

# BLUEPRINT FOR A BETTER FUTURE

*An engineering perspective  
on Hong Kong's infrastructure*



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## Introduction

Hong Kong has come a long way in the last 60 years. Indeed the Hong Kong of today – a metropolis of more than seven million people and a thriving centre for global finance and trade – is almost unrecognisable from the city depicted in photographs taken immediately after the Second World War.

The reason is simple. Hong Kong has re-built itself, several times over. And, if anything, the process is accelerating. It is driven by a combination of strong economic growth and the pressure of a population that has grown tremendously in recent years, fuelled largely by immigration from Mainland China. The result is that Hong Kong has truly become a “world city” which plays a significant role in international commerce as well as having a direct and tangible effect on global affairs.

While Hong Kong's success is often attributed to its geographic location – on the doorstep of Mainland China and close to the major trading ports of Asia – it is Hong Kong's infrastructure that truly sets it apart from regional competitors. Infrastructure underpins the entire economy, from the ports – both sea and air – that facilitate the movement of people, to telecommunications without which most businesses and in particular the banking and financial sector could not function.

Energy infrastructure which keeps homes and businesses running, and environmental infrastructure, from the treatment and supply of drinking water to sewage and refuse management, help to preserve the reputation of the Hong Kong as one of the most popular places to live and work in Asia.

# Preface

## This Report

While Hong Kong's growth has been spectacular, the Hong Kong Institution of Engineers (HKIE) recognises that ensuring the city's continued development and success poses significant challenges in a number of key areas. This report – the first of what we hope to be a series to come – is designed to provide an unbiased and professional assessment of the state of key areas of Hong Kong's infrastructure from the experts in these fields – the engineers that created it.

The report is broken down into five Chapters – Buildings, Energy, Environment, Information and Transport – and draws on published information sources\*. Furthermore, comments and insight from HKIE members from consultation forums and further online consultation conducted in May and June 2007 have been incorporated where appropriate.

Each Chapter provides an analysis on the current state of Hong Kong's infrastructure, the future demands the city and its population may place on the infrastructure, as well as the critical areas the HKIE believes need to be managed more effectively if Hong Kong's quality-of-life and its commercial success are to be sustained.

We hope that everyone concerned with Hong Kong's future – Government, the private sector as well as the public at large – will consider these recommendations carefully whenever Hong Kong's development is discussed and projects are designed and implemented.

Ir Dr LO Wai Kwok MH JP  
President  
The Hong Kong Institution of Engineers

\* *Note: Facts and figures extracted from published information sources may not be up to date.*





Chapter 1

# Buildings

Building on the Past – Safeguarding the Future

# Introduction

The skyline of Hong Kong is instantly recognisable. Its landmark buildings stand proud, confirming its status as a world city. Its many structures, spread over nearly 1,000 square kilometers, form a rich tapestry of modern architecture and engineering, and older, more traditional buildings.

The quality of Hong Kong's buildings compares favourably with other global cities. Under the auspices of the Buildings Department (BD) and the Electrical and Mechanical Services Department (EMSD), the stock of commercial and residential buildings offers tenants safe and comfortable refuge from the elements and are comparatively well maintained. From a structural engineering perspective, the city's newer buildings are, if anything, over-engineered, thanks to a comprehensive and thorough building code.

However, there is always room for improvement. Hong Kong's designers have, for sound practical reasons, traditionally worked to prescriptive standards, codes of practice and short time scales. This has at times restricted innovation, and fostered a tendency to stick to trusted designs and materials.

Although lagging behind the progress which has been made in the rest of the developed world, there is now more prefabrication, and recycled aggregate is allowed though hardly used. If Hong Kong is to achieve a pre-eminent position amongst the world cities, the Government needs to maintain a proactive attitude if it is to keep codes of practice up to date with fast moving technical developments.

On the other hand, there is also a need to review the upkeep of many of Hong Kong's older buildings, which fair less well when compared to similar buildings in Singapore, Tokyo, Europe and the United States.

The most obvious issues faced by Hong Kong's building infrastructure are environmental and the most visible problem is worsening air quality, both indoors and out. There are doubts too about the indoor air quality (IAQ) levels being achieved in Hong Kong's buildings because they are not routinely monitored.



Energy usage is another major environmental issue that needs to be addressed. Although there is no evidence that Hong Kong is any more wasteful of energy than other cities, there is tremendous potential for saving energy through sensible design of buildings and plant and plant controls.

Hong Kong has been slow to develop and implement green initiatives and less willing than other cities to develop and enforce rigorous performance targets. However, this and other problems need to be addressed in a coordinated manner that will improve the quality of our buildings and the overall environment for the benefit of the entire community.

To this end, the Buildings Services engineering profession is of particular significance. The prospect of reducing energy consumption both in the design of air conditioning and ventilation systems, and its operation and maintenance, are in their hands. The profession should no longer be passive, but proactive in insisting on energy efficient design and operation, and should raise technical standards in the process.

In this Chapter, the HKIE offers a candid evaluation of the state of Hong Kong's building infrastructure and sets out some considered recommendations with a single overriding goal – to build on the past while safeguarding the future.

# The State of Present Infrastructure

## Energy Efficiency and Green Features

Performance issues relating to energy efficient buildings have been gaining prominence in recent years. It is now a recognised part of global initiatives to reduce mankind's environmental footprint through a combination of cutting back on energy consumption and maximising energy efficiency.

The energy performance of existing buildings in Hong Kong is not subjected to any regulatory control, as far as energy efficiency is concerned. However, statistics suggest that Hong Kong performs as well as many other locations with similar circumstances.

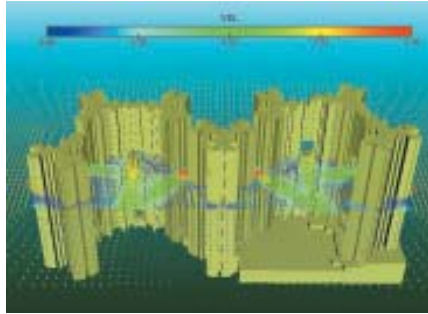
The results of energy audit studies carried out by local researchers reveal that the energy efficiency of Hong Kong's commercial buildings varies widely between very poor to very good. The variance provides a strong indication that there is considerable room for energy efficiency improvements to be made involving buildings that fall short of the auditing benchmarks.

Therefore, taking into consideration that commercial buildings account for a high proportion of energy consumption, any expenditure to save energy could contribute to an important sustainable improvement in building energy efficiency.

It has been noted that many energy efficient technologies are available, which, if properly implemented, could bring about significant improvements. Such technologies could also lead to sufficient energy cost savings to payback the investment within a relatively short period of time.

Nonetheless, the take up rate of such technologies remains low. Among the reasons regarded as the key barriers are a lack of knowledge, motivation and financial resources. Traditionally, many building owners have paid little attention to reducing energy cost due to rental income outweighing any savings generated from the implementation of energy efficient measures. In addition, energy costs may be transferred to tenants by charging them management fees and levying additional charges for amenities such as air-conditioning.

There are also uncertainties in the achievable savings of proposed energy efficient measures, and the fear that implementing such measures may affect the comfort of building occupants or reliability of services. Nevertheless, the topic of operating energy efficient buildings has gained in prominence.



The BD and the EMSD encourage the development of energy efficient and environmentally sustainable buildings. The Building (Energy Efficiency) Regulation is an important piece of legislation promoting green building practices. It regulates buildings to be designed and constructed to achieve energy efficiency. Under this regulation, the code of practice for commercial and hotel buildings sets maximum Overall Thermal Transfer Value (OTTV). But, apart from the mandatory OTTV requirements, which itself is simplistic and unlikely to result in optimum energy minimisation, other standards and Government recommendations are only advisory for the private sector, though presumably are taken notice of in new public buildings. More mandatory standards are necessary to force the pace of “green” innovation in Hong Kong.

A number of Practice Notes to Authorised Persons have been issued to encourage designs for better living quality. These include exemptions for common amenity provisions from gross floor area (GFA) calculations, natural lighting for staircases, and ventilated bathrooms with artificial lights.

The first Joint Practice Note No.1 entitled “Green and Innovative Buildings” was issued by the BD, Lands Department and Planning Department in 2001. Revised in 2004, its current version allows green features including balconies, wider common corridors and lift lobbies, communal sky gardens, communal podium gardens, acoustic fins, sunshades and reflectors, wing walls, wind catchers and funnels, all to be excluded from GFA and/or site coverage calculations. It is understood that recently this Practice Note is under review.

Another important potential influence on greater innovation is the use of performance-based design as opposed to prescriptive code design. Many countries have embraced this approach, which is now gaining ground in Hong Kong.

