the current ten major infrastructure projects underway and future developments in Hong Kong.

Lu Pan

The construction industry can be traced back to the very beginning of Chinese history. In Chinese folk culture, there is a saying that 'In the 360 industries, none can succeed without an ancestor'. A skilled craftsman and key figure of the industry, Lu Pan, is respected as one of the most renowned ancestors of the construction industry.



Lu Pan is worshipped by Chinese carpenters, painters, and plaster workers ('Three Line' Craftsman). According to legend, Lu Pan invented many tools for carpentry, machinery and manual craftsmanship. For example, the angle meter (carpenter's ruler) is colloquially known as the 'Lu Pan Ruler'. The line and ink used by the carpenters for alignment were his other inventions that are still in use today.

Lu Pan is still worshipped by workers in the construction industry today. The 13th day of the sixth month in the Lunar Calendar is the Lu Pan Festival during which workers of the industry pray for a safe and smooth work year. Lu Pan signifies that ancient artisan skills have provided improvements of efficiency in the construction and to the advancement of society. The construction industry's respect of Lu Pan remains paramount in the industry today.

Support to Economic Growth

Growing cross-border relationships and economic activities require better transportation and other related infrastructure systems. The industry provides logistics and facilities for many other industries and therefore significantly supports the economy of Hong Kong. In addition, the construction industry's success in recent years forecasts an anticipated rise in the number of sites and employment opportunities in Hong Kong.

Many construction projects are crucial in supporting the four major economic pillar industries and sectors of Hong Kong, namely, trading and logistics, tourism, financial services, and producer and professional services.

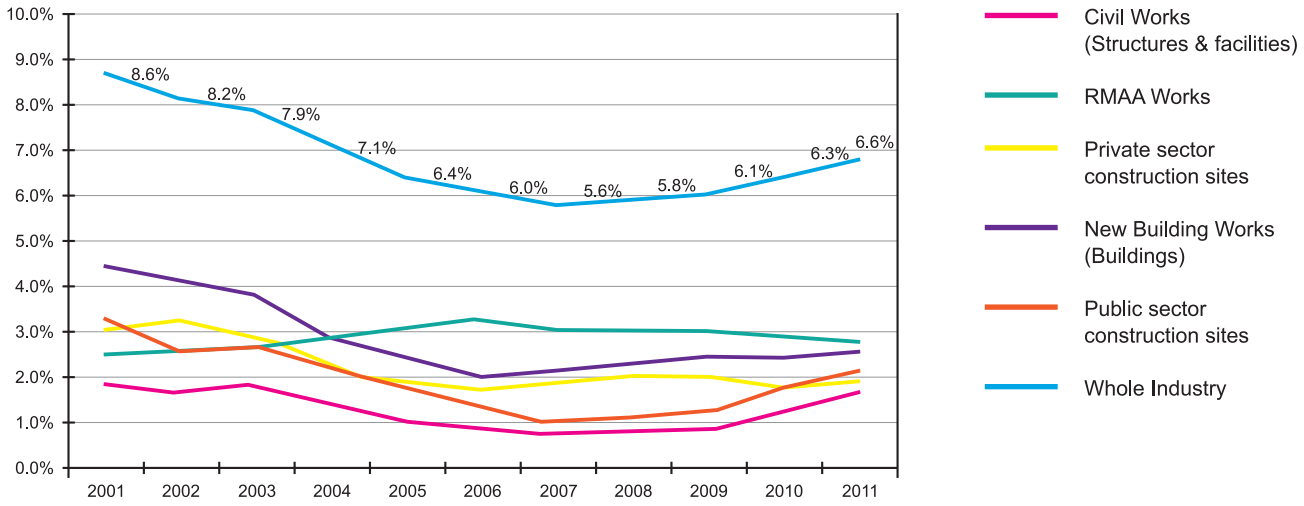


Fig 1a Gross Value of Construction Works to GDP

Construction Sites and Employment

As of June 2012, the overall number of sites and employment has been higher (22.4%) than the same period of the previous year:

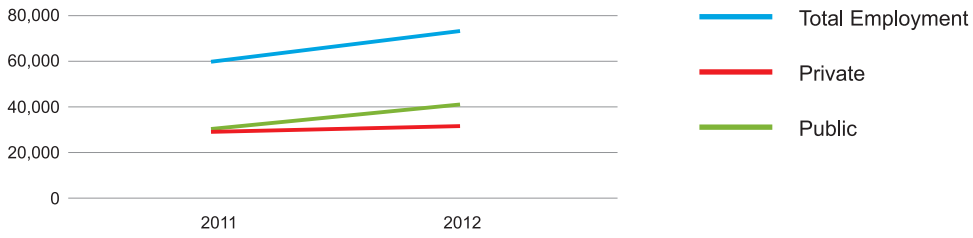


Fig 1b Construction Site Employment 2011-12

Source: Census and Statistics Department of Hong Kong

Fig1c Ten Major Infrastructure Projects

Chapter 2:
Types of Construction

Introduction

Construction projects significantly improve the everyday lives of citizens and thus the liveability of a city. They also contribute to building landmarks that embody the culture and image of Hong Kong. Significant infrastructure and landmark projects represent different eras in Hong Kong's history, while still serving important functions to the city's continuous growth.

Ensuring technology up-to-date is crucial in a rapidly changing world in order to maintain Hong Kong's competitiveness. Owing to a number of constraints, such as the scarcity of land and the congested city environment, the demand for high-quality planning and the application of the right technology have become more crucial.

This chapter outlines different types of construction projects, with notable examples and highlights on the technologies used.

Buildings
provide citizens with shelter and safety and support daily activities

Transportation network
connects citizens with one another and enhances convenience in mobility

Public utilities
support the daily life through the provision of electricity, water, and waste management

Buildings

What are the Uses of Buildings?

Buildings provide facilities that support a range of public and private functional activities and environments. Buildings cater for different needs of individual citizens, industries, the community at large and the Government.

The construction industry is involved in all aspects of the building development process. The industry is actively exploring new technologies and developing new construction methods to improve the quality of buildings in Hong Kong. Examples include reducing the "wall effect" by improving air circulation; improving building energy efficiency; and utilising more eco-friendly practices in design and construction.

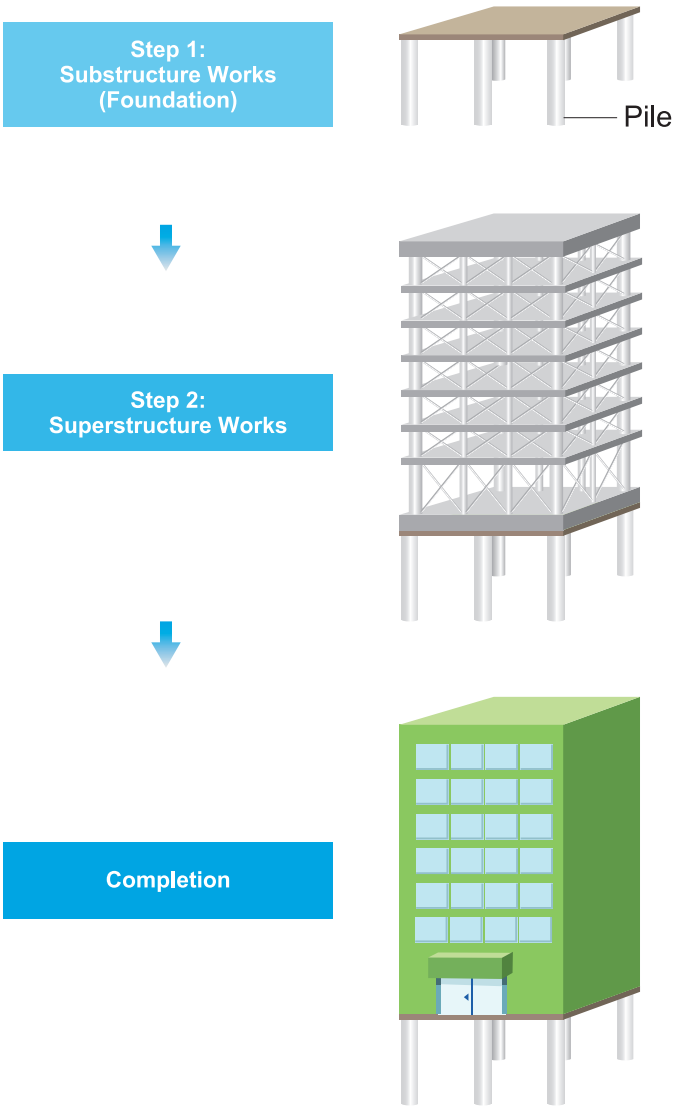


Fig 2a Building Construction Process

What Types of Building Are There?

Building types in Hong Kong are broadly categorised by their main functions. This section examines the following buildings types:

Residential

Commercial

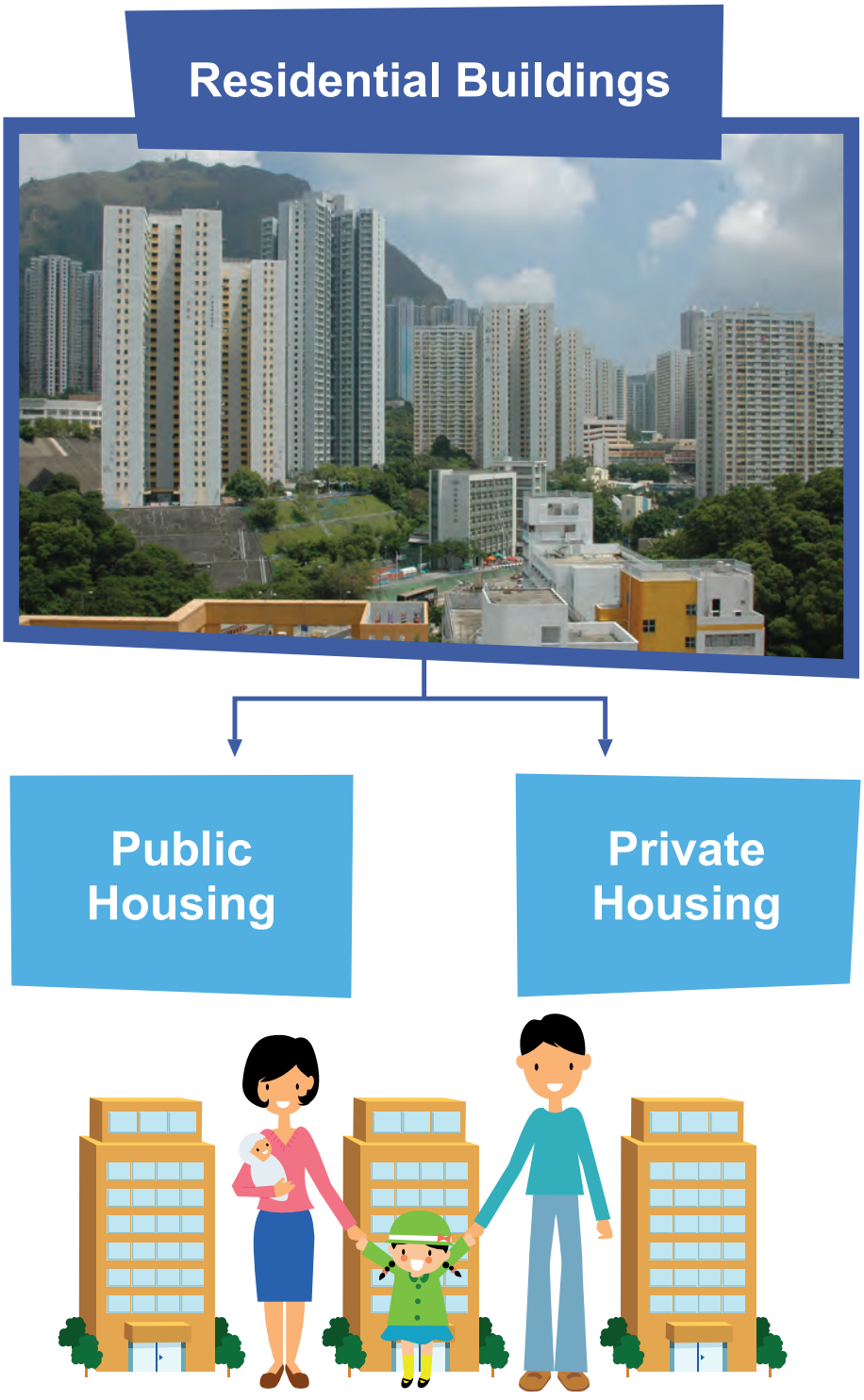
Institutional

Residential Buildings

What are Residential Buildings?

Residential buildings are buildings that cater for the living and accommodation needs of citizens. In 2011, Hong Kong Annual Digest of Statistics estimated that there were more than 2.5 million domestic households in Hong Kong.

Types of Residential Buildings



Public Housing

Residents of public housing are provided with housing units at an affordable price through low rental or several subsidy programmes for purchasing. The Hong Kong Housing Authority (HKHA) provides public rental housing and subsidised housing units for lower income citizens. The HKHA reported that more than 30% of the population reside in public housing estates.

Features of Public Housing

- Standard building design
- High-rise
- Grouped in clusters
- Offered at lower costs
- Examples of public housing estates in Hong Kong: Sha Tau Kok Chuen, Tivoli Garden, Kwai Chung Estate[1]

Case 1: Ngau Tau Kok Estate Redevelopment Plans

[1] Introduced the first sandwich class housing scheme in Hong Kong

Private Housing

Private housing estates are residential buildings built by private developers and regulated by the Buildings Department. The city's future population growth anticipates an increase in demand. The demand for private domestic units has seen yearly growth from 2006 to 2011. Private housing estates cater for the higher income class of the population in Hong Kong.

Features of Private Housing

- Higher costs due to luxury designs or facilities and high land premiums
- Either high-rise clusters; low-rise with large floor area; or individual housing blocks
- Examples of private estates in Hong Kong: Mei Foo Sun Chuen, City One Shatin, Taikoo Shing

Case 2: Timeline of Private Housing Development

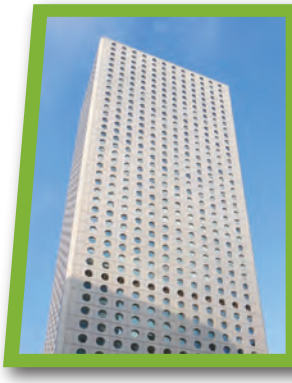
Commercial Buildings

What are Commercial Buildings?

Commercial buildings are used for day-to-day work activities and offer facilities for offices, warehouses, hotels or retail businesses. Commercial buildings in Hong Kong are largely high-rise in order to maximise their capacity. Many international companies are headquartered in these business centres. Some of the commercial buildings even become Hong Kong landmarks.

Landmark Buildings

Hong Kong is home to some of the world's tallest buildings, each one having a unique concept and iconic design. The three landmark buildings mentioned below are remarkable examples that highlight Hong Kong's rapid development over the years.



Jardine House

Jardine House is significant in Hong Kong because it is generally regarded the city's first skyscraper. Known as the Connaught Centre in earlier days, it was the first building in Hong Kong to reach over 50 storeys. It was constructed in 1973 and stands at a height of 178.5 meters with a total of 52 floors, which was the tallest skyscraper in Asia at the time.

Two International Finance Centre (Two IFC)

Construction of Two IFC was completed in 2003. The building forms part of the development project which includes two skyscrapers that host first-class offices, a luxury mall, and five-star hotel, designed to achieve the concept of "a city within a city". Located within the central business district, Two IFC was once the tallest building in Hong Kong at 88-storeys and accommodates some of the leading international financial institutions. It is now the second tallest building in Hong Kong.

International Commerce Centre (ICC)

The ICC is the tallest building in Hong Kong and also hosts first-class offices, a shopping centre and luxury hotel. The ICC is 118-storeys tall and is located at West Kowloon. The project was completed in 2010 and is owned by MTR Corporation Limited and Sun Hung Kai Properties. At a height of 484 metres, the ICC is currently the fifth tallest building by height in the world.

Institutional Buildings

What are Institutional Buildings?

Institutional buildings are ubiquitous. These buildings accommodate various forms of day-to-day activities for the public. Building and facility features vary based on the functions of the institutions. Types of institutional buildings are discussed on the following page.

Types of Institutional Buildings

Institutional Buildings and Functions

Cultural Buildings

- Promotes culture, arts, or showcases historical artefacts and other treasures

Exhibition Buildings

- Provides facilities for exhibitions and conferences

Educational Buildings

- Special designed buildings that support learning activities of students

Government Buildings

- Houses different branches of Government such as the Government Headquarters at Tamar, courthouses, legislative chamber

Community and Other Buildings

- Other types of buildings support activities such as healthcare, community services, religion, leisure

Transportation

The transportation network in Hong Kong connects citizens from urban to outlying areas, Mainland China and the rest of the world. This section discusses various transportation infrastructures, focusing on the following:

Road Network

Bridges and Tunnels

Airport

Railway Network

Terminal

Why is it Important?

Transportation infrastructure increases mobility and connectivity. Well-developed transportation systems strengthen the economy by improving trade activities and access. It also brings people closer together.

Road Network

As one of the most highly traffic-dense cities in the world, Hong Kong has a very advanced road network that covers a significant portion of land. The network increases connectivity and mobility by providing convenient access for cars, trucks and public transport vehicles. The road network is designed and developed by the Transport Department and the Highways Department.

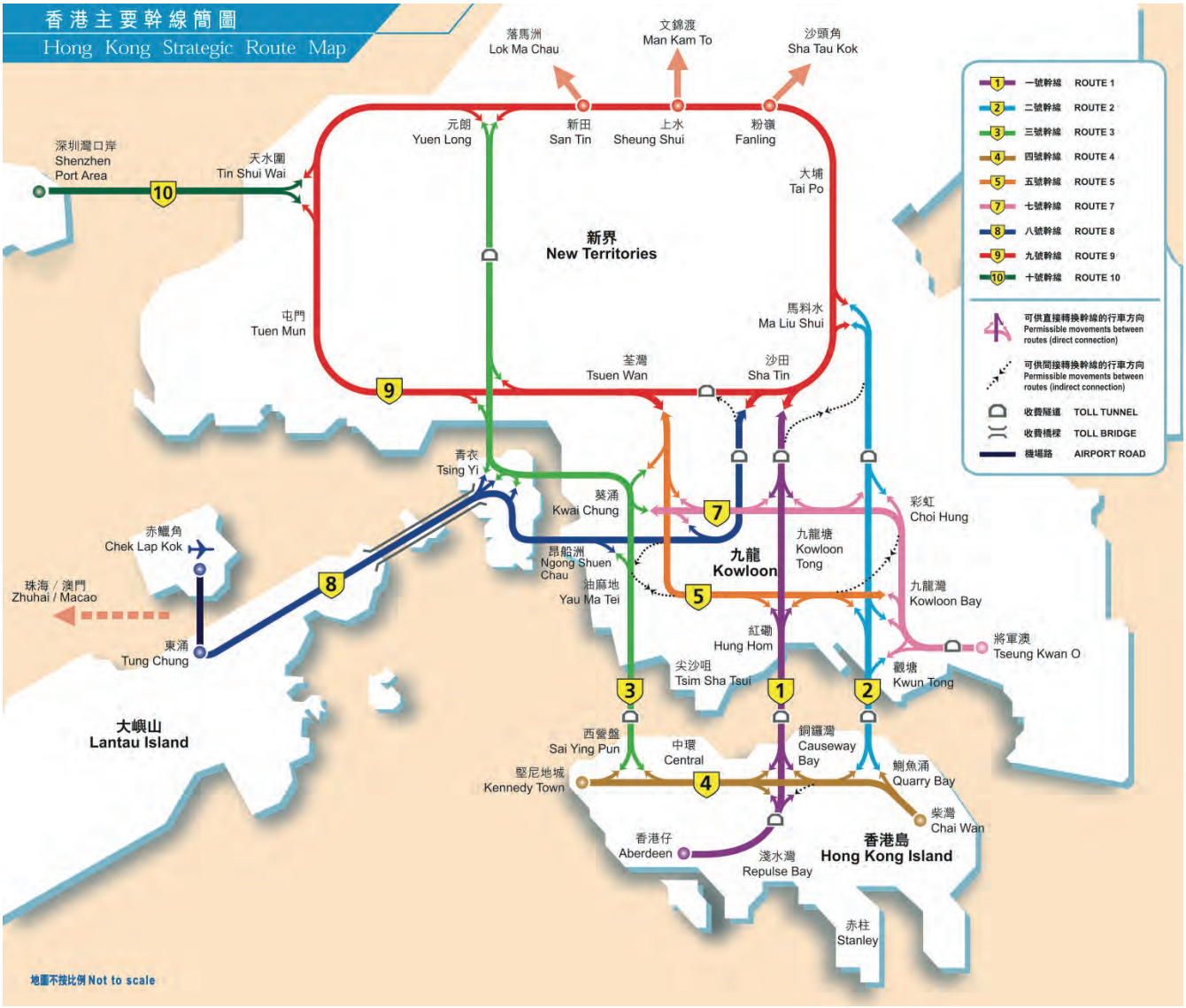


Fig 2b Hong Kong Strategic Route Map

Interesting Facts[2]

- Total road length is 2,090 km:

Hong Kong Island	Kowloon	New Territories
444 km	462 km	1,184 km

- Travelled by more than 645,880 vehicles daily in 2012

[2] http://www.thb.gov.hk/eng/psp/publications/transport/publications/hk_highway.htm

Bridges and Tunnels

To overcome geographical constraints, bridges and tunnels have been constructed, many of which have become iconic to Hong Kong. Currently, there are 16 major road tunnels and approximately 1,320 flyovers and bridges. Bridges and tunnels are mainly designed and constructed by the Highways Department.

Bridges

Bridges connect urban regions and provide linkages to Hong Kong's islands. The design of bridges in Hong Kong incorporate specific safety features, for example, to be able to withstand severe typhoons. Bridges connect two areas where there is no ground access available to cross them. Bridges are also provided to relieve ground traffic flow by diverting the vehicles from one area to another via bridges. Some notable bridges include:

- Tsing Ma Bridge
- Kap Shui Mun Bridge
- Ting Kau Bridge

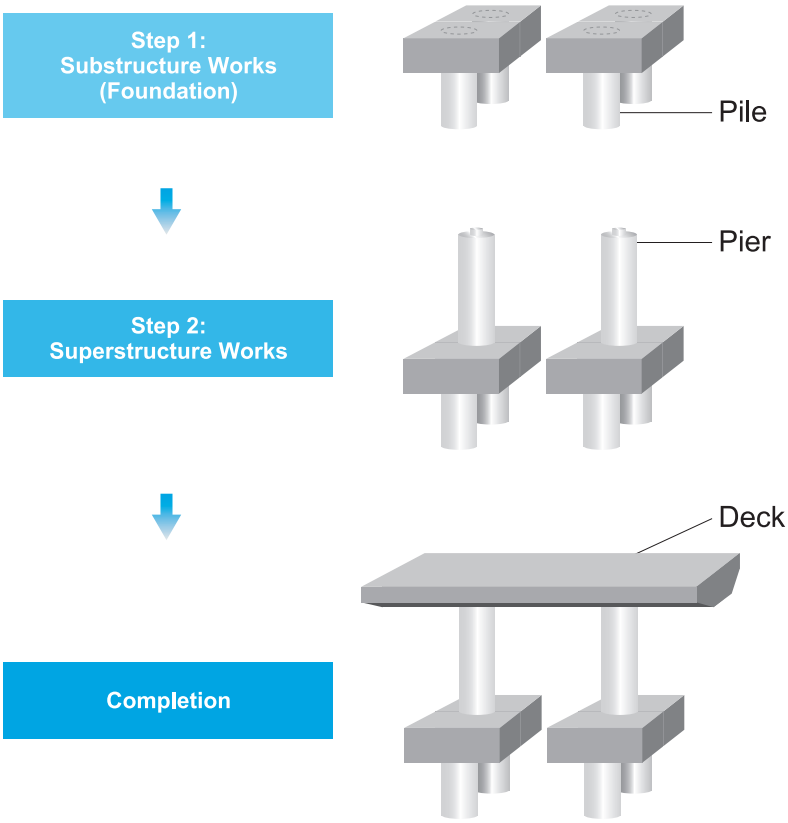


Fig 2c Construction Process of Bridges

Case 3: Tsing Ma Bridge

Tunnels

Tunnels also overcome geographical constraints by connecting different regions of Hong Kong. The first tunnel, the Cross-Harbour Tunnel was opened in 1972 and drastically changed the way people travelled. Earlier, ferries were the only way of crossing the harbour. Hence the construction of tunnels was significant in improving the efficiency and convenience of the transportation network.

Case 4: Cross-Harbour Tunnel

Railway Network

The railway network plays a critical role in Hong Kong's public transportation system, from ground to underground railways. It alleviates road congestion, provides a timely and quick means of travelling, and improves connectivity among people. The network speedily links people between urban and outlying areas, the airport and Mainland China. MTR Corporation Ltd., whose major stakeholder is the Government, builds and operates this system.

Current expansion projects of the entire railway network are under planning and design, some of which are now under construction.

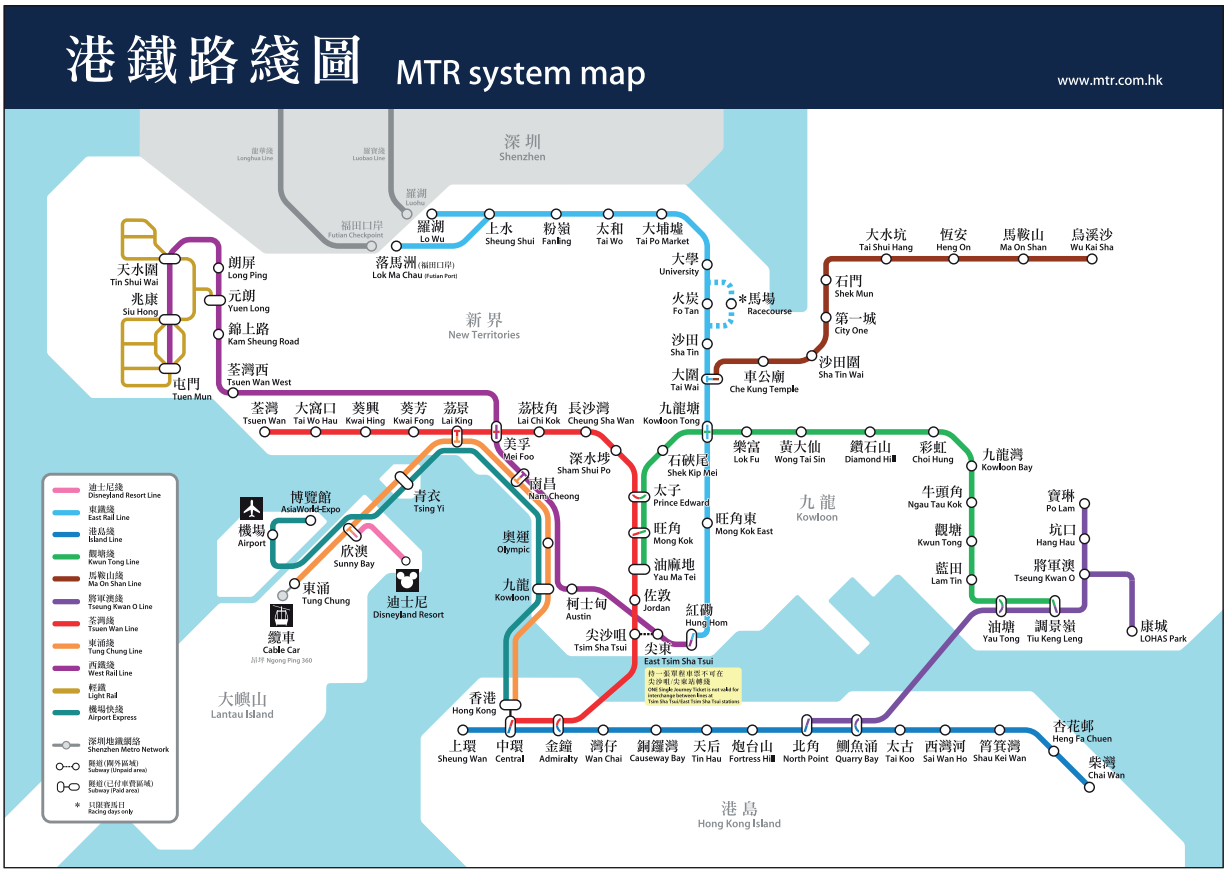


Fig 2d MTR System Map

Interesting Facts[3]

Daily railway use accounts for 38% of public transport

The railway has a length of 175 km and a total of 82 stations

The average daily patronage of the railway system is about 4.07 million

Case 5: New Developments in Hong Kong

[3] http://www.hyd.gov.hk/en/road_and_railway/railway_projects/index.html
http://www.yearbook.gov.hk/2011/en/pdf/E13.pdf

Terminals

In terms of water transportation, the Victoria Harbour of Hong Kong is world famous for its deep, sheltered waters and strategic location on the South China Sea. In addition to the Star Ferries and other private boating services for individual passengers to commute between the Hong Kong Island, the Peninsula and the outlying islands in its territory, Hong Kong also prides on its container terminal and cruise terminals which service marine vessels from all over the world.