## Indoor Air Quality

IAQ is a growing concern for businesses, building managers, tenants, and employees because it can impact the health, comfort, well being, and productivity of building occupants. IAQ is not a simple, easily defined concept. It is a constantly changing interaction of complex factors that affect the types, levels, and importance of pollutants in indoor environments. These factors can include sources of pollutants or odors; design, maintenance and operation of building ventilation systems; moisture and humidity.

Unacceptable IAQ can aggravate sick building syndrome (SBS) and building related illness (BRI). SBS occurs when occupants of a building experience acute health effects that seem to be linked to time spent in a building, but no specific illness or cause can be identified. BRI is generally considered to be induced by chemical and microbial agents



present in the indoor air which can cause physical illness. While BRI can be a consequence of negligence in building management, SBS is a more common consequence of unacceptable IAQ.

A study carried out in 1997 by a research team closely inspected air-conditioned office buildings and concluded that a third of existing buildings in Hong Kong were suffering from various levels of sickness. The IAQ within schools has also raised concerns and has been found to be widely varying. In many cases schools are dependant on the quality of outside air, which is subject to local conditions and pollution levels.

The outbreak of Severe Acute Respiratory Syndrome (SARS) in 2003 again brought the issue of IAQ into sharp focus when the World Health Organisation blamed the flow of SARS-contaminated airstreams passing through drainage systems, refuse chutes, pipe ducts, staircase stacks, exhaust stacks, and lift shafts for the spread of SARS in Amoy Gardens.

As a consequence of SARS and mounting concerns over IAQ, in 2003 the Indoor Air Quality Management Group of Hong Kong launched a Guidance Note for the Management of Indoor Air Quality in offices and public places and a Guide on Indoor Air Quality Certification Scheme. The certification scheme is voluntary and designed to establish an effective self-regulatory system for maintaining IAQ. However, the scheme is not legally binding and compliance with the guidance note does not provide exemption from existing legal obligations.

## Performance of Our Buildings

### *Fire Safety*

A fire in any building is always a major concern. Over the years, Hong Kong's buildings have been made increasingly safer as regulations have been put into place to tighten the control on new building designs. This has led to better and safer escape facilities, use of fire resistant or retardant construction materials and systems that become active in the event of a fire.

For buildings in Hong Kong, the existing ordinances and codes, which are basically prescriptive, exert tight control on all aspects related to fire safety. Passive fire safety measures include escape route design, refuge floor layout, travel distance to safety exits, direct distance to safety exits, occupation load, escape route width, staircase width and number of staircases. Existing ordinances also include fire fighting access (Emergency Vehicle Access, fireman lift, travel distance for fire fighters), fire resisting construction (use of building material, fire resistance periods for walls and floors).



Active fire safety measures considered during the design stage of the building include hose reel and hydrant placement, sprinkler systems, fire detection systems and smoke control systems. Statistics suggest if fire fighting and detention equipment is well maintained and used properly, buildings are relatively safe.

Although widely used in constructing modern buildings, the fire safety design for the “double skin façade” (DSF) is not clearly defined. The term DSF is part of the ventilated double façade concept that is based on the type of ventilation, the partitioning of the façade and the modes of ventilation of the cavity.

For historic buildings, there is no explicit mention of fire safety issues within the existing ordinance.

Much has been learnt from major fires in Hong Kong. Each fire has led to a new ordinance or an amendment to enhance public safety. Between 2001 and 2005 about 400 members of the public were injured each year by fire.

During the same period fatalities were 32, 25, 9 and 15 respectively, indicating a downward trend in death resulting from fire. The figures represent about one death for every hundred fires. Overall, these and other statistics show that the community in Hong Kong enjoys a high level of fire safety compared with other major cities and regions in the developed world.

### *Building Assessment*

Along with the rest of the developed world, Hong Kong has been developing its building performance assessment tools. As an industry initiative, the Hong Kong Building Environmental Assessment Method (HKBEAM) has been in development in the last decade or so and is gaining wider application in both Government and private buildings. Assessment of buildings using HKBEAM is at present on a voluntary basis. The BD has recently completed development of the Comprehensive Environmental Performance Assessment Scheme (CEPAS), a world-class assessment tool for various building types in the high-rise and high-density development environment of Hong Kong.

Hong Kong is at the forefront when it comes to providing a Life Cycle Costing/Assessment (LCC / LCA) for building infrastructure, with the LCC / LCA tool developed by the EMSD. However, the design of buildings that take “whole of life” costs into consideration is currently not a significant part of the industry’s culture. In a small survey as part of this study, Hong Kong industry practitioners put LCC / LCA amongst the top of a list of proposed improvement actions.

As for construction quality assessment, there are a number of systems in existence in the developed world. Singapore has well developed assessment systems for building construction quality such as Construction Quality Assessment System (CONQUAS) and Buildable Design Appraisal System. These systems are widely used across the industry and the “scores” achieved are publicly available. Malaysia has also recently introduced a CONQUAS equivalent. In Hong Kong the Housing Authority has its Performance Assessment Scoring System for construction and quality control which

provides a greater scope for assessment than CONQUAS. However, no equivalence is in use in private sector building construction. Some countries such as Japan even have construction quality assurance laws and warranty systems but Hong Kong seems to leave much of the burden on prospective purchasers of properties. Contractors and developers are only contractually bound by their respective defect liability periods.

### Noise

The major source of noise inside commercial buildings is the heating, ventilation and air conditioning system. Currently there is no statutory requirement on the noise level, although some recommended levels are given in voluntary assessment schemes HKBEAM and CEPAS. There is also no statutory control on the indoor acoustics of residential flats whilst there are published good practices on building services equipment installations to minimise structural-borne and air-borne noise.

For traffic noise, the current policy is to set up mitigation at locations where the noise levels exceed limits. Hong Kong has made extensive

use of sound absorbing surfaces, but in Japan such barriers are now covered with vegetation for better effect and can significantly increase evaporative cooling and combat "heat island" effects.

The Environmental Protection Department's recent development of software to provide 3D noise maps of predicted noise levels at a building façade is an example of world-leading innovation which will help future designs.

### Building Refuse

The handling of building refuse is another area where Hong Kong could easily improve. Currently most of our housing estates have no proper ventilation for waste handling facilities and no de-odorising equipment. Even worse, between 20 to 30 per cent of refuse chutes do not function and the ones that do work do not take any measures to reduce noise.

Private housing estates are not necessarily any better, and many do not have proper facilities such as refuse storage chambers. And while the provision of such chambers and material recovery rooms are recommended by the Government, at present it remains only optional.

## Ageing Buildings and Unauthorised Building Works

It may seem that Hong Kong is continuously constructing new buildings, but in reality Hong Kong has a good many older buildings and the number is growing every year.

The number of buildings over 30 years old and the target for the Government's proposed Mandatory Building Inspection Scheme (MBIS) is expected to grow to about 22,000 by 2016. However, compared to similar cities such as Singapore, Hong Kong's older buildings are in poor condition.

The concrete is often of poor quality, with spalling, cracks, water leakages and windows are often corroded. The poor condition of the concrete is probably partially due to inadequate control during mixing and application during construction. Concrete degradation is further aggravated by carbonation due to age, allowing moisture in the air to attack steel reinforcement.



The issue of older buildings was covered comprehensively in a recent Hong Kong Construction Industry Institute Research report entitled “The Repair, Maintenance and Sustainability of the Ageing Residential Building Stock in Hong Kong”. It suggested that well over 10,000 of the buildings 30-years old or older could be satisfactorily renovated and fire safety standards improved. And while there would be costs, the resulting rise in market values would make the investment worthwhile.

Since November 2000, the BD has been involved in the Coordinated Maintenance of Buildings Scheme in various districts throughout Hong Kong. The goal is to assist building owners and owners’ corporations to pursue a comprehensive building management and maintenance programme.

While the lack of repair and maintenance of ageing buildings have long been a problem in Hong Kong, so has unauthorised building works (UBW). To combat the issue, over the years there have been a number of official clearance campaigns, including the current Blitz Unauthorised Building Works Clearance Operation (Blitz UC) initiative implemented by the BD.

UBWs typically include external appendages, projections and internal subdivisions of premises. In extreme circumstances UBWs have been known to collapse resulting in loss of life. UBWs that obstruct fire escape routes could be potentially dangerous while UBWs in varying degrees can interrupt ventilation air flow. In addition, UBWs contribute to environmental degradation through unauthorised trade effluent discharge, storage areas for rubbish, and as physical eyesores.

The BD estimates there are presently around 750,000 UBWs and the Department receives an average of 21,257 UBW reports a year. The Blitz UC is proving effective in obligating owners to remove their own UBWs. This together with the large-scale clearance approach by the BD on older buildings means the UBW inventory of about 750,000 is being reduced at a rate of a little under 40,000 per annum.