Cruise Terminals

The Ocean Terminal, Hong Kong's first cruise terminal, opened in 1966 and through its history has welcomed many well-known cruise liners and ships. The terminal provides Hong Kong with another transportation alternative which attracts many tourists to Hong Kong, one of the world's most famous shipping centres with more than 700 shipping companies represented.

Another terminal, Kai Tak Cruise Terminal, opened in 2013 at the site of the former Kai Tak Airport.

Interesting Facts

- There is a floating dock for repairs of vessels up to 46,000 tonnes and ship repair and engineering facilities
- Queen Elizabeth II (built for Cunard) has berthed in Hong Kong

Case 5: New Developments in Hong Kong

Container Terminals

In Hong Kong, the logistics sector relies heavily on container handling facilities. The city continues to be one of the world's busiest ports. Terminals use state-of-the-art facilities and equipment to improve efficiency and operations for the trade and logistics industry.

Hong Kong has nine existing container terminals with a total of 24 berths located at Kwai Chung and Tsing Yi occupying an area of 279 hectares. Hong Kong was the world's third busiest container port in the world in 2012 behind Shanghai and Singapore.

Airport

Hong Kong International Airport (HKIA), developed by the Airport Authority, was opened in July 1998 on Lantau Island. It is the only civilian airport in Hong Kong and is recognised as one of the world's best airports. The airport facilitates a high demand of passenger transportation and is also one of the largest cargo hubs.

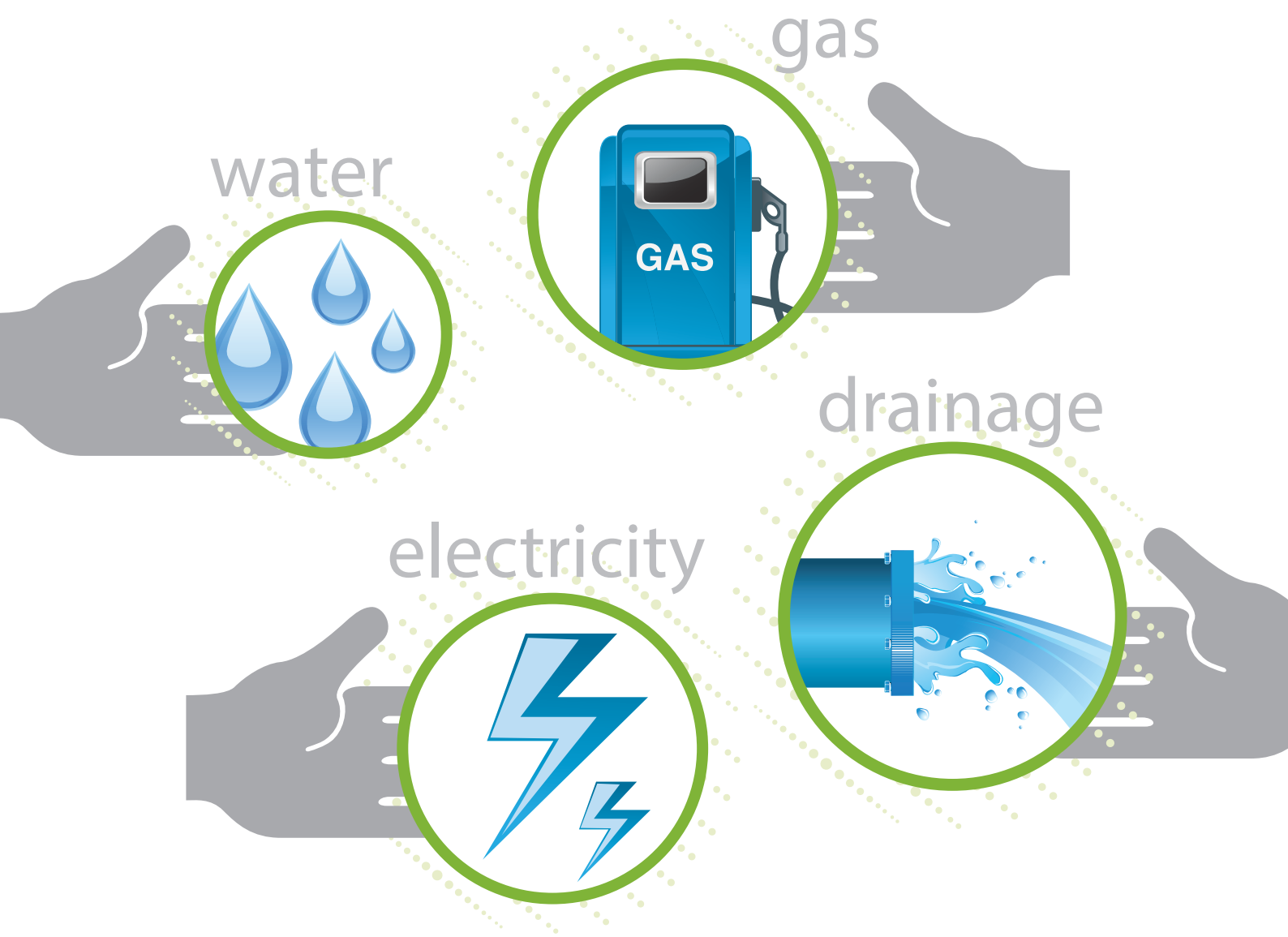
Interesting Facts

- Total area of 1,255 hectares that hosts two passenger and two cargo terminals
- More than 65,000 employees work for HKIA
- Capacity of 64 flights per hour

Case 6: Expansion of HKIA Runaway

Public Utilities

Public utilities are public services that provide essential everyday services to citizens such as water, electricity, gas and drainage. Hong Kong has well-established infrastructure that is crucial to a liveable city provided by the construction industry.



Why is it Important?

Clean water, electricity and gas are daily necessities. Proper handling of waste water and prevention of flooding are also essential for a liveable city.

Water Network

Water is a crucial part in liveability. Water is used for drinking, flushing, sanitation and leisure. Infrastructure works to store, drain and regulate water supply serving these purposes. In Hong Kong, the Water Supplies Department manages the water supply while the Drainage Services Department is in charge on drainage and wasterwater treatment.

Water for Consumption

From rainwater collection to importing water from the Dongjiang River in Mainland China, Hong Kong gathers its water from multiple sources and enjoys safe water supplies. The High Island Reservoir, located in the eastern-end of Sai Kung, is a major reservoir that stores a large amount of water. It improves the contribution and protection of potable water needs of Hong Kong citizens.

Case 7: High Island Reservoir

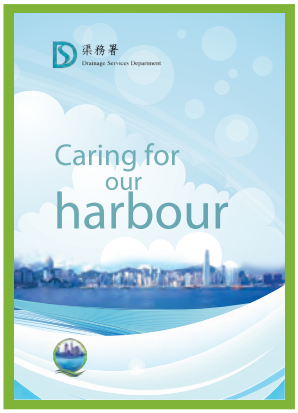
Drainage

Hong Kong encounters heavy rainfall, particularly during typhoon season, thus creating risks of flooding of low lying areas. To avoid flooding of the roads and land, a sophisticated drainage system is required.

Today, drainage methods such as drain-laying; interception and technology to transport rainwater; and temporary underground storage tanks for rainwater are used.

Wastewater Treatment

A sewerage system collects sewage through sewers (pipes) and directs it to treatment facilities (wastewater treatment plants) before expelling it into the sea. The purpose of this infrastructure is to ensure proper sanitation and health.

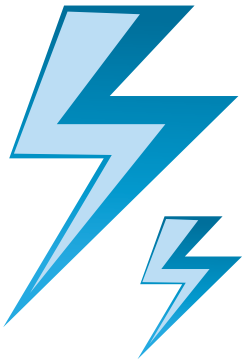


The Harbour Area Treatment Scheme (HATS) operates to improve the overall water quality of Victoria Harbour. There are 27 sewage treatment facilities in the New Territories and 40 in Hong Kong, Kowloon and the outlying islands.

Electricity Supply

An electricity supply network is necessary to supply power to households, commercial buildings and other electricity consumers. Electricity is supplied by CLP Power Hong Kong Limited to Kowloon, the New Territories, Lantau Island and Cheung Chau; and by Hong Kong Electric Company Limited to Hong Kong Island and Lamma Island. Both are investor-owned companies that liaise with the Electrical and Mechanical Services Department. The construction industry is involved with building the infrastructure such as the power plants, power lines.

There has been a rising trend in electricity consumption in Hong Kong which results in increasing carbon emissions to the atmosphere. Carbon emission causes global warming, therefore the city has begun to experiment with renewable energy which is sustainable and does not emit pollutants or gases into the atmosphere. Solar and wind energy are relatively recent applications being employed in Hong Kong. Although these technologies have been developed, there is still the challenge of delivering it to the mass population of Hong Kong.



Case 8: Lamma Island Wind Energy

Gas Supply

Hong Kong uses town gas and liquefied petroleum gas (LPG) for fuelling household, commercial and industrial activities (which accounts for 2.3 million customers). Citizens use gas every day, from cooking to bathing and washing. The industry is involved with the construction of the gas supply pipe networks. Town gas is supplied to household and commercial consumers through gas pipe networks running mainly underneath the roads throughout the city.

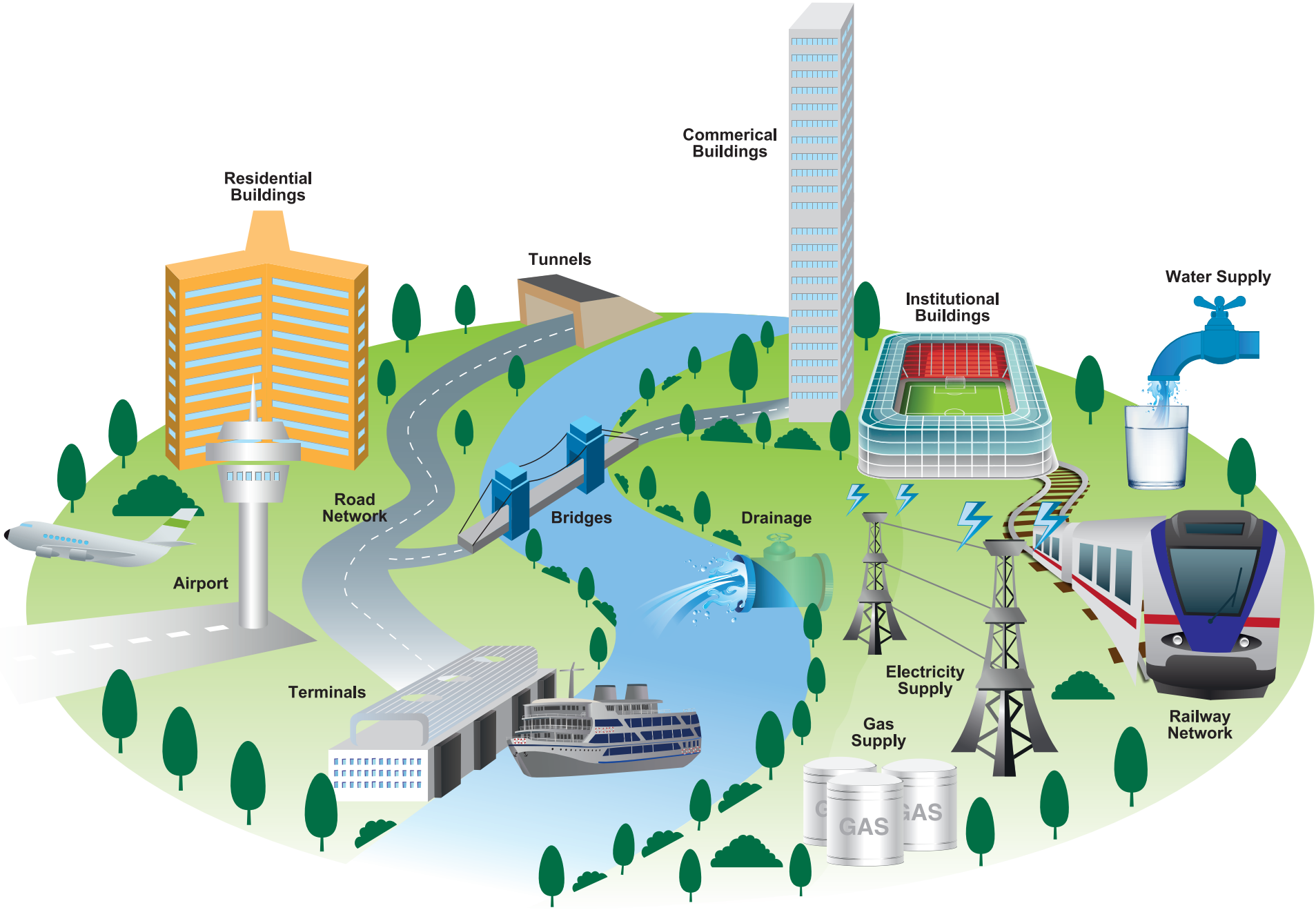


Fig2e Overview of various Construction Projects

Chapter 3: Industry Stakeholders

Introduction

The development of infrastructures and buildings requires the involvement of different parties. All those involved are industry stakeholders that include real estate developers, professionals, academics, contractors, workers, and government departments. Co-operation and collaboration is essential in the positive development of the industry as a whole. This section will provide a broader outlook of key stakeholders and their roles in the industry.