By preventing the building of new UBWs, and removing existing UBWs the backlog is gradually being reduced. At the current rate of removal the majority of UBWs could be removed in 20 years.

# Key Issues and Recommendations

By any estimate, the state of Hong Kong's building infrastructure is good. However, to fulfill the HKIE's vision of "building on the past while safeguarding the future" we can and must do more.

The good news is that Hong Kong is in an excellent position to do just that. There are many new techniques and technologies that could help. If these are used in combination with a more flexible regulatory regime that promotes innovation and offers strong financial incentives, Hong Kong's building infrastructure could lead the region.

The following takes a detailed look at the areas where focus is needed if we are to move forward and, where appropriate, investigates potential solutions.

## Energy Efficiency and Green Features

While new building technologies are appearing almost daily, Hong Kong is not even using many tried and true solutions. Hong Kong has a poor record on renewable energy. For example, there is virtually no use of solar power to provide electricity for lighting or contribute to the supply of hot water. Solar photovoltaic and solar thermal energy could be used on virtually every building, while at present it is used on almost none. In many countries, the use of renewable energy in buildings is actively encouraged by government through various mechanisms.

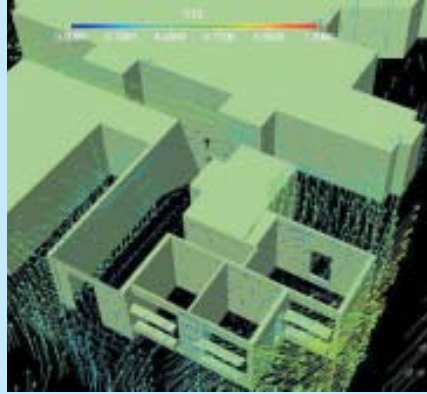
Many new buildings in Hong Kong do contain the latest products to help enhance energy performance. For example, building automation systems, energy efficient lightings, electronic ballast, energy efficient chillers and variable speed motor drives have already become common provisions in new building developments. Advanced glazing systems are increasingly being adopted in new commercial building developments.

The EMSD has published building energy efficiency codes for air-conditioning, lighting, electrical and lift installations, but they are not mandatory. A performance-based energy code has also been published to provide an alternative compliance route to the prescriptive energy efficiency codes.

Building simulation softwares commonly used in Europe and the USA to test building control strategies are hardly used in Hong Kong. This could change if compliance were to become mandatory.

Mandatory compliance with the energy efficiency codes is being considered. A pilot scheme for cooling towers, which allows buildings to use the more energy-efficient water-cooled air-conditioning systems, has also been implemented and is being reviewed.

Guide documentation on metering and instrumentation for building automation systems is needed urgently together with standardised building automation/intelligent buildings protocols.



A guide, perhaps in the form of a code of practice is needed on the keeping of proper records of plant performance data to facilitate building audits and identification of energy management opportunities.

The use of individual wall mounted air cooled conditioners in residential buildings wastes energy and needs study. Research should be funded by the Government on topics such as water-cooled air conditioners with a central supply of water for condenser cooling.

The Government has already initiated a series of studies on wider use of water-cooled air-conditioning systems in Hong Kong, including district cooling systems, mainly in the interest of energy conservation and greenhouse gas reduction.

We believe the Government should lead the way with public sector buildings that are designed with green features. There should also be incentives to encourage private developments to adopt energy-efficient design and materials. Mandatory compliance with energy-efficiency could be considered.

## Indoor Air Quality

Outdoor air quality has become a hot topic in Hong Kong and the Government has stated its intention to deal with the problem at source, both here in Hong Kong and in neighbouring Mainland China.

The quality of outdoor air in Hong Kong is already below world health standards and is a significant contributor to poor IAQ. IAQ is also on the agenda. Air quality in schools is variable and sometimes unsatisfactory, often because contaminated outdoor air is used for ventilation. The Government should establish a task force to recommend how to achieve a healthy standard of air quality in our schools including reviewing, for example, the practice of positioning schools beside busy expressways for noise separation between roads and high-rise residential buildings.

The problem of build-ups of indoor pollutants has been recognised for sometime, and clusters of cases during the SARS outbreak were attributed to indoor air issues. This has made the design of ventilation for high-rise

residential buildings a priority and the question of whether a centralised stack, with or without mechanical fans, is still a viable solution must be investigated as a matter of urgency.

In IAQ assessment, few contractors possess the full range of instruments for the existing testing methods. A faster system that is based on fewer samples is worth investigating. An express IAQ assessment protocol is recommended to replace the existing thorough but costly assessment methods.

The urban micro-climate related to high-rise and high-density development, which in turn affects air pollutant loads, is an area to address. Massive developments with insufficient wide gaps between buildings and long street grids could interfere with natural ventilation and create local downwind stagnant zones. Much urgent work is required and the professional engineers are best equipped with expertise and various modeling tools to contribute towards scientific airflow assessment of development sites and areas of different scales. Efforts by Government departments should be coordinated.



## Performance of Our Buildings

### *Performance-based Design*

Hong Kong enjoys the protection afforded by strong building codes. However this prescriptive approach is not flexible and has slowed the adoption of performance-based designs that are already being used in other countries such as Europe, UK and Singapore to encourage innovation, and energy performance in buildings. The BD allows performance-based design in areas such as fire safety engineering and daylight factor prediction.

Performance-based design allows more room for creativity and buildings are potentially more likely to function as required. The development of the Building Regulations is moving in this direction, but progress has been relatively slow and should be reviewed.

The Government should amend existing building regulations to allow wider use of the performance-based design approach for the adoption of innovations and to cater for complex and unusual situations.

#### *Fire Safety*

Not enough is known about the fire risks in high-rise buildings with curtain walls and double skin walls. Human behaviour simulation studies are also needed to enable sound risk assessments. The Government should support research in this area.

The Government should accelerate the study on Fire Engineering Approach to Fire Safety in Buildings and amend the existing building regulations to allow performance-based fire safety design.

#### *Building Assessment*

The Government should consider adopting a similar system to that of Singapore whereby the quality of residential construction can be given a score which is also publicly available.

The Government should take the initiative in the further development of building environmental assessment tools and take steps to encourage their applications.

#### *Innovative and Advanced Technologies*

While environmentally related technologies are often in the news, there are other innovative technologies which could help improve value-for-money in our buildings. The HKIE has examined a number of them in detail – some involving new materials and others using software systems developed in Hong Kong which leads the world in terms of innovation.

These include materials such as high performance light-weight concrete, Fibre Reinforced Polymer, Flowing Concrete and software for steel analysis and design, structural optimisation and in 3D design documentation and construction site operation simulation.

The Government should encourage and fund research, and facilitate their applications.

## Ageing Buildings and Unauthorised Building Works

The number of privately owned buildings over 30 years old that are in need of repair and refurbishment is in excess of 10,000 and is set to increase.

The Government should mount a sustained programme on the back of the soon-to-be-started MBIS and provide, or otherwise bring about, means of financial help with loans for the owners on the security of the increased value. Linked to this initiative must be the clearance of UBW.

The UBW clearance programme is outstripping the new UBW construction, but it could take as long as 20 years to effect final clearance. We believe, therefore, that this programme should be accelerated.





Chapter 2  
**Energy**  
Energising Hong Kong

# Introduction

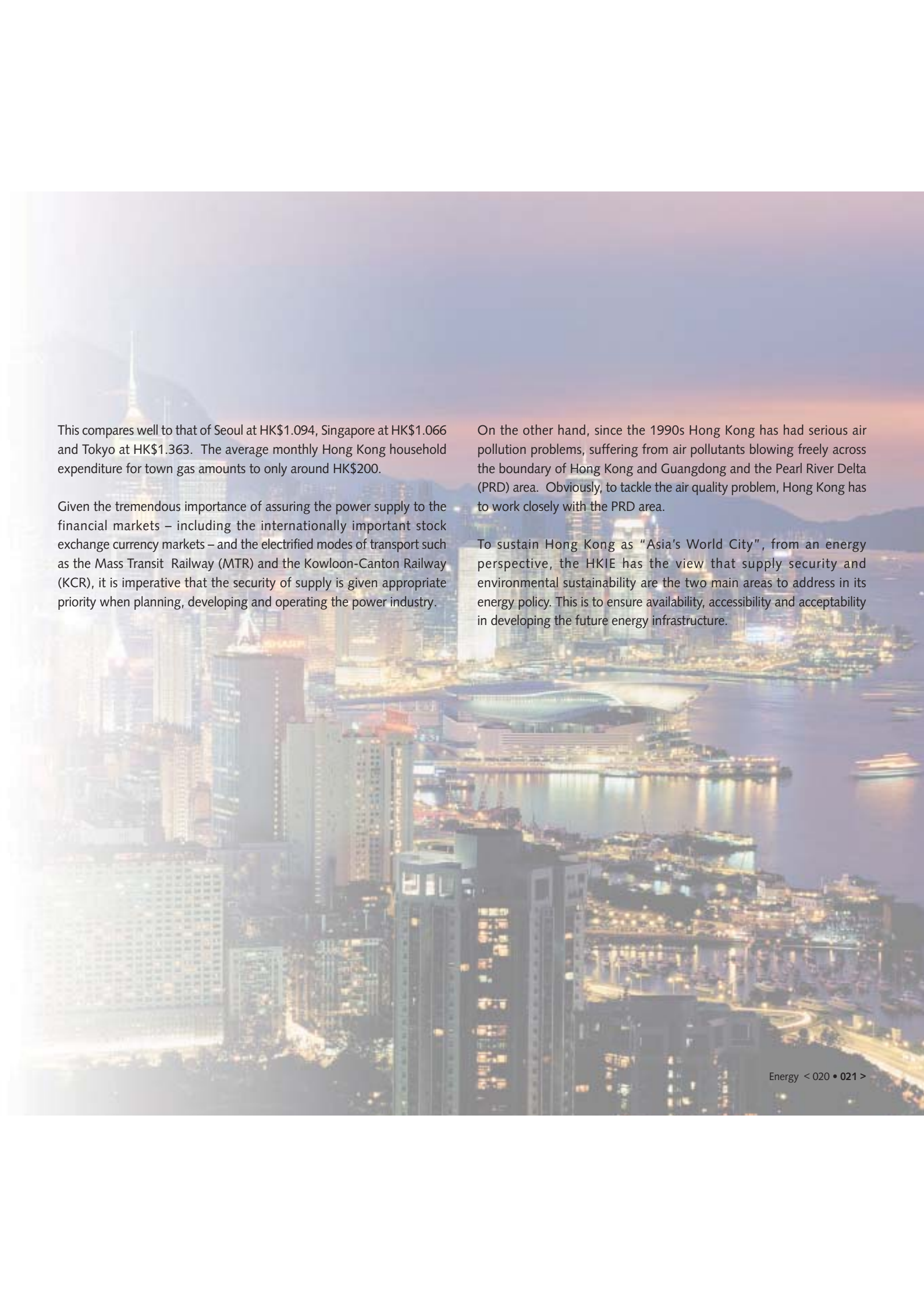
Hong Kong is one of the busiest places on earth. However all of the energy to sustain the territory's existence and prosperity is imported – in the form of coal, natural gas and oil products – and used to generate electricity and power vehicles. Hong Kong also imports electricity generated at the nuclear power station in nearby Daya Bay. In practice, Hong Kong has a more balanced mix of energy imports than most of its neighbours.

As Hong Kong's economy has evolved from manufacturing to a service economy, little is left of the old energy-intensive industry. And, even though global energy prices have gone up tremendously over the past few years, to date, imports have not yet exerted pressure on Hong Kong's balance of payments. In other words, Hong Kong can still afford its energy imports which in 2000 amounted to only 3 per cent of Gross Domestic Product (GDP).

While Hong Kong enjoys the second highest GDP per capita in Asia, energy costs are comparatively low. According to official statistics, the average household spent only 3.9 per cent of expenses on electricity, gas and water – much less than other outlays such as transportation. In January 2006, the tariff per kWh enjoyed by a typical household with an annual consumption of 3,300 kWh was:

CLP Power Hong Kong Ltd. (CLP) - HK\$0.872

Hongkong Electric Co Ltd. (HEC) - HK\$0.948



This compares well to that of Seoul at HK\$1.094, Singapore at HK\$1.066 and Tokyo at HK\$1.363. The average monthly Hong Kong household expenditure for town gas amounts to only around HK\$200.

Given the tremendous importance of assuring the power supply to the financial markets – including the internationally important stock exchange currency markets – and the electrified modes of transport such as the Mass Transit Railway (MTR) and the Kowloon-Canton Railway (KCR), it is imperative that the security of supply is given appropriate priority when planning, developing and operating the power industry.

On the other hand, since the 1990s Hong Kong has had serious air pollution problems, suffering from air pollutants blowing freely across the boundary of Hong Kong and Guangdong and the Pearl River Delta (PRD) area. Obviously, to tackle the air quality problem, Hong Kong has to work closely with the PRD area.

To sustain Hong Kong as “Asia’s World City”, from an energy perspective, the HKIE has the view that supply security and environmental sustainability are the two main areas to address in its energy policy. This is to ensure availability, accessibility and acceptability in developing the future energy infrastructure.

# The State of Present Infrastructure

## Energy Landscape

Since all the energy to sustain the territory's existence and prosperity is imported, the current Hong Kong energy landscape is an interesting picture.

### *Electricity*

Hong Kong's electricity is supplied by two listed utilities, namely CLP Power Hong Kong Ltd. and Hongkong Electric Co Ltd. Broadly speaking, CLP supplies electricity to Kowloon, the New Territories and Lantau Island, while HEC supplies Hong Kong Island and Lamma Island.

CLP is the larger electricity supplier and produces electricity from three power plants – Castle Peak Power Station, Black Point Power Station and Penny's Bay Power Station. CLP also imports power from Daya Bay Nuclear Plant and Conghua Pumped Storage Plant in Guangdong where CLP has equity interests. HEC generates electricity from its Power Plant on Lamma Island.

CLP and HEC are interconnected, allowing mutual support and reserve savings from which the customers of both companies benefit. To further increase the interconnection capacity and allow sizable economic transactions between the two companies an assessment of the cost and benefits would be required as the marginal fuel costs of the two companies are more or less on par. On the other hand, CLP is also interconnected to Guangdong Province and the South China Grid (SCG) and in recent years, has been selling power to Guangdong which has experienced severe supply shortages due to its rapid growth.

Both companies compare favourably with similar utilities around the world in terms of efficiency and performance, particularly on supply reliability, affordability and concern for the environment.

The industry is regulated by an agreement with the Government called the Scheme of Control (SoC) which enables the companies to generate a return on net fixed assets. The current 15-year SoC is due to end in 2008.

### *Oil Products*

With no native oil refining industry, Hong Kong imports all of its oil products, mainly from Exxon/Mobil, Shell, Caltex and China Resources which have oil depots on Tsing Yi Island.

Among the six major types of oil products used in Hong Kong, diesel oil and naphtha account for the largest share of local sales (54.4 per cent), followed by jet fuel (23.9 per cent), liquefied petroleum gas (LPG) (12.7 per cent), gasoline (7.8 per cent) and fuel oil and kerosene (0.6 per cent each).

Oil products are transported from the depots to petrol filling stations (PFS) and other destinations by road tankers.

### *Gas Fuels*

The main types of fuel gas used throughout Hong Kong for domestic, commercial and industrial purposes are town gas and LPG. In addition, LPG is used as a fuel for taxis and public light buses.

Town gas is supplied by the Hong Kong and China Gas Co Ltd. (Towngas), an investor-owned utility. While its Ma Tau Kok plant uses naphtha as feedstock, its Tai Po plant uses dual feedstock of natural gas and naphtha. The product from the two plants is the same and supplied through an integrated distribution system to about 1.6 million customers. The gas network extends throughout Hong Kong and is within economic reach of 85 per cent of homes in Hong Kong.

Natural gas is currently used for power generation by the two power companies.

LPG is imported by four oil companies operating in Hong Kong, and sold through a number of channels, including more than 230 distributors that supply domestic customers with gas in cylinders. LPG is also distributed to bulk storage installations providing piped LPG supplies to residential and commercial developments and vehicle filling stations.



## Energy Policy

In many countries, energy policies are based on complex equations that feature many variables. These include projections of future energy demand and supply, the fuel mix, consumption patterns, energy imports and exports, the amount of investment required and the environmental parameters, such as greenhouse gas (GHG) emissions.

Hong Kong is different. Possibly stemming from the Government's long cherished tradition of "active non-interventionism" when it comes to managing the economy, the Hong Kong energy policy does not include these details. Instead, its approach is results driven, setting out policy objectives rather than drawing up "road maps" dictating how the objectives are attained.

The energy policy is set by two Government departments, the Environment Bureau (ENB) and the EMSD. Despite this, the policy is straightforward and covers three areas:

- To ensure a safe and secure supply of energy at a reasonable price;
- To promote the efficient use and conservation of energy; and
- To minimise the environmental impact of energy production and consumption.

### *Regulation vs De-regulation*

The Hong Kong economy is not energy-intensive. Consequently, there is no urgent need to introduce significant reform to the energy market.