Stakeholders of Construction Projects

Who are they?

The construction industry is manpower intensive to make the systems work and to provide the required quality to guarantee Hong Kong's ongoing development and the livelihood of its citizens. Owing to the complex nature of the process of construction projects, the participation and co-operation of many construction industry participants is required.

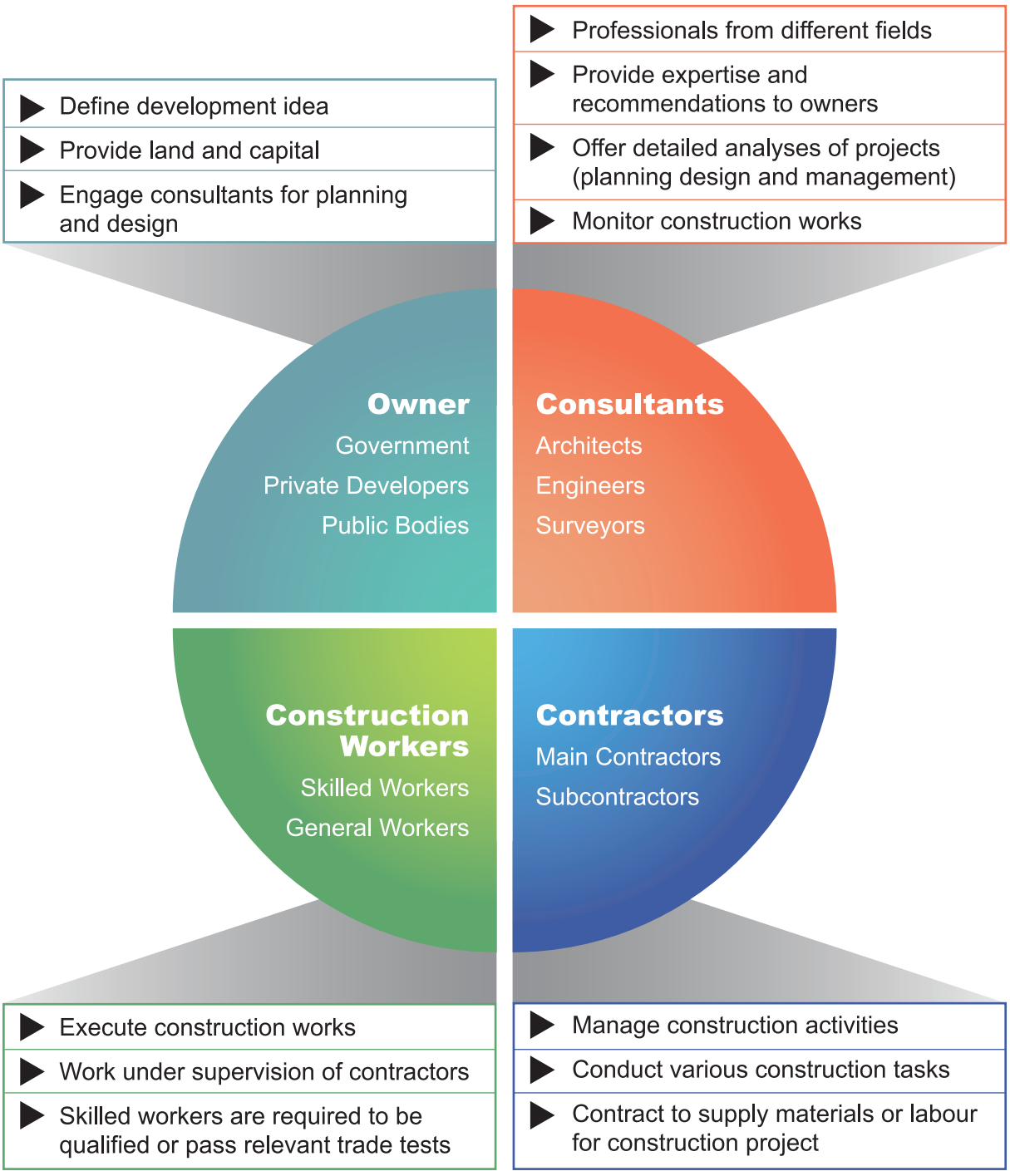


Fig 3a Stakeholders and Their Responsibilities

Interesting Facts[4]

- While the professional construction industry is highly specialised, there are about 100 trades available for test and registration
- For details of each trade please refer to the Construction Worker Registration Ordinance (cap 583) or cwr.hkcic.org

[4] http://www.legislation.gov.hk/blis_pdf.nsf/6799165D2FEE3FA94825755E0033E532/03E2ED7691ADBBA1482575EF001F02DB/$FILE/CAP_583_e_b5.pdf
http://cwr.hkcic.org/registration/Designated_Trades.pdf

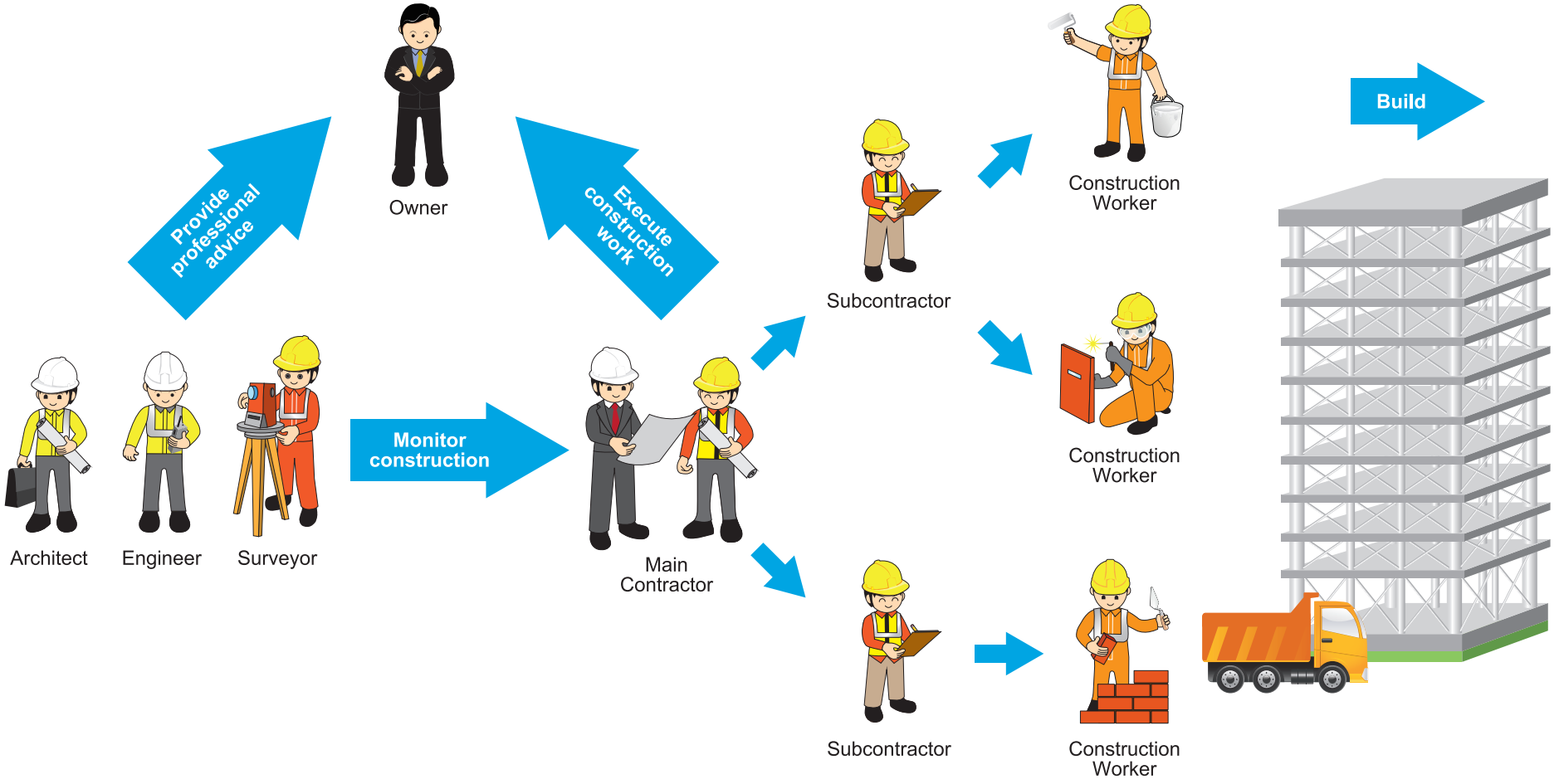


Fig 3b Process of General Construction Projects and Stakeholders

Government Departments and Statutory Bodies

Processes involved in construction activities are multifaceted and therefore require the participation of various industry stakeholders. The Government also plays a pivotal role in the construction life cycle from being a regulator that sets out standards and ensures their compliance, a project originator of many infrastructure projects, to a facilitator that provides necessary facilities such as creating landfill and public dumping sites for construction waste materials.

Key Government Departments Involved:

- Architectural Services Department
- Buildings Department
- Housing Department
- Water Supplies Department
- Environmental Protection Department
- Drainage Services Department
- Electrical and Mechanical Services Department
- Civil Engineering and Development
- Highways Department

The Construction Industry Council

As various stakeholders are involved in the construction industry, the industry was once described as "very fragmented". To reform the industry and to foster better co-ordination, an industry co-ordinating organisation in the form of a statutory body was recommended to generate consensus on strategic issues, and to communicate the industry's needs and aspirations to the Government.

The Construction Industry Council (CIC) was formed on 1 February 2007 under the Construction Industry Council Ordinance (Cap.587). The CIC consists of a chairman and 24 members representing various sectors of the industry including employers, professionals, academics, contractors, workers, independent persons and Government officials.

The main functions of the CIC are to forge consensus on long-term strategic issues, convey the industry's needs and aspirations to Government, provide training and registration for construction workforce and serve as a communication channel for Government to solicit advice on all construction-related matters.

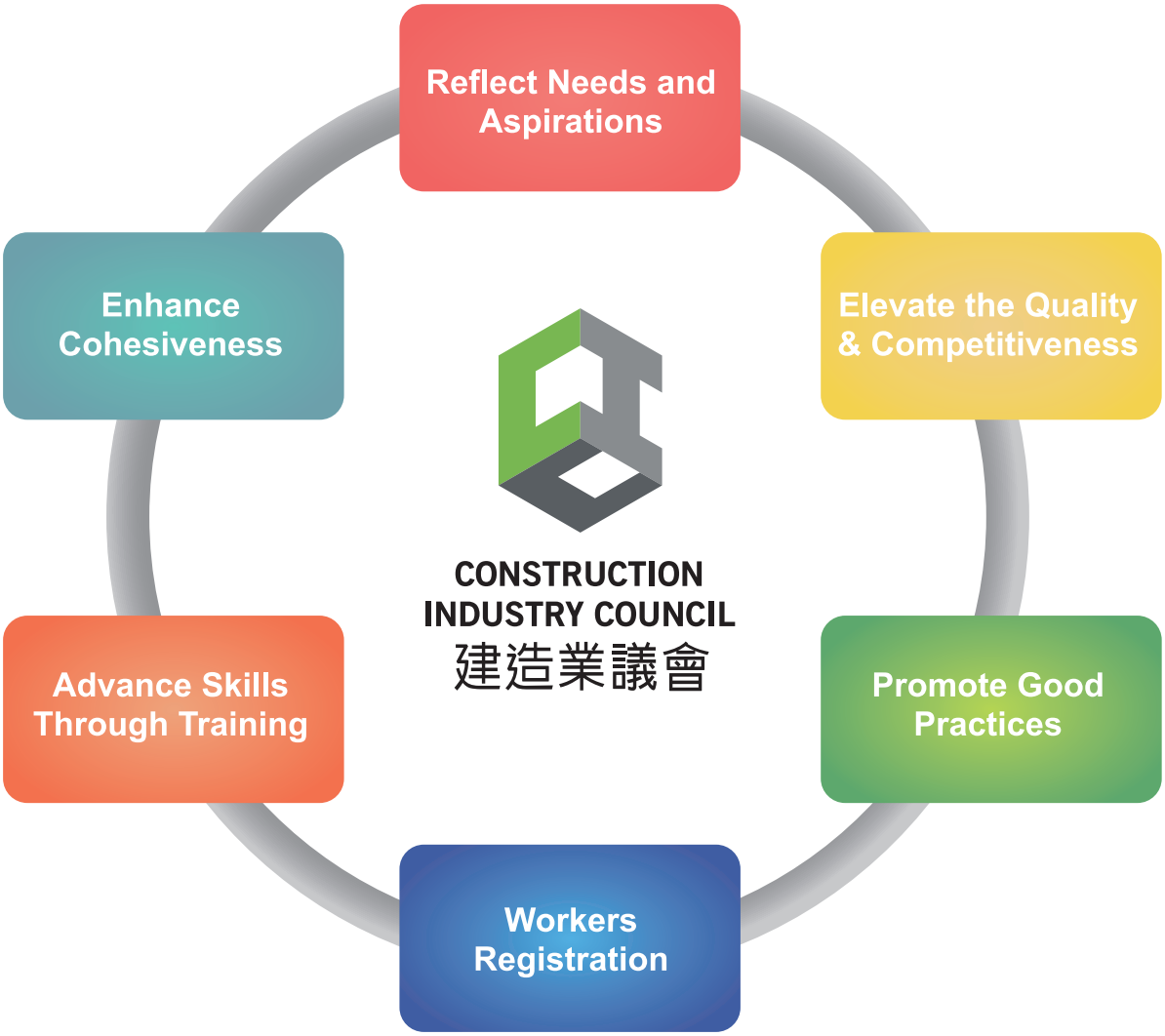


Fig 3c Functions of the CIC

Chapter 4: Sustainable Development

Introduction

Sustainable development was first recognised in 1987 by the United Nations World Commission on Environment and Development “Our Common Future” report. The report states the importance of having "development that meets the needs of the present without compromising the ability of future generations to meet their own needs."