### *Oil Market*

Currently the oil market in Hong Kong is an open market with no entry barriers. Additionally, the ENB keeps a close eye on the movement of international and local oil prices in an attempt to ensure that the oil companies do not engage in price gouging in their local oil sales. The Hong Kong Consumer Council carried out a study of motor diesel and petrol in 1999, analysing the cost structure and margins of the different companies. The study did not discover any evidence of collusion.

In a further response to public concern, the Government commissioned a consultancy study on the Hong Kong auto-fuel retail market. The report published in 2006 did not uncover any evidence of collusion, although it claimed that "it remains a risk and preventive measures are warranted."

### *Electricity Market*

The power companies in Hong Kong are regulated by the Government through the SoC. The power companies are investor-owned, requiring no subsidy from the Government. Furthermore, they are operated efficiently and provide excellent service. In short, the driving forces for de-regulation in many other countries simply do not apply to Hong Kong.



However, in line with international trends, the Government has been considering de-regulating the electricity market by introducing competition.

The Government recently proposed higher targets for environmental performances, such as emission caps on the two power companies. It would also like to see the rate of return trimmed down and the agreement period shortened. However, the power companies have expressed different views on the proposed rate of return and the agreement period emphasising the need for sustainability and supply reliability secured by adequate investment. Negotiations are still in progress.

Most energy specialists agree that there are two main risks associated with de-regulation. The first is that security of supply may be reduced. The second is that incentives for the power companies to make new investments may be reduced once the market is opened up.

Naturally, Hong Kong should not blindly reject the de-regulation option. However, the Government would be well advised to closely watch developments overseas before it makes any decision on whether to open up the industry. In short, there is no urgent need for Hong Kong to decide now.

### *Gas Market*

Companies supplying town gas and LPG have been operating in a competitive market all along. The emergence of new gas suppliers in the local gas market, in particular those supplying natural gas directly to consumers for use as a fuel, depends on a number of factors. These include the availability of reliable and stable supply sources, economic benefits and consumers' affordability.

In 1997, the Government published a consultancy report on the feasibility of introducing a common carrier system in Hong Kong as a means to enhance competition in the local gas market. Based on the Government's study, it has shown that, in principle, this merits further consideration as a means of promoting competition in the gas supply sector. However, considerable uncertainties remain, including the availability and security of natural gas supply, the extent of any potential benefits to consumers from switching to natural gas and whether the relatively small local market is sufficiently contestable and attractive enough for greater competition to develop.

These uncertainties have to be cleared up before it can be decided whether a common carrier system is a practical and effective means of promoting competition in the gas supply sector.

## Energy Security

For a city that has no natural energy resources, energy security is obviously a major consideration.

### *Electricity*

Hong Kong has always enjoyed an adequate and reliable electricity supply. In addition, the security of electricity supply has been excellent, consistently rating over 99.99 per cent.

Hong Kong presently uses a mix of coal, gas and oil fuels to meet its energy needs as well as nuclear power imported from nearby Guangdong Province. Such a fuel mix allows the power utilities operational flexibility to face supply fluctuations in any type of fuel as well as the significant differences between peak and trough demands.

Recently the Government decided that no new coal-fired power plants would be built in Hong Kong, unless they apply technology to ensure that no harmful emissions are produced. However, any intention to phase out coal-fired power plants in the future should not be taken lightly. Environmental considerations have to be balanced against the security of overall energy supply. By the same token, the construction of a liquefied natural gas (LNG) terminal in Hong Kong would also benefit the security of energy supply.

Taking a glimpse into the more distant future, there is a question of whether Hong Kong should open up its power market and integrate with the SCG. Hong Kong would have to consider how much installed capacity it wants to retain in order to be able to supply essential local operations with minimum power requirements if decoupled from the SCG. While experts have long anticipated that supply would catch up with demand in the South China region, consumption has continued to grow more quickly than anticipated, and there are still power shortages in the region.

### *Fuel Oil Supply*

To ensure an adequate supply of oil, the Government mandates that the oil companies maintain a certain stock of oil products.

### *Gas Supply*

The reliability of town gas supply has always been over 99.99 per cent. With the introduction of natural gas from the Guangdong Liquefied Natural Gas Terminal to Hong Kong by Towngas, a dual naphtha and natural gas feedstock mix is used for the production of town gas at the Tai Po plant. The plant can switch from dual feedstock mode to single naphtha mode when necessary, further enhancing the reliability of the town gas supply.



## Environmental Balance

Hong Kong has been plagued by serious air pollution problems since the 1990s with air borne pollutants blowing freely across the boundary of Hong Kong and Guangdong. Despite the efforts taken by the Government to curb emissions by motor vehicles in the past decade, which have reduced roadside emissions of nitrogen oxide (NO<sub>x</sub>) and respirable suspended particulates (RSPs), air quality in Hong Kong has deteriorated appreciably due to emissions from the manufacturing-intensive PRD area. Obviously, to tackle the problem, Hong Kong has to work closely with the PRD area.

Power generation and the transportation sector are the two major sources of air pollutants. Despite the efforts taken by the power plants to control emission, the Government has set stringent emission targets for power plants. Emissions of NO<sub>x</sub>, RSPs and volatile organic compounds all declined in 2004 compared with 1997 by 16 per cent, 28 per cent and 23 per cent respectively, but emission of sulfur oxides (SO<sub>x</sub>) increased by 47 per cent during the same period, mainly because of power plant sources.

One of the easiest ways to meet the emissions targets for 2010 is for Hong Kong to use more natural gas for power generation. CLP has submitted a proposal to the Government to build an LNG terminal at South Soko Island to replace the depleting reserves of the Yacheng field.

The Government is scrutinising the proposal. Yet some are opposing the site selection on environmental grounds. The “not in my backyard” mentality is becoming increasingly evident in Hong Kong. There is a need to educate people on the tradeoffs involved and that each option has its own costs. This may ensure that the decision is based on promoting public good and not hijacked by pressure groups.

For example, there are clear issues that apply to the development of renewable energy sources such as solar and wind power. Hong Kong's urban environment and lack of space mean that Hong Kong may not be the best place to utilise renewable energy. In the clamour for the development of renewable electricity, one should not ignore the fact that any meaningful project would probably demand land and space to the extent that it may limit other possible uses of the site, such as recreation. Some may oppose large renewable facilities because of their impact upon the beauty of the natural environment.



Until there is a major technology breakthrough, wind and solar power remain much more costly than conventional power. The public should be informed and made aware of the issues associated with such initiatives before making the decision to pursue these forms of electricity on a large scale. Increasing tariffs to finance environmental conservation initiatives warrants closer assessment as a policy to address the environmental issues. However, effort should continue into research and assessment of renewable resources and how they could be used, as well as trials and demonstrations of renewable technologies in Hong Kong, and in general, use of renewable energy (including biomass, solar, wind, etc) should be encouraged.

### *Emission Reduction*

The power companies have introduced natural gas as a main fuel in generating electricity which reduces carbon dioxide (CO<sub>2</sub>) emissions significantly compared to using only coal as fuel. CLP also has nuclear energy and hydro energy investments in Guangdong with no GHG emissions.

In the 1970s, Towngas switched from using coal and heavy oil as feedstock for town gas production to naphtha which is a very clean fuel with low sulphur content. Using natural gas and naphtha as feedstock helps to improve the air quality in Hong Kong by further reducing the emissions of CO<sub>2</sub>, NO<sub>x</sub> and SO<sub>x</sub> by 26 per cent, 42 per cent and 40 per cent respectively during the town gas production process.

Towngas has also been a pioneer in commercially using landfill gas as fuel for town gas production. The pilot landfill gas utilisation project was successfully commissioned at Shuen Wan in 1999. Another treatment facility at the Northeast New Territories Landfill, together with the construction of a 19 km pipeline connecting Tai Po Gas Production Plant, has just been commissioned. Treated landfill gas, at a design output of 8,000 standard cubic metres per hour (natural gas equivalent), is projected to be delivered for over 25 years, further reducing the overall emissions at the landfill site and at the gas production plant.



## Sustainable Energy

The Hong Kong Committee of the World Energy Council (WEC) defines sustainable energy policy in terms of the three A's, Availability, Accessibility, and Acceptability. Availability refers to security and reliability of supply, adequacy of investment and return to guarantee supply, end-user energy efficiency, and renewable energy. Accessibility relates to "access" and affordability, whereas Acceptability refers to the impact on regional air quality and response to climate change. Consideration of these aspects of energy policy is in line with the current interpretation in many countries around the world.

### *Energy Efficiency*

To ensure Hong Kong adopts a sustainable energy development policy as defined by WEC, enhancing energy efficiency as a means to reduce emissions of air pollution and GHGs, as well as enhancing energy security should be seriously considered. Active promotion and enforcement of efficient ways to consume energy, and mandating the replacement of low efficiency devices by high efficiency ones to avoid wastage should be adopted as an effective strategy for sustainable energy infrastructure development.