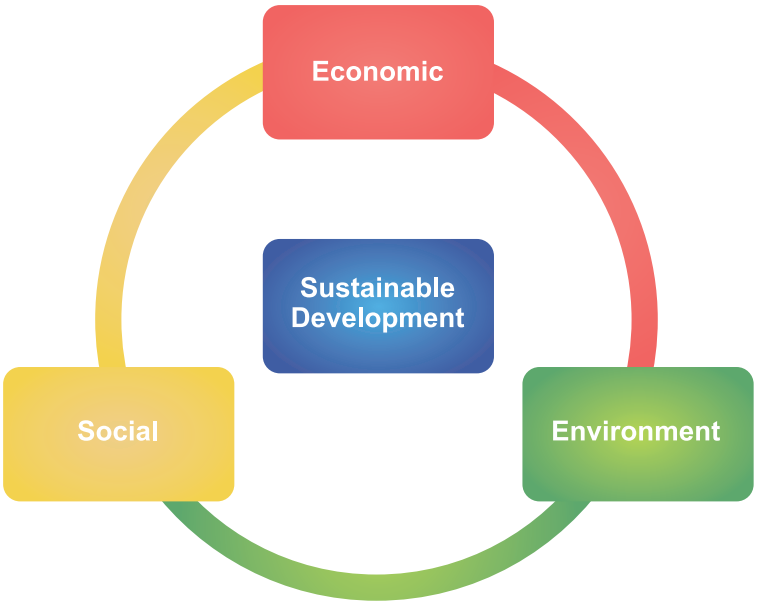


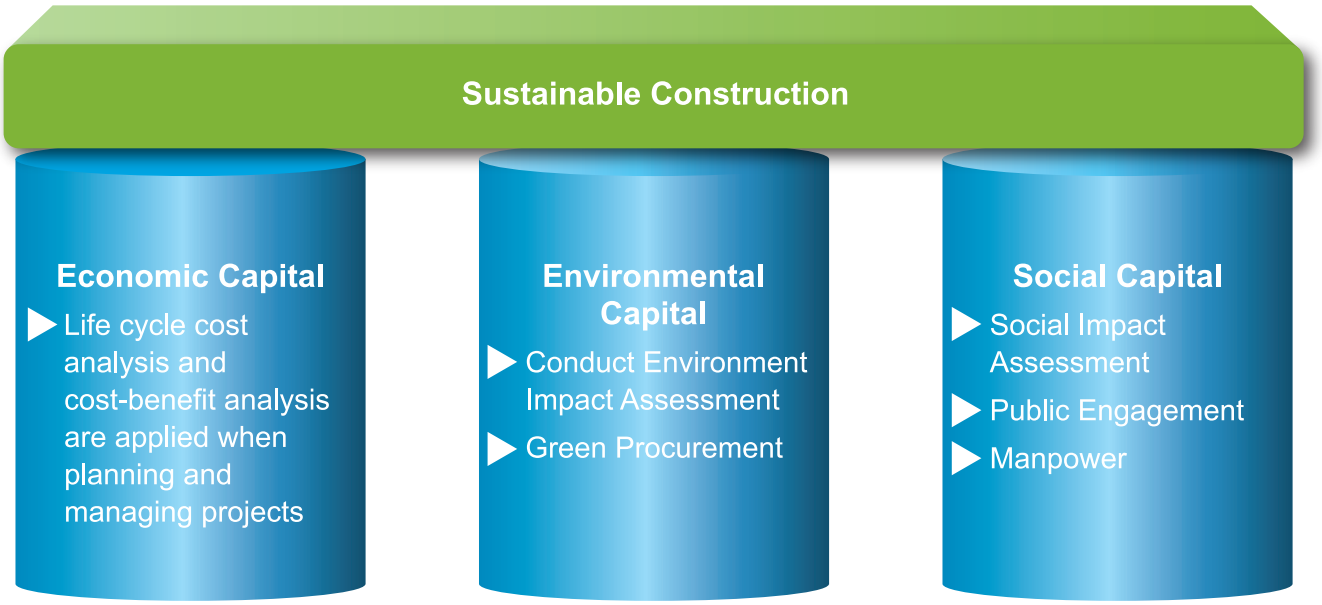
Fig 4a Sustainable Development

The essence of sustainable development in the industry is the ability to balance progress and the environment. This implies that the industry’s activities should foster growth, without impairing future societal needs or the natural environment. Many government initiatives are intended to provide the legal framework to assess situations regarding sustainable development.

In recent years, the industry has aimed to enhance efficiency by improving some of its existing practices to achieve both growth and sustainability. This chapter examines a few initiatives on how sustainability can be achieved in developments:

Sustainable Construction

"Sustainable development means to keep the three constituent pillars of sustainability, namely economic, environmental, and socio-political, in balance."



Source: CIC Newsletter Issue No.5

To ensure construction projects are carried out in a sustainable way, consideration should be given from planning and design to construction stages. Examples of sustainable practices are illustrated below.

Case 8: Lamma Winds, Case 9: ZCB

Green Building Standards

In recent years, green building has become a worldwide priority. Eco-friendly efforts in construction planning have jumpstarted many local and international green building standards. Benefits of these standards include:

BEAM Plus

BEAM Plus is a set of local green building standards adopted by the Hong Kong Green Building Council (a local organisation actively involved in green building practices and assessment) for assessing the environmental performance of buildings.

HKGBC BEAM Plus 綠建環評

Buildings may be awarded with different green building labels (Platinum/Gold/Silver/Bronze) after the assessment.

Green Construction Material

Green construction materials are recycled materials used by the construction industry. The employment of these materials in construction activities and processes address several environmental and sustainability concerns. In recent years, the Government has been enforcing several regulations and initiatives to utilise green construction materials in large-scale infrastructure projects.

This section uses fly ash, environmental protection tiles and recycled gravel as examples.

Fly Ash

Environmental Protection Tiles

Recycled Gravel

Fly ash

Fly ash (Pulverised Fuel Ash or PFA) is a by-product from power generated in coal-fired power stations without specific usage. It has however been found that PFA can be used as a component for concrete. PFA technology has been used in large-scale projects such as: Eastern Harbour Tunnel, Housing Authority Headquarters and HKIA. It is now commonly adopted in construction works.

Benefits of Fly Ash

- Reduce the consumption of cement and thus reduce cost of manufacturing of concrete
- Reduce the burden of disposal of the PFA
- Versatile and can be used in strong, light-weight construction materials (e.g. hollow plates); paving; concrete products (e.g. tunnel lining)

Environmental Protection Tiles

Environmental Protection Tiles (EPT, Green Brick) are bricks composed of recycled glass waste that is crushed and moulded into 3mm glass sand pieces to be mixed with gravel, cement and other materials. In October 2010, the Highways Department required upcoming public road maintenance contracts to use EPTs for walkways

EPTs are capable of converting air pollutants into harmless substances due to the brick surfaces (coated with titania) converting emissions into non-toxic solid nitrates by chemically reacting with sunlight and emissions.

Benefits of EPTs

- Addresses landfill shortage issues in Hong Kong by using glass waste
- Replaces traditional brick-making which was causing impact to the environment
- More than 20% of nitrogen oxides are effectively eliminated

Recycled gravel

Recycled gravel and aggregates from inert construction or demolition materials, such as concrete and rock fragments, contain more than 95% of the natural stone. These recyclable materials are transported to factories that separate concrete, stones, and other objects, that are then processed into crushed recycled aggregates. These are formed into stone that are then ready to be used for construction.

In April 2003, the Highways Department introduced recycled aggregates in the manufacturing of precast concrete paving slabs used to install pavement.

Benefits of Recycled Gravel

- Versatile for the use of road construction materials, foundation work debris, drainage works, gravel packing and as general fillers
- Slows down consumption and exhaustion of natural resources used in concrete production
- Reduces the reliance of river sand used as aggregate

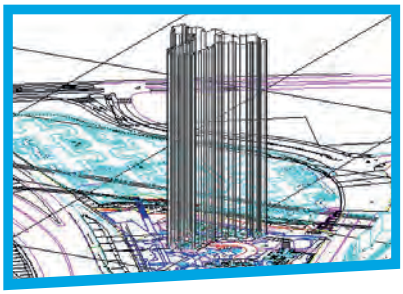
Sustainable Construction Technology

Technology plays an integral part towards industry-wide sustainable development initiatives. Some of these tools are used in the design and planning process, whereas others are used for construction activities. These technologies make processes more efficient and effective. The Government supports the use of these technologies by enforcing sustainable construction technology in recent major infrastructure projects.

Prefabricated components and Building Information Modelling are key buzzwords in this area and are changing the industry today.

Prefabricated Components

Building Information Modelling



Prefabricated Components

Prefabricated components are components that are factory-built before being shipped to sites for assembly. Construction using concrete prefabricated components is easier to assemble to permanent structures. However this method requires meticulously-controlled logistics and transport functions. Today, this technology is used on building parts particularly for facades, staircases, walls, floors, door components, beams and bathrooms.

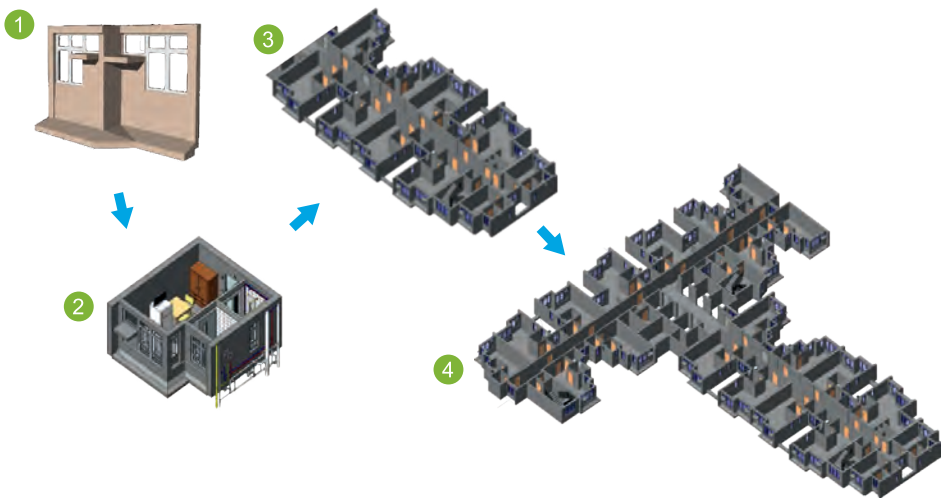
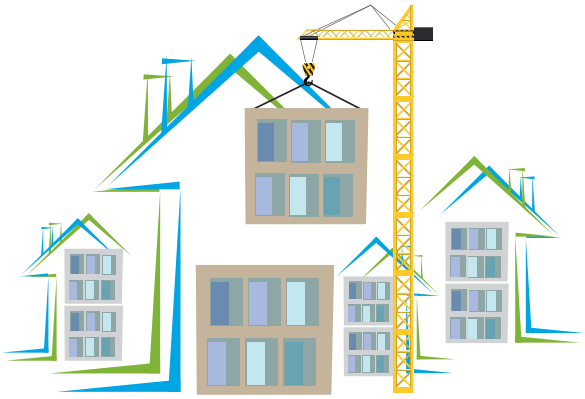


Fig 4b Typical Process in the Use of Prefabricated Components

There are several important considerations to facilitate the use of prefabrication in high rise construction:



Symmetry in Layout Design

If the layout can be symmetrically designed, the prefabricated steel formwork can be rotated from one wing to another, thus avoiding the transfer of formwork to ground level. The number of types of precast elements could also be largely reduced, hence more repetitive use of steel moulds and simplify logistics.

Use of Tower Cranes

Tower cranes contribute a significant cost to construction. If crane capacity could be reduced, it saves in the overall construction cost. If the weight of precast components could be minimised, such as the use of planar facades or facades with less complicated profiles, the capacity of tower cranes could be smaller. Symmetry of layout could also greatly enhance the tower crane capacity as the reach of the crane can be optimised. Sometimes, if the block is asymmetrical, two instead of one tower crane may be required.

Dimensional Accuracy of Precast Elements

Precast construction calls for high precision otherwise it cannot fit into and interface with in situ construction as formwork is also prefabricated. Where precast is connecting to precast, such as non-wind resisting elements, accuracy is also vital. Generally, a maximum of 4mm tolerance between each connection is allowed.

Transportation from Factory to Site

The width of precast elements have to be limited to less than 2.5m for truck transportation. Transportation is preferably by road, and 'just in time' to minimise storage on site.

Benefits of Prefabricated Components

- Promotes material savings and can be recycled
- Higher performance and safety due to quality control
- More accurate and efficient construction planning budgets

Building Information Modelling

BIM is a new design method for construction projects that uses digital information to represent physical buildings and other types of construction. It covers geometric, spatial relationships, geographic information systems, the nature of various building elements and nominal variables. Main uses of BIM are for construction design and planning, facilities delivery and operation as well as sectional visualization of a building.