The Environmental Protection Department (EPD) is becoming increasingly involved in the energy business in so far as it oversees the environmental aspects of all energy installations, including production and distribution facilities. Further, it also regulates the pollution problems associated with energy consumption such as motor vehicles.

The Planning Department and Lands Department are involved in the allocation of land for building energy production/conversion installations and distribution facilities including power lines, pipelines and PFS's. On the whole, the regulation process has been fairly smooth, implying that Hong Kong has the proper expertise to execute the regulatory work. However, co-ordination among the various bureaux and departments leaves something to be desired, adversely affecting the quality of the Government's work in the energy sector. Following the reorganisation of the Government departments in July 2007, it is hoped that the Government's energy policy and the pursuit of sustainable energy infrastructure development will receive appropriate attention and focus.

### *Human Infrastructure*

Given that Hong Kong's energy needs are not expected to grow at anything more than a slow rate, the human infrastructure needed to sustain future energy demand is not a critical problem as long as the existing training and relevant academic programmes are maintained.

## Integration with Southern China

The issue of integration of Hong Kong's energy infrastructure with Southern China becomes especially relevant when considering the impact of de-regulating the electricity industry.

This might involve transferring large quantities of power on the current interconnection between the Hong Kong grid and the SCG. However, at the moment Southern China is still short of the power needed to supply its own users, and is in no position to sell power to Hong Kong.

Therefore the prudent course would be to watch how the electricity supply situation develops in Southern China in the coming decade before making a decision on whether to rely on imported electricity from SCG.

Another factor is the view of an overwhelming number of Hong Kong citizens that agree that the security of supply should be the paramount consideration involving thoughts of de-regulation. For example, in the long run, Hong Kong might be able to procure cheaper electricity from Southern China, but the interconnection could affect the security and flexibility of supply.

It should also be noted that, apart from residential and agricultural tariffs which are suspected to be kept artificially low for socio-political reasons, commercial and industrial tariffs in the neighboring cities to Hong Kong are at similar levels, or in some cases higher, than those in Hong Kong. Moreover, any large procurement of electricity from Southern China should be subject to review of the associated emissions of pollutants and GHGs there.

The issue is clearly highly complex and the development of a post-2008 energy policy framework – after the current SoC expires – calls for a spirit of co-operation between the electricity providers and consummate political skill on the part of the Government.

# Key Issues and Recommendations

The HKIE has the following views on the energy infrastructure needed to sustain the future development of Hong Kong as Asia's World City.

## Energy Landscape

Hong Kong is essentially one big city, which gives it a very different energy landscape from a country. In such a small place it is difficult to have meaningful competition in the local energy markets. Instead, the security of supply as well as the issue of environmental concern, in particular air quality, should be the over-riding consideration in any energy policy.

## Energy Policy

The Government's energy policy has addressed the issues of safe and secure supply, energy conservation and minimising environmental impact in broad terms. In early 2003, the HKIE submitted to the Government a paper on the "Need for a Comprehensive Energy Policy for Hong Kong" clearly recommending that improvements in the Government's energy policy are required in the following areas:

- Transparent regulatory system;
- Specific primary energy intensity target;
- Promotion of renewable energy policy;
- Implementing GHGs emission targets;
- Definitive economic, social and environmental costs set in achieving targets; and
- Alignment of energy related tasks by various bureaux and departments.

These recommendations still hold and furthermore, the following areas in relation to energy policy should also be addressed:

- *Building the Infrastructure*

The Government's key role is to direct and facilitate the building and strengthening, as required, of the energy infrastructure, both by the private sector and by public funding, has to be clearly defined and realised, so that the long-term energy availability, acceptability and affordability for supply reliability and supply security, is ensured.

- *Education*

In the face of the growing importance of public opinion in the running of Hong Kong, the public should be educated on energy matters, providing them with facts and impartial assessments so that objective views can be maintained, and the comprehensive energy policy and its associated energy infrastructure accepted. The importance of efficient use of energy should also be promoted and enforced.

- *Fuel Mix*

The guidelines for the long term optimal fuel mix, including renewables (biomass, solar, wind, etc), for Hong Kong have to be clearly laid down in the Government's energy policy after due consideration to supply security, flexibility, diversity, fuel standards and quality, environmental impact, economics and coordination with the energy suppliers.

- *An Energy Board/Commission*

To enhance the alignment of energy related tasks by various bureaux and departments, it is recommended that the Government consider setting up an Energy Board/Commission to deal with all issues related to energy.



## Energy Security

### *Energy Infrastructure*

Hong Kong's energy infrastructure is robust and working well. With proper maintenance, incremental extensions and competent operation, it should continue like this over the next 10-15 years. However, to sustain Hong Kong as "Asia's World City", the local energy infrastructure needs to be maintained and allowed to develop so that the long-term energy availability, acceptability and affordability for supply reliability and supply security, is ensured.

### *Fuel Supply and Fuel Handling*

Hong Kong relies solely on imported fuel and fuel supplies in the near and long term need to be secured. For example, the contract for CLP to buy electricity from the nuclear plant at Daya Bay in Guangdong Province will expire in 2014. The Yacheng natural gas field, off China's Hainan Island which currently supplies about 25 per cent of Hong Kong's consumers is expected to be depleted early in the next decade. Steps must be taken in a timely manner to renew or replace these supplies.

The near term and long term supply of fuels for the local energy market, including natural gas, nuclear power, coal, oil must be guaranteed with suitable reserves maintained in Hong Kong to cope with unforeseen contingencies, such as interruption of the supply chains.

The Government should ensure the commercial entities undertaking the supply of energy have always secured the supply of fuel with adequate infrastructure to receive, handle and store such fuels.

## Environmental Balance

In the longer term, with declining oil supplies and new international agreements to manage GHG emissions, energy prices will undoubtedly rise. Hong Kong's economy has a low energy intensity and should be able to manage energy costs. However, much of Hong Kong's economy is based on energy-intensive factory output in China. Therefore thought must be given to the overall energy supply for the region.

Environmentally acceptable energy infrastructure for energy generation and supply has to be carefully determined, ensuring that a suitable balance between supply security and the care for the environment is achieved. Additionally, Government's approach towards the energy sector in regard to environmental problems associated with global climate change and air pollution, including CO<sub>2</sub> emissions, needs to be included in the energy policy.

## Sustainable Energy

The impact of “climate change” on the energy sector has not received the attention required to sustain a long term development for Hong Kong. Equally, promotion of energy efficiency warrants focused effort for it to be realised. These issues are complicated ones and need the concerted effort of the Government and the energy suppliers to tackle them jointly. The Government's energy policy needs to address these issues.

The establishment of a sustainable energy infrastructure should also be considered together with other sectors, such as transportation and environment, and to support other sectors' initiatives, such as promoting gas or electric vehicles to reduce transportation oil fuel, distributed resources, for the sustainable development of Hong Kong.

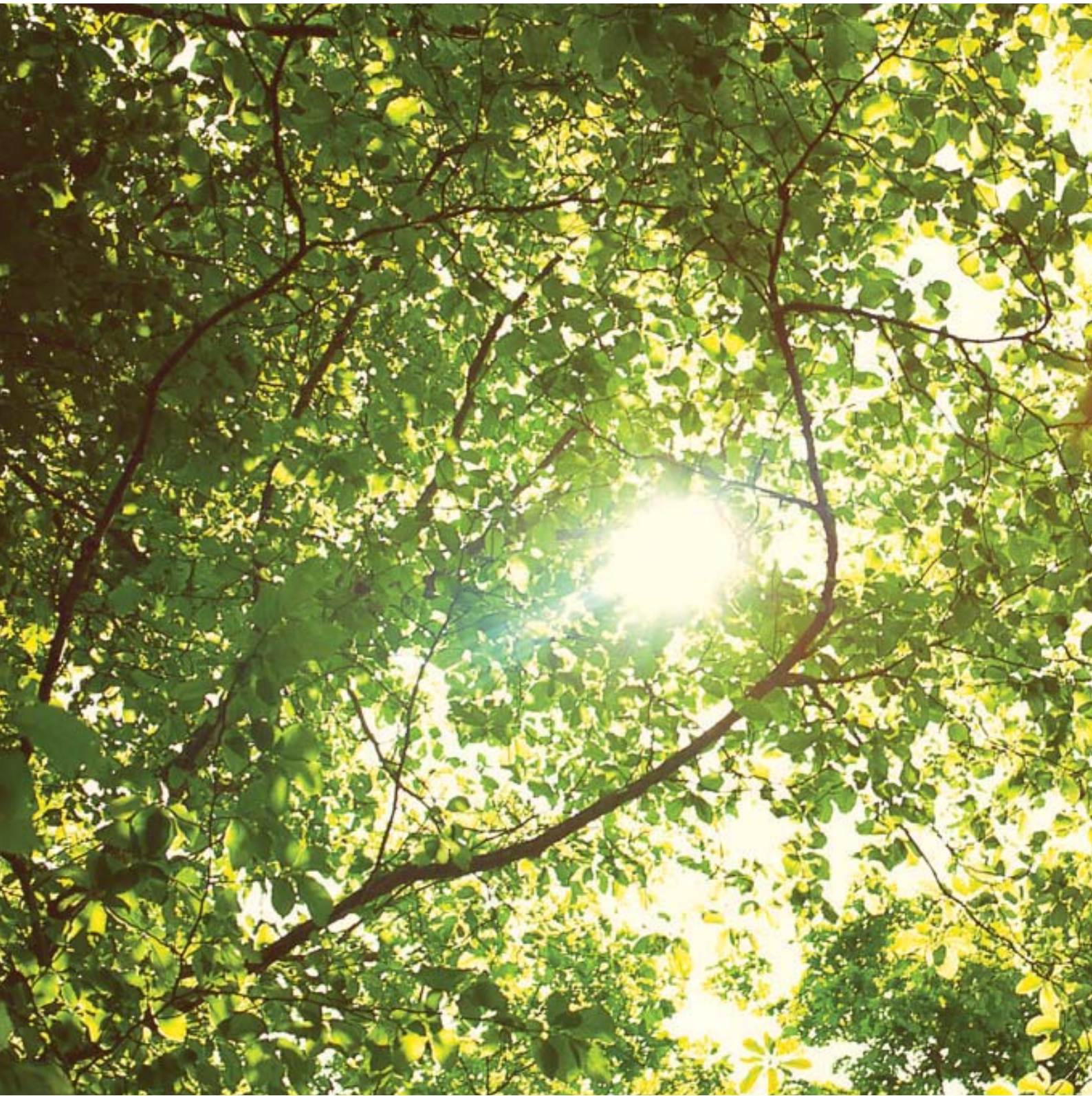
## Integration with Southern China

The future of Hong Kong lies in integration with the Chinese economy, especially with Southern China. Energy linkages should be built up gradually with the implementation of well thought out plans and should only come after the necessary regulatory, environmental, legal and economic frameworks are in place and level playing fields have been created.

Hong Kong needs to co-operate with neighboring Southern China in tackling environmental protection issues arising from energy matters.



Photo Source: CLP Group





Chapter 3

# Environment

Raising the Bar for Environmental Management



# Introduction

Hong Kong's reputation as a true "world city" is well deserved and is based on a number of criteria, including strategic geographic location as well as Hong Kong's role in global affairs. Underpinning all of that is an infrastructure that enables the heart of the city to keep on ticking.

The purpose of this Chapter is to review the present condition of existing environmental infrastructure developments and assess the performance and capacity of this infrastructure to serve the present needs of Hong Kong. Just as importantly, it seeks to assess the performance and capacity of this infrastructure to serve future demand in the next 5 to 10 years and assess the requirements for any necessary additional infrastructure. However, no cost figures will be provided in this Chapter as it is beyond the scope of this study to estimate the funding needs.

The ultimate goal is to develop an accurate and detailed picture of the state of the infrastructure today, and put forward recommendations for enhancements and improvements to meet Hong Kong's future needs and aspirations.

This Chapter covers four types of infrastructure - drinking water, waste water, waste management and noise reduction. It should be noted that infrastructure dealing specifically with air quality is not mentioned in this Chapter because there is no major infrastructure designed for air quality in Hong Kong, apart from a few air quality monitoring stations currently maintained and operated by the Government or its contractors.

# The State of Present Infrastructure

## Drinking Water

Hong Kong's success is all the more surprising when you consider that it has virtually no natural resources. Almost everything needed to sustain the city is imported, including food, power and even drinking water.

With few sizeable natural lakes, rivers or underground water supplies, Hong Kong gets all of its water from two main sources.

The oldest is a series of reservoirs that collect rainfall during the rainy season, although the maximum capacity has not been reached since 1998 when storage approached 97 per cent. However, even completely full, these reservoirs cannot meet the city's demand for drinking water which averages 2.62 Mm<sup>3</sup> of water a day.

The other, and by far the largest, source of drinking water is a pipeline that brings water to Hong Kong from the Dongjiang River in neighbouring Guangdong Province.

Supported by a network of storage facilities, pumping stations and treatment works capable of supplying 4.8 Mm<sup>3</sup> of water a day – almost twice the daily average demand – the supply easily meets the quality standards adopted by the Water Supplies Department (WSD). Piped water now reaches 99.9 per cent of the population, with only a few remote villages still not connected to the network.

### *Government Policy*

The Government's policy on water supply is to ensure the provision of an adequate, reliable and sustainable supply of quality water in Hong Kong. This is carried out by the WSD which is responsible for planning and developing water resources.

The Department maintains and operates the current water supply system to provide a 24-hour water supply throughout the year, and also plans, designs and oversees new projects for the expansion of fresh and salt water supplies (for flushing) to new developments.

In addition, the Department is responsible for treating water to ensure that it conforms to established international standards, such as the World Health Organisation's Guidelines at all times.

### *Performance and Capacity*

Hong Kong began receiving water from Shenzhen Reservoirs in 1960 and the Dongjiang River in 1965. Today it accounts for about 70-80 per cent of the territory's water requirements, with the balance supplied by rainfall stored in reservoirs.

The Dongjiang-Hong Kong water supply system was designed to deliver up to 1,100 Mm<sup>3</sup> per year, although this level has never been reached. In fact, the actual quantity of water brought to Hong Kong from the Dongjiang varies from year to year, as does the price per m<sup>3</sup>. The annual expenditure for the purchase of water from 2006 to 2008 will be HK\$2.49 billion. The total volume of raw water imported in 2005 was 808 Mm<sup>3</sup> – 73.4 per cent of the capacity.

The quality of the water from the Dongjiang River also varies, and this has an impact on the amount of treatment it requires before it meets Hong Kong's drinking water standards which follow the World Health Organisation's Guidelines. A network of 21 water treatment works throughout the territory is capable of processing up to 4.8 Mm<sup>3</sup> a day, or almost twice the average daily demand.



## Waste Water

Secondary or higher level sewage treatment has become the norm in developed countries. Today about 26.3 per cent of Hong Kong's raw sewage receives preliminary or primary treatment while 55.3 per cent receives Chemically Enhanced Primary Treatment (CEPT). The remaining 18.1 per cent receives secondary/tertiary treatment.

### *Government Policy*

Hong Kong's waste water infrastructure is extensive and includes a network of over 1,500 km of sewers as well as nearly 270 sewage pumping stations and treatment works. More than 98 per cent of the sewage produced in Hong Kong is collected and "treated" amounting to approximately 2.65 Mm<sup>3</sup> a day.

Responsibility for this infrastructure is split between two Government departments. The EPD looks after the policy and planning for

sewage treatment, while the actual construction, operation and maintenance of facilities falls to the Drainage Services Department (DSD).

Despite this dual-department approach, the Government's policy goals for sewage infrastructure are straightforward. One is the protection of public health. The other is to achieve the agreed Water Quality Objectives (WQOs) for the waters that receive the effluent.

WQOs are important because they ensure that Hong Kong's waters are clean enough for a variety of uses including swimming and other recreational activities as well as sustaining a healthy marine and freshwater ecosystem. The real question is whether these objectives are high enough, and the answer is no!

### *Performance and Capacity*

In a developed and affluent city such as Hong Kong all sewage should receive at least secondary (biological) treatment. However, of the 2.65 Mm<sup>3</sup> of sewage treated each day, just 18.1 per cent receives secondary/tertiary treatment.

Of the rest, 26.6 per cent receives preliminary/primary treatment which means it is screened and grit is removed before discharge. The bulk of Hong Kong's sewage – 55.3 per cent – receives CEPT which uses Ferric Chloride, among other chemicals, for treatment of the waste water.

The most significant waste water infrastructure development in recent years has been the Harbour Area Treatment Scheme (HATS), which as its name suggests is aimed at improving the water quality of Victoria Harbour. The first stage of the HATS is completed, and the results are now being felt. The second stage – a HK\$20 billion

programme that will provide additional facilities to convey all sewage from the Harbour area to Stonecutters Island Sewage Treatment Works for CEPT, disinfection, and biological treatment is expected to be completed in 2010-11. It will expand the daily treatment capacity from 1.725 Mm<sup>3</sup> to 2.8 Mm<sup>3</sup>.

Other key infrastructure areas include the Tolo Harbour Effluent Export Scheme, in which treated effluent from Shatin and Tai Po Sewage Treatment Works is diverted via a major pipeline to Victoria Harbour and has resulted in significant improvements to water quality in Tolo Harbour.