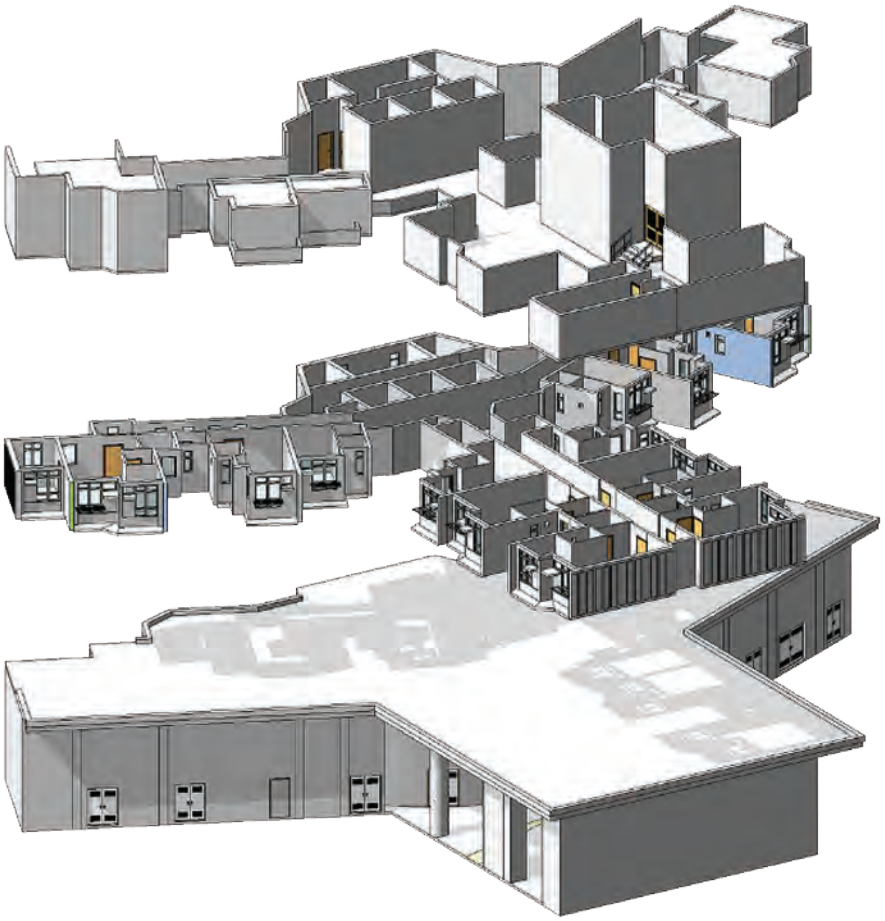


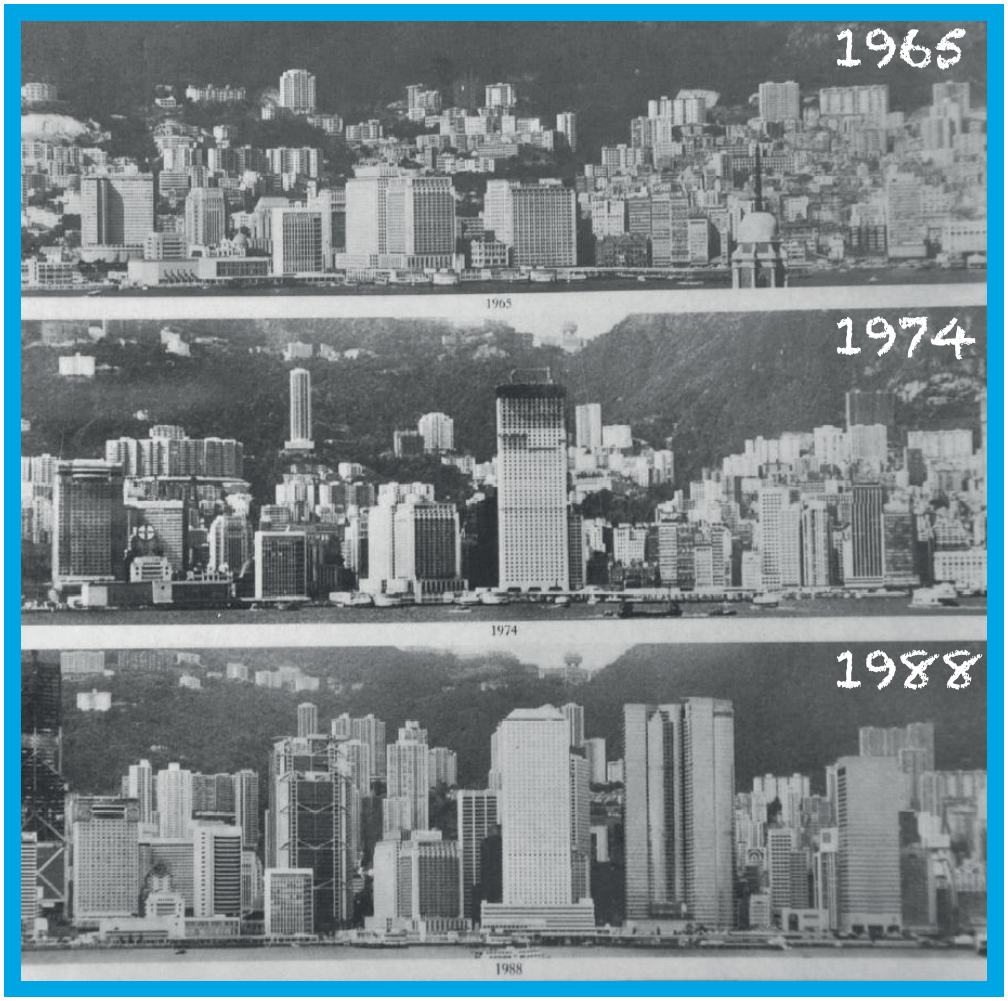
Fig 4c Building Information Modelling

BIM can facilitate construction project developments in:

- Providing multi-dimensional visual images and timely information of construction projects
- Allowing testing on models and quickly generate options for better decision making in respect of time, cost, process, and risk
- Detecting design faults (especially clashes) and minimise design changes
- Improving site safety management and education
- Enhancing financial risk management and minimise financial claims due to variation and delay
- Facilitating better project coordination by bringing all relevant disciplines of participants in the construction project to collaborate and achieve an integrated design at an early stage
- Assisting in operating and maintaining facilities more efficiently

City Redevelopment

Increasing population and limited supply of land has triggered the redevelopment of existing locations in order to effectively use available land. The city has worked towards improving processes in restoring and conserving buildings or revitalising existing areas. These methods help to reduce the need to create new land or other processes that may negatively impact the environment.



Heritage

Heritage conservation has also become a significant factor in the construction industry as citizens are aspiring for linkages to the past and sense of identity through the city's landmark buildings. Therefore the Hong Kong Government has a Partnership Scheme for revitalising these historic buildings.

Restoration and Conservation of Old Buildings

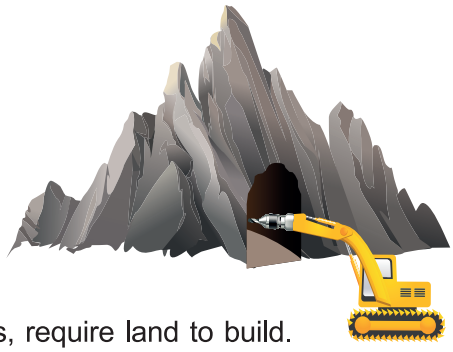
Challenges arise in balancing the progress of a city's development and preserving its heritage. Many old buildings in Hong Kong symbolise a significant part of history and embody the city's colourful past. While demolition of such historical buildings in the past has ignited many protests, many of these buildings have safety concerns that require maintenance, repair, or even relocation. Therefore to conserve these buildings, technologies and other conservation processes have been extensively used.

Many old buildings, such as factories, have been restored and converted for other purposes in Hong Kong today. By reusing old buildings, the demolition of existing structures and construction waste to build a new structure is significantly reduced. This is better for the environment as well as for preserving the city's heritage. Many restored buildings in Hong Kong now host facilities for galleries, hotels, offices, or learning centres.

Revitalisation of Developed Areas

Plans to revitalise existing developed areas that are not being used resourcefully have been in the works. These areas provide existing foundations and endless opportunities for new developments.

Case 10: Energizing Kowloon East



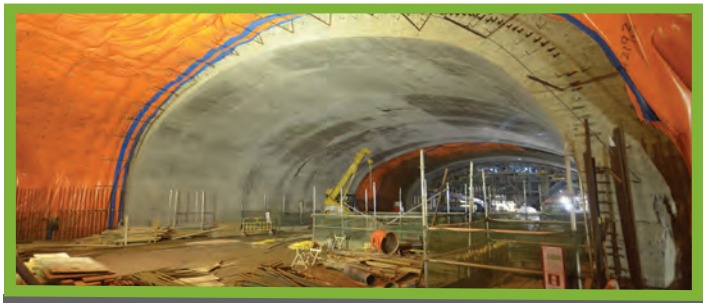
Identifying New Resources

Why Identify New Resources?

All buildings and infrastructure, from road networks to skyscrapers, require land to build. However, land supply to support a growing population has always been a critical issue in Hong Kong. Therefore various methods have been employed to obtain or 'create' more land. Among all, rock cavern development (RCD) is a more sustainable practice of land formation.

Rock Cavern Development

Rock cavern development (RCD) involves the use of underground caverns for construction projects such as sewage treatment facilities and storage. In Hong Kong, RCD can provide strong and stable environments for many infrastructure projects though the practice has not yet been widely adopted. Fig 4e shows the number and locations of strategic cavern areas (five as at Sept 2013) which are still under study. They are subject to further review and may be changed when necessary.



Benefits of Rock Cavern Development

- Releases existing valuable land for development
- Minimises adverse impacts on the community and environment
- Recycles rock excavated from caverns

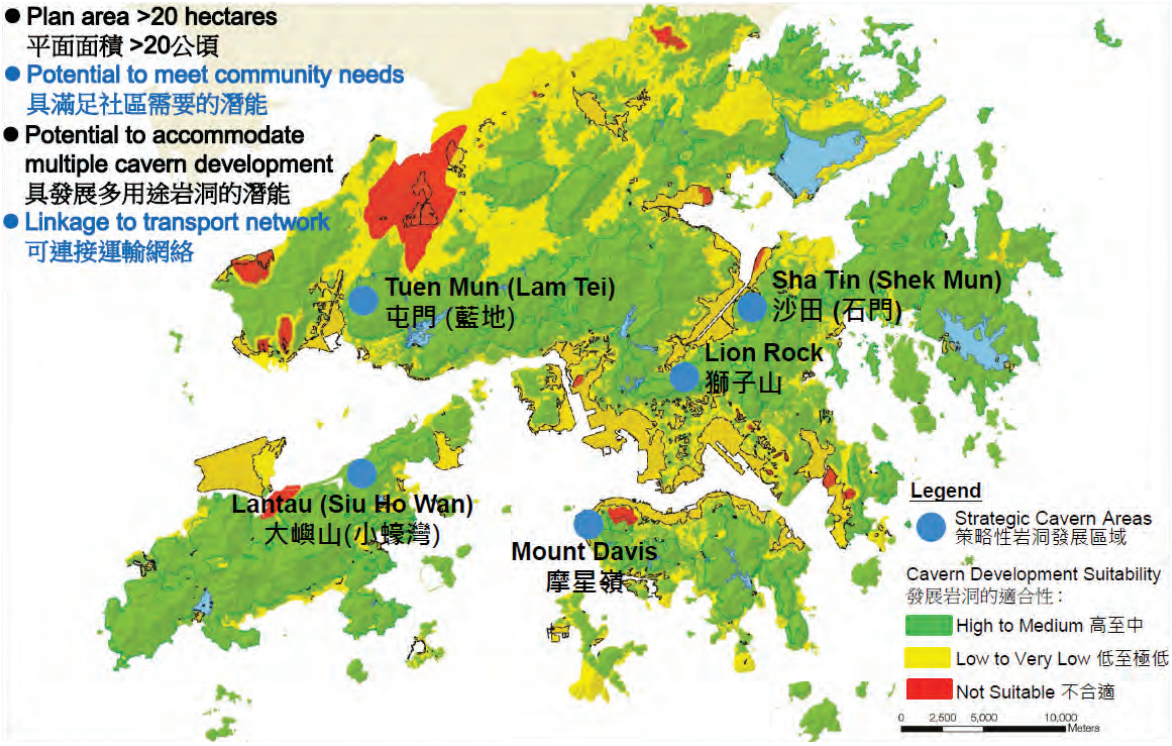


Fig 4d Five Strategic Cavern Areas

Case 11: Stanley Sewage Treatment

Other Types of Land Formation

Excavation, reclamation and landfill are other means of land formation which are commonly adopted in Hong Kong. Despite their effectiveness in providing new land to build on, their impacts on the environment need to be carefully tackled.

Excavation

Excavation is a process to acquire land by cutting into hillside or slope areas. Essentially this clears a site of unwanted items such as structures, soil and debris by using excavation machines. Commonly, it is the first phase of construction.

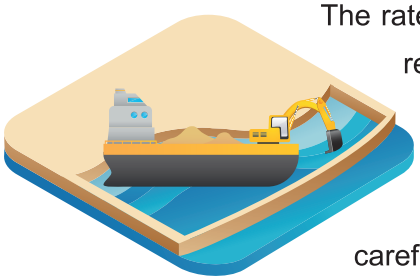
Excavation Technology and Process

- Remove unwanted items such as buildings, shrubs and trees, soil and debris by using excavation machines and bulldozers
- Once the site is cleared, the excavation process cuts into the slope or land to obtain the necessary area
- Levelling the land by cutting or filling

There are several challenges of the excavation process which may have a negative effect on the natural environment and conservation of trees. Additionally the excavation process requires slope works in order to prevent landslides. The Civil Engineering and Development Department (CEDD), under the responsibility of its Geotechnical Engineering Office, established a Landslip Preventive Measures Programme that has been in effect since 1976.

Reclamation

One major method of land formation is reclamation. The process involves constructing new land by filling in specific areas of water. In Hong Kong, a majority of these formations have been made along Victoria Harbour.



The rate of reclamation has recently declined due to environmental concerns regarding the preservation and conservation of Victoria Harbour. The Protection of the Harbour Ordinance was passed in 1996 to prevent harmful activities affecting Victoria Harbour from land development. Further reclamation now has to be considered very carefully and carried out in an environmentally friendly manner.

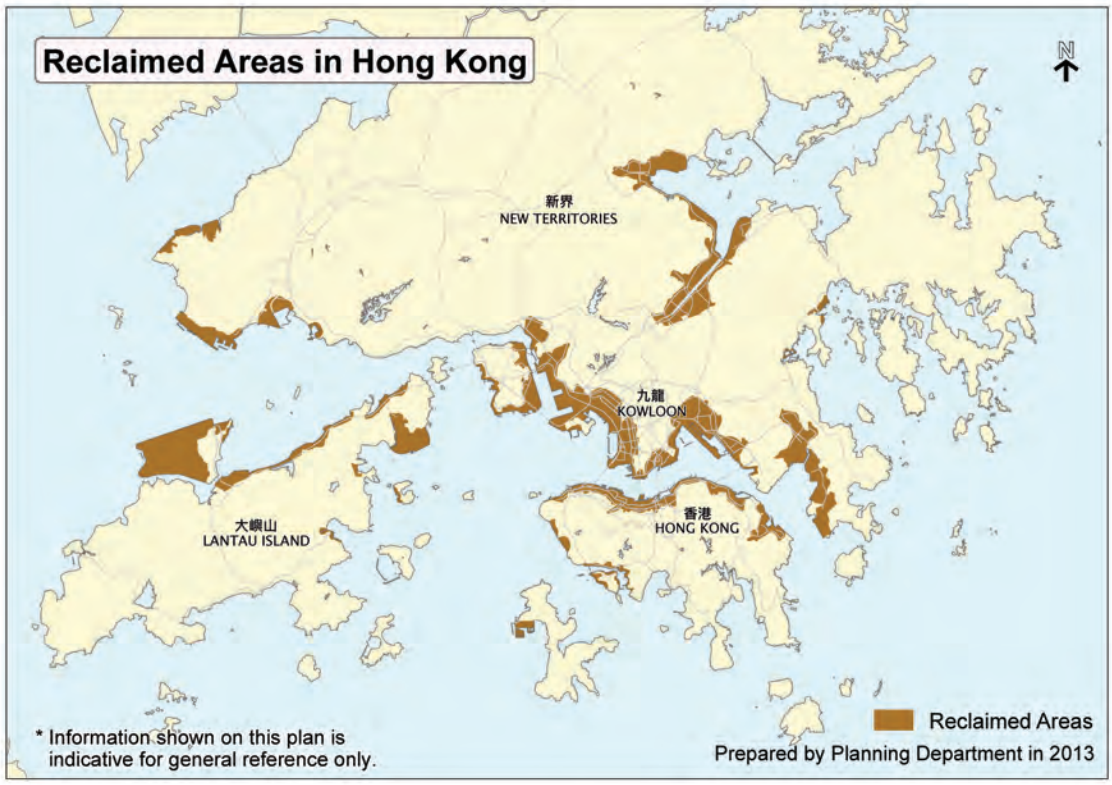


Fig 4e Reclaimed Areas in Hong Kong

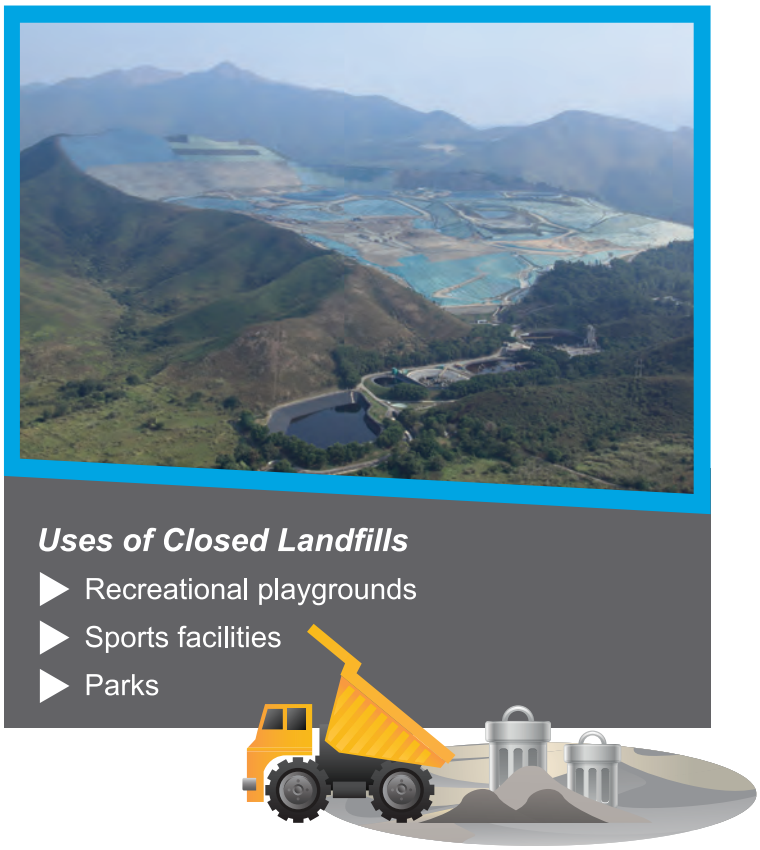
Reclaimed Land Developments

1. Former Kai Tak Airport
2. Shatin New Town
3. Hong Kong International Airport
4. West Kowloon District
5. Hong Kong Disneyland Resort

Landfills

Landfills are managed by the Environmental Protection Department for the disposal of solid waste. Although new pieces of land could be formed from the landfills, the land created is of limited usage because of contamination.

The method of land formation from landfills is through restoration of closed landfills. Hong Kong has 13 closed landfills that occupy a total area of approximately 300 hectares. Landfills must be restored properly to minimise adverse impacts on the environment and to ensure public safety and health.



Case 12: South East New Territories Landfill (SENT)

Fig 4f Existing Practices of Sustainable Development

Future of the Construction Industry

The construction industry has played an important part throughout the history of Hong Kong. Looking to the future, the industry faces the challenge of not only building new structures within the limited resources in Hong Kong, but also the redevelopment of what has already been constructed utilising innovative and advanced technologies.

Innovation

Centuries ago we thought that the provision of land was totally controlled by mother Earth and perceived the Chinese fables of “Yugong moving the mountain” and “Jingwei filling up the sea” as symbols of perseverance and willpower. With the advancement of technology we’ve been able to excavate slopes and reclaim land from the sea, drastically transforming our landscape. Innovation, which often comes from imagination, shapes the construction industry today.

Sustainability

In developing our city, we need buildings and infrastructure that cater not only for the present demands but also the needs of future generations. Sustainable standards, initiatives, practices and existing technologies need to be continuously improved to cope with the needs of, and to advocate, sustainable development.

Liveability

Today, Hong Kong enjoys a high standard of liveability which can be attributed partly to its well-developed infrastructure and organised urban planning. The construction industry and its stakeholders, including frontline workers, have made a tremendous contribution to the development of the city in the interests of the society at large. To keep the industry thriving, new talent with innovative ideas will help to propel the industry even further to improve the future of Hong Kong.

Case Studies

Case 1: Ngau Tau Kok Estate Redevelopment Plans

Ngau Tau Kok Estate is one of Hong Kong's major public housing estates and was built between 1967 and 1968. Government redevelopment initiatives began on the estate of Upper Ngau Tau Kok in 2003. The buildings were demolished and rebuilt in 2009, totalling six 39-40 storey buildings with 4,585 housing units. The redevelopment used many new technological and innovative processes that improved the living environment for residents and was recognised with several awards.

Redevelopment Technology

- Technology was used to optimise the natural environment, facilitate energy saving, and enhance safety and comfort
- Several micro-climate studies were conducted through computer simulation to analyse air flow, wind speed, sunshine, solar heat gain and noise levels
- Unique architectural design of the buildings and transition to a non-standard design of the estate's blocks

Social Involvement

The redevelopment phase which concerned planning and designing processes involved residents of Lower Ngau Tau Kok Estate. Residents participated in multiple briefing sessions and partner workshops. This helped in understanding the needs of residents in the planning process of the development.

Questions

1. How did the Ngau Tau Kok Estate redevelopment project improve the lives of residents?
2. Why do you think it is valuable to include residents in the planning process?
3. What features or facilities do you think are essential in residential building?

Case 2: Timeline of Private Housing Development

Over the years, several features and facilities of private housing estates have changed to meet the demands of citizens. Major developments began in the 1960s and are continuing to evolve today. Below is a timeline of some of Hong Kong's largest private housing estates:

Mei Foo 1960s

- Located in Lai Chi Kok
- Completed in 1965
- 99 Blocks 13,500 Units

Taikoo Shing 1970s

- Located in Quarry Bay
- Completed in 1970s
- 61 Blocks 12,698 Units

Whampoa Gardens 1980s

- Located in Hung Hom
- Completed in 1980s
- 88 Blocks 10,431 Units

City One late 1980s

- Located in Shatin
- Completed in 1987
- 52 Blocks 10,643 Units

Kingswood Villas 1990s

- Located in Tin Shui Wai
- Completed in 1997
- 58 Blocks 15,808 Units

Many of these developments are still continuing and are adding facilities that improve the living standards of residents. These estates have become like small cities by offering various services and facilities for residents.

Increasing Facility Developments

- Sky gardens
- Parking lots / indoor parking
- Fitness areas
- Shops or malls
- Better connections to transportation (e.g. MTR)

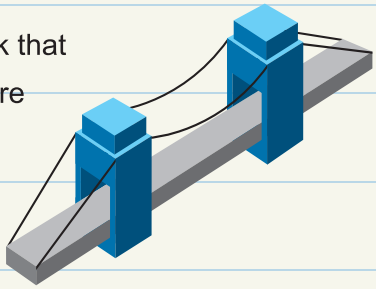
Questions

1. What difference can you find through those private housing estates developed in different decades?
2. What features or facilities do you think are the most essential to the living standards of residents? Why?
3. What features or facilities do you think could be improved in residential buildings? Whose responsibility is it to make these improvements?

Case 3: Tsing Ma Bridge

The Tsing Ma Bridge has become a landmark in Hong Kong and is the main connection between Hong Kong International Airport and urban regions and the main gateway of the Lantau Link. Construction across the Ma Wan Channel for the Tsing Ma Bridge began in May 1992 and was completed in May 1997. The project was developed by the Highways Department of Hong Kong.

The bridge utilises distinctive safety features that include a lower deck that is open to traffic in the event of maintenance of the upper deck or severe typhoons. In addition, the bridge's cross-section to the suspended deck has a commissioned ventilation gap. To ensure safety, wind tunnel testing was applied to test the possible effects of severe typhoon wind speeds.



Information

- Length of 2,160 metres and a main span of 1,377 metres
- World's longest spanning suspension bridge carrying both road and railway
- Average daily traffic volume was 65,544 trips in 2011
- Two levels: Upper (dual three-lane highway); lower (two railways and two road lanes)

Questions

1. What are some other iconic bridges in Hong Kong? Which areas do they connect?
2. What are the differences in the outlooks and features of those bridges? Do you know why there are such difference?

Case 4: Cross-Harbour Tunnel

On 1 September 1969 construction of the Cross-Harbour Tunnel commenced and was opened to traffic on 2 August 1972. It was the first cross-harbour tunnel in Hong Kong, linking Hong Kong Island and Kowloon Peninsula. The opening of the tunnel brought an immense change to the way Hong Kong citizens travelled.

Management rights of the tunnel eventually transferred to the Hong Kong SAR Government after the franchise "build, operate, transfer" (BOT) expired in August 1999.

Information

- The tunnel is 1.86km in length
- Constructed using the immersed tube method
- Process required laying 15 prefabricated caissons underwater and welding them together
- In 2011, the tunnel had an average daily traffic volume of 120,545 trips

Case 5: New Developments in Hong Kong

The 2007-2008 Policy Address announced ten major infrastructure projects in Hong Kong to boost the economy. Refer to the Policy Address to find out more about the projects.

MTR Expansion

Current expansion projects are underway to all major areas in Hong Kong. The construction and development of these railways will encourage greater use of the railway network which remains the backbone of the passenger transportation system.

MTR Expansion Projects

- West Island Line, extending Island Line to Kennedy Town
- South Island Line East, from Admiralty to South Horizons
- Kwun Tong Line extension, from Yau Ma Tei to Whampoa
- Guangzhou-Shenzhen-Hong Kong express railway expansion
- Shatin to Central Link

Kai Tak Cruise Terminal

The Kai Tak Cruise Terminal is a new development at the site of the former Kai Tak Airport. The Government constructed the new cruise terminal to develop Hong Kong into a leading cruise ship hub. Construction commenced in May 2010. The terminal building and first berth opened in 2013. The second berth is expected to be completed by 2014. The construction cost is estimated to be approximately HK$2 billion.

Features of the Kai Tak Cruise Terminal

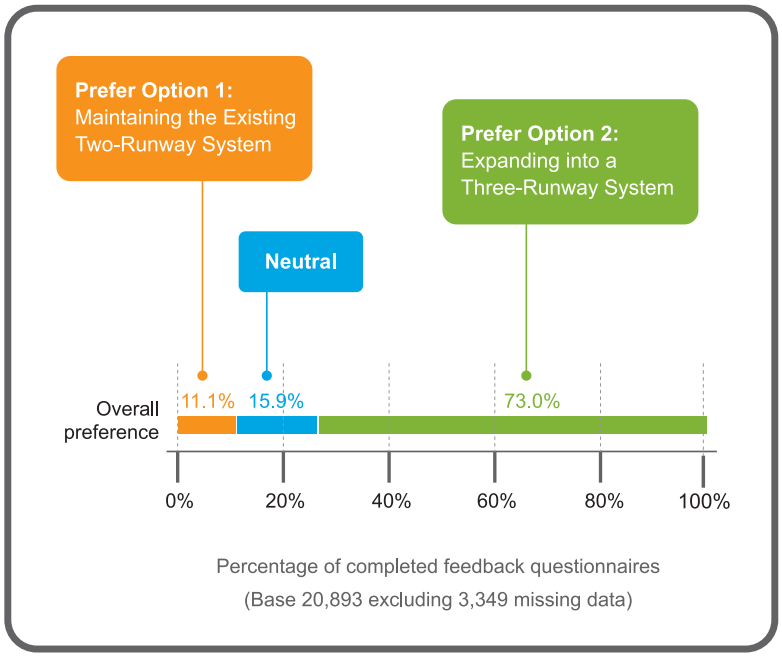
- Two alongside berths capable of accommodating some of the world's largest cruise ships
- Completed area is expected to be 7.6 hectares
- Terminal is expected to handle 3,000 passengers per hour
- Docks and terminal use cutting-edge environmental technology and features

Case 6: Expansion of HKIA Runway

HKIA currently operates a two-terminal and two-runway facility that connects approximately 1,000 flights daily to about 180 destinations. The airport has continued to encounter increasing traffic growth over the years. One solution under debate is to develop a third runway to handle the expected growth.

Future development of HKIA to achieve sustainable growth was outlined by the Airport Authority (AA) in the HKIA Master Plan 2030, which was published in June 2011. The two options proposed are shown in the figure below. Expansion into a three-runway system is proposed to help "meet the airport's long-term growth demand".

The then IATA Director General Giovanni Bisignani stated in 2011 that "The current two runways are near saturation. A third runway is needed and the time to start planning is now." It has been forecasted that the number of passengers and the amount of cargo will continue to rise. It is argued that the construction of a new runway will have significant effect on the city's economy.



Source: Hong Kong International Airport Three-runway System website

Fig cs1 Overall preference for the two proposed development options

Questions

1. How may the construction of a three-runway system benefit Hong Kong?
2. Are there any adverse effects in building a three-runway system?

Case 7: High Island Reservoir

Hong Kong gathers its water from various sources and enjoys one of the safest water sources in the world. The High Island Reservoir, located in the eastern-end of Sai Kung, was commenced in 1971 with the construction of two dams rising 64 meters above the sea-level. The damns link the east and west ends to the storage water reservoirs.

The water conveyance network includes 40 km of tunnels, 12 km of catchwaters, 13 km of water pipelines and several rainwater collection facilities. The reservoir stores a large amount of water, which improves the contribution to and protection of the potable water needs of Hong Kong. The High Island Reservoir is managed by the Water Supplies Department.

Information

- It is the largest water storage reservoir in Hong Kong
- Water storage capacity of 281 million cubic meters
- Selected as one of the “Ten Outstanding Projects” in Hong Kong in 2000
- 78 blocks of dolosse concrete were used on the east main dam to resist wave impact

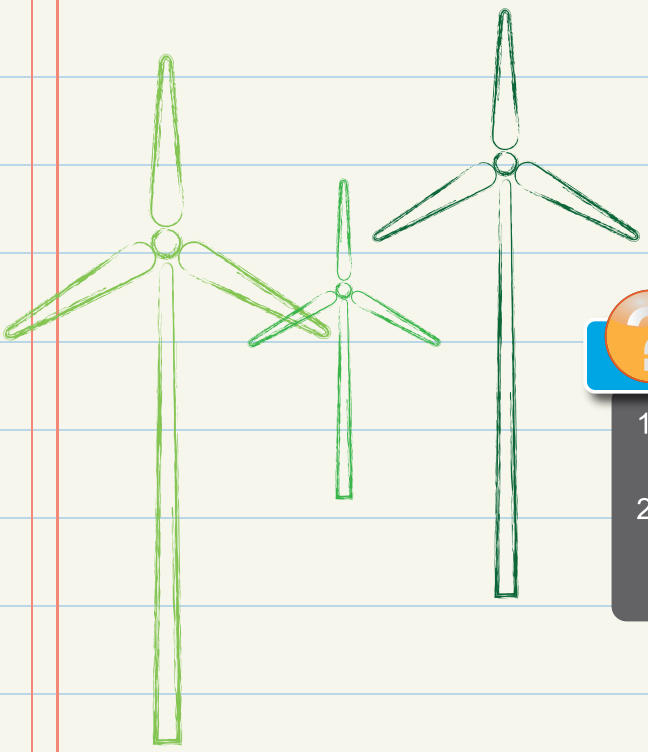
Case 8: Lamma Island Wind Energy

Wind energy utilises kinetic energy from the movement of atmospheric air to generate power. It consumes no fuel and emits no air pollution, unlike other power sources. Therefore it is a renewable and sustainable energy.

Hong Kong Electric began operating the first commercial-scale wind turbine in Hong Kong in 2006 on Lamma Island. It is located in Tai Ling. The effects of this technology have had no adverse impact on the environment.

Information

- Rotor diameter of 50 metres (160 ft)
- Delivers an average output of around 100 kilowatts (130 hp)
- Generates power for approximately 250 households



Questions

1. What are the benefits of greater research and development in wind energy technology?
2. What other renewable energy technologies do you know? Can you give some examples of those adopted in Hong Kong today?

Case 9: ZCB

The Construction Industry Council partnered with the Government to develop the city's first zero carbon building, ZCB. Reached the highest level of certification in the Green Environmental Assessment System (BEAM Plus), ZCB demonstrates cutting-edge building technology and an advanced design that uses an interactive approach of teaching sustainable living and building.

ZCB 零碳天地

Technology to improve green building and the environment in Hong Kong has increasingly become an integral part in the future development of the industry and city. ZCB reflects this and as a major project and pioneer in Hong Kong, it raises the bar for new standards of future buildings.

ZCB's Technology

The concept of ZCB's technology is that the entire construction process, from the planning to the actual construction, engages sustainable practices. The building uses solar panels and a triple-supply (cooling, heating and power) system for energy and operates renewable energy to return surplus energy to the public grid.

Passive Design

Passive design refers to a design approach that uses natural elements, such as sunlight and wind, to heat, cool, or light a building. Passive solar or passive cooling designs take advantage of the sun's energy to maximise heating or cooling based on a building's sun exposure and the local prevailing wind conditions.

The approach can include the structure of the building itself, including building orientation, window placement, skylight installation, insulation and building materials, or specific elements of a building, such as windows and window shades. Various passive design measures lead to 20% energy saving compared to similarly designed buildings.

Active Design

Active systems refer to the electrical and mechanical systems, such as the HVAC (heating, ventilation and air conditioning) systems and lighting systems. The energy efficient active systems in ZCB result in a 25% of energy saving compared to a similar building of the current standard design.

Renewable Energy

Renewable energy is natural energy which is unlimited in supply. Renewable energy can be used again and again, and will never run out. Examples of renewable energy sources include biomass, hydro energy, geothermal energy, solar energy, tidal energy, wave energy and wind energy. In ZCB, renewable energy is generated on site from solar energy by photovoltaic (PV) panels and from biofuel (one kind of biomass) made from waste cooking oil.

Facilities of ZCB

The buildings of ZCB host exhibition halls, multi-purpose rooms and offices. Additionally, it provides appropriate facilities that host educational tours on sustainable building and living.

Features

- Uses EPTs
- Total area of 147,000 square feet
- Green zone of 75,000 square feet
- Two-storey building that host offices and exhibition areas
- 135 native trees to improve vitality and oxygen

Some examples of other zero carbon buildings in the world include: Self-sufficient solar house (Freiburg, Germany), Beddington Zero Energy Development (London), and BCA Academy (Singapore).

Activity

1. Students should visit ZCB and examine the various features and facilities, particularly taking note of how this project can help the sustainable development and the future of Hong Kong.
2. Students can also participate in the Student Ambassadors Scheme of ZCB. Please refer to zcb.hkcic.org for details of the Scheme.

Case 10: Energizing Kowloon East

Kowloon East Office
九龍東辦事處

A recent government policy initiative called "Energizing Kowloon East" is aimed at transforming Kowloon East into an attractive, alternative Central Business District (CBD) to support Hong Kong's economic development. .

Vision of the Energizing Kowloon East Project

Comprising the former Kai Tak Airport, Kwun Tong and Kowloon Bay districts, Kowloon East witnessed rapid growth as a major industrial base creating thousands of jobs in the heydays of our manufacturing industry and propelling Hong Kong's prosperity. The area lost some of its vibrancy from the past with many under-utilised industrial buildings following the relocation of our Airport to Chek Lap Kok and manufacturing base to the Mainland. Meanwhile, the booming of Hong Kong's financial and service sectors as well as the establishment of a large number of regional headquarters and offices of multi-national companies have increased the burden of our traditional CBD in satisfying the demand for quality offices. In meeting this market demand, many private developers have begun redeveloping their properties in Kowloon East into high-grade office buildings and retail centres since the mid to late 90's. The vision of Energizing Kowloon East is to continue facilitating transformation of this area as Hong Kong's CBD^2.

Activity

Gather several news sources on updates of Energizing Kowloon East and follow the project's progress.

Case 11: Stanley Sewage Treatment

Commissioned in 1995, Stanley Sewage Treatment Works (STW) was the first underground Sewage Treatment Works in Southeast Asia, designed and constructed with latest cavern construction technology at that time. The natural environment of the area is maintained while the neighbourhood is spared with unacceptable environmental impact during construction and daily operation.

With only the entrance visible to the public, the STW is integrated with the surrounding environment and lives harmoniously with the nearby community. The nearest distances between the ventilation shaft and a nearby school, staff quarters and the residential area are about 200m, 300m and 400m respectively. After disinfection through aeration process, effluent from the collected sewage is disposed of into the ocean southeast of the peninsula via a submarine outfall pipeline of 0.6 m in diameter and 2.3 km in length.

Information

- Housed within 3 caverns, each of about 120m long, 15m wide and 17m high
- Connected by over 450 metres of road access and ventilation tunnels and shafts
- Daily sewage treatment capacity of 11,660m^3
- Currently receiving about 9,000 m^3/day sewage
- Serves 27,000 residents of Stanley, Tai Tam, Chung Hom Kok and Red Hill areas

Questions

1. What other examples of cavern application do you know? Give some examples in Hong Kong and outside Hong Kong.
2. What other facilities would you suggest to be accommodated in cavern? Why?
3. How do you compare the use of cavern with the other types of land formation?

Case 12: South East New Territories Landfill (SENT)

Located in Tai Chik Sha south of Tseung Kwan O, the SENT Landfill is one of the three strategic landfills in Hong Kong developed by the government. It started operating in September 1994. With an area of 100 hectares (land and sea) and a capacity of 43 million cubic meters, the landfill receives about 5,340 tonnes of domestic and special waste every day.

The landfill is expected to reach capacity in 2015 on the current forecast. Waste will then be transported to the North East New Territories Landfill and West New Territories Landfill, which will require more garbage trucks for long-distance transport. Therefore, the Environmental Protection Department (EPD) intends to extend the landfill to a 15-hectare area in Tseung Kwan O and a 5-hectare area around Clear Water Bay Country Park, in order to provide about 1.5 million cubic metres of additional landfill capacity.

Closed landfills may form new land, but there is the potential of hazard to the natural environment and the possibility of pollution which may harm the public if their usages are not properly handled.

Questions

1. How do you think the Hong Kong Government should make use of the new land created from the landill?
2. Are there any creative alternatives that you can think of to address land supply shortage?

Online Resources

Chapter 1: Introduction of the Construction Industry

Building and Construction Industry in Hong Kong
hong-kong-economy-research.hktdc.com/business-news/article/Hong-Kong-Industry-Profiles/Building-and-Construction-Industry-in-Hong-Kong/hkip/en/1/1X000000/1X003UNV.htm

Construction Industry Performance Report for 2011
www.hkcic.org/eng/info/kpiIndex.aspx?langType=1033

Chapter 2: Types of Construction

Private Buildings in Hong Kong
www.buildingmgt.gov.hk/en/database_of_private_buildings_in_hong_kong/12.htm

Hong Kong Housing Authority
www.housingauthority.gov.hk

Flood Prevention and Sewerage
www.dsd.gov.hk/TC/Education/Teaching_Kit_for_Liberal_Studies-Flood_Prevention_and_Sewerage/index.html

Water Supply in Hong Kong
www.wsd.gov.hk/tc/education/index.html

Chapter 3: Industry Stakeholders

Construction Industry Council
www.hkcic.org

Development Bureau
www.devb.gov.hk

Understanding the Building Process and Teamwork
archsd.gov.hk/archsd/html/teachingkits/TK2/index_En.html

Online Resources

Hong Kong Institute of Architects
www.hkia.net

Hong Kong Institution of Engineers
www.hkie.org.hk

Hong Kong Institute of Surveyors
www.hkis.org.hk

Hong Kong Construction Association
www.hkca.com.hk

Chapter 4: Sustainable Development

Environment Bureau
www.enb.gov.hk

Environment Protection Department
www.epd.gov.hk

Hong Kong Green Building Council
www.hkgbc.org.hk

Cultural Heritage and Built Environment
archsd.gov.hk/archsd/html/teachingkits/TK3

Urban Renewal Authority
www.urec.org.hk/html/chi/home.html

Conserve and Revitalise Hong Kong
www.amo.gov.hk/en/teaching_kit.html

Sustainable Design for Buildings
archsd.gov.hk/archsd/html/teachingkits/TK1/index.html

The Construction Industry Council would like to express its gratitude to the following organisations for their permission to use photos and other reference materials in this kit. The credits are listed in order of appearance:

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The Hong Kong and China Gas Co Ltd
Energizing Kowloon East Office (EKEO)
Hong Kong Green Building Council (HKGBC)
ZCB
Hong Kong Housing Authority (HKHA)
Civil Engineering and Development Department (CEDD)
Planning Department
Environmental Protection Department (EPD)
Water Supply Department (WSD)

About the Construction Industry Council

The Construction Industry Council (CIC) was formed on 1 February 2007 under the Construction Industry Council Ordinance (Cap.587). The CIC consists of a chairman and 24 members representing various sectors of the industry including employers, professionals, academics, contractors, workers, independent persons and Government officials.

For Enquiry

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