#### *Key Performance Indicators (KPIs)*

Quality of the receiving waters is an indicator of the adequacy and effectiveness of the existing sewerage infrastructure and of future infrastructure requirements. The EPD monitors water quality to check for compliance with established WQOs.

Water quality generally is improving. In 2005 some 85 per cent of tests across Hong Kong met the WQO standards. Water in the Eastern Harbour improved by 90 per cent in terms of bacteria content, largely due to the commissioning of the first stage of the HATS.

The number of beaches achieving a "Good" ranking has also increased drastically from 13 in 1996 to 23 in 2005. The number of beaches ranked "Poor" has also increased, from zero in 2000 to six in 2005 (mainly the beaches in the Tsuen Wan area) due to HATS.

HATS has also substantially improved water quality in Central and Eastern Victoria Harbour, Junk Bay and the Eastern Buffer Water Control Zone. However, elevation of E. coli in the Western Harbour, particularly in the vicinity of the Stonecutters Island Outfall, has worsened. This has resulted in the year round closure of all gazetted beaches in the Tsuen Wan area.

The western part of Hong Kong Island and North Western New Territories, the North Western Water Control Zone and Southern Water Control Zone have moderate water quality due to the flow from the Pearl River and local pollution sources such as effluent from sewage treatment works and screening plants.

The water quality in Deep Bay remains poor, with relatively low Dissolved Oxygen and high levels of nutrients (nitrogen and phosphorus) and is showing signs of further deterioration.



## Waste Management

Hong Kong's affluent population generates massive quantities of solid waste. So much that, unless something is done we will run out of landfill capacity within eight years.

This should not be a surprise. A high population density and relatively small land area makes efficient and effective solid waste management essential. But, as the approaching landfill crisis proves, we have clearly not been successful.

Measures such as the recent Construction Waste Charging Scheme, the expansion of source separation schemes, the soon-to-be commissioned EcoPark and anticipated legislation for Municipal Solid Waste (MSW) charges in 2007 may reduce waste disposal rates, and thereby extend landfill life somewhat. However, the need for new landfill capacity remains urgent.

### *Government Policy*

Hong Kong has a number of policies designed to combat waste. The Waste Reduction Framework Plan (WRFP) 1998-2007 has achieved a number of successes, notably leasing of land to recyclers through short-term tenancies, the Wastewise Scheme and the provision of more than 28,000 three-colour recycling bins across the territory.

The WRFP also set up the Waste Reduction Committee and a number of task forces to tackle waste reduction in a range of sectors. A programme on source separation of domestic waste has been rolling since 2005.

The most recent Policy Framework for MSW in Hong Kong 2005-2014 includes further policy measures and identifies waste management infrastructure needed for more comprehensive waste reduction, reuse and recycling.

Responsibility for carrying out these policies falls mainly on three Government departments.



The EPD is charged with safeguarding health and welfare from the impact of handling and disposing of MSW. In practice this means developing a sustainable waste management strategy, providing waste management facilities and enforcing the controls in the main legislative tool governing waste management – the Waste Disposal Ordinance.

Public waste collection and public hygiene are the responsibility of the Food and Environmental Health Department. Inert construction waste sorting facilities, fill banks, fill stockpiling areas and public fill barging points are managed by the Civil Engineering and Development Department.

### *Performance and Capacity*

Hong Kong's waste management infrastructure is based on the Waste Disposal Plan (WDP) developed in 1989. It covers a variety of waste types, collection and disposal methods as well as proposed locations for new infrastructure.

It currently comprises eight refuse transfer stations (RTS), the Chemical Waste Treatment Centre and the Shaling Livestock Waste Composting Plant. There are also three strategic landfills which have replaced older landfills and provide significantly improved environmental protection. Each of the new strategic landfills has stringent performance specifications as well as operational and environmental standards, and the operators face penalty deductions if standards are not met.

Additional facilities not specified in the 1989 WDP include North Lantau RTS, the Outlying Islands Transfer Facilities and the recently opened Low-level Radioactive Waste Storage Facility in Siu A Chau. The majority of these facilities were created using a "Design, Build and Operate" approach with private sector third parties rather than purely as public facilities.

Building new structures also produces inert construction waste which in the past was used as fill for land reclamation. Two "fill banks" acted as a buffer between inert construction waste generation and demand for fill and recycled aggregates.

Since land reclamation in Hong Kong has effectively ceased, both fill banks have had to be extended and are now fully utilised. However, a recent agreement with China's State Oceanic Administration to deliver reclamation materials to the Mainland should enable the fill banks to be slowly reduced.

A number of old landfills have also been restored. While strictly speaking they do not constitute active waste management infrastructure, they do represent a significant investment in environmental protection. The restoration work has added leachate collection and treatment as well as passive/active landfill gas control. Landscaping has been carried out on a number of the restored landfills which are now being used for community recreation in the urban areas.



## Noise Reduction

It has been said that Hong Kong is small and crowded. It is also noisy.

And, with the lion's share of economic activity confined to a relatively tiny 25 square kilometre area, the most severe environmental noise problem for most Hong Kong people is traffic noise.

### *Government Policy*

The principal framework for dealing with road traffic noise in Hong Kong is the Hong Kong Planning Standards and Guidelines, which applies to both public and private developments. It sets traffic noise standards for various land uses and developers must ensure their proposals meet them.

Minimum noise compliance rates must be achieved for any proposed residential development and a self-assessment form detailing planning information and the traffic noise performance of the site has to be submitted to the EPD. This process is an effective way of reducing noise exposure and it is estimated that more than 500,000 people have benefited from this planning mechanism to date.

Since 1990, the Government has introduced a number of noise abatement programmes. These include road resurfacing and noise barrier retrofitting programmes worth HK\$3,874 million that have brought significant benefits to an estimated 950,000 Hong Kong residents.

In addition to the noise abatement programmes, the Government has also launched a number of noise policies designed to reduce traffic noise levels at source.

### *Performance and Capacity*

The scale of the noise problem in Hong Kong is a function of traffic flow and population density.

In 2000, more than 1.1 million people – 17 per cent of the population – were routinely exposed to traffic noise levels in excess of 70 dB(A) L10(1 hour). The problem was most acute in Yau Tsim Mong district, mainly due to the proximity of residential buildings to major roads.

Interestingly, given the scale of the problem, the EPD spent just HK\$92.5 million, or 3.8 per cent of its HK\$2,442.9 million budget for 2005/06 on noise-related activities. This is 2.6 per cent less than that was spent in 2003/04, although it appears that this reduction was achieved through better management of operating expenses and manpower.

While private and commercial vehicles are the usual targets of environmental measures, public transport is also a candidate. It is clear that a sustainable mass transport system is a more environmentally friendly transport option than bus transport. A mass transit system can move more people in a single trip and greatly reduce air and noise impact, especially in urban areas.

The noise control for railway systems can be concentrated at the railway line, which is easier to manage than a similarly sized road network. Appropriate noise control measures in the form of noise barriers, noise enclosures and floating slab tracks are usually incorporated into the railway design at the planning stage to ensure full compliance with relevant noise control legislation and guidelines.

The Government carried out the Second Railway Development Study (RDS-2) in 1998 to formulate a strategy for expanding the railway system to support future growth and development of Hong Kong. It determined that an underground railway option should be the “base case” and other options, such as at-grade or elevated, should be considered only after the underground option had been explored. More than 60 links and alternatives were evaluated in RDS-2 and the proposed new railway systems will help to relieve the pressure on bus transportation, resulting in noise reduction on local roads.

One such railway, the Kowloon Southern Link, is being built by the Kowloon Canton Railway Corporation (KCRC) and is scheduled for completion by 2008. There are four other railway projects currently being planned – the Northern Link/Express Rail Link, Shatin to Central Link, West Island Line and South Island Line. With the implementation of these new railway systems traffic noise should be reduced in future.

# Key Issues and Recommendations

## Drinking Water

The Government sensibly takes a long-term view on water supply issues. It concluded negotiations with the Guangdong Provincial Government on new supply arrangements for Dongjiang water in April 2006. To improve the supply of drinking water between now and the end of 2015, there are numerous developments focused on distribution efficiency, water quality and increasing storage capacity. It seems clear that Hong Kong's existing drinking water supply system can meet future demand until 2015, but the majority of water will still have to be imported.

Work on the rehabilitation of some 3,000 km of ageing water mains is now underway and will take about 15 years to complete, down from the 20 years originally envisioned. The work will greatly reduce leakage and mains bursts, improve distribution efficiency, reduce costs and meet the public's expectation of a reliable supply of high quality water. The effort to reduce water leakage should continue through implementation of rehabilitation plans for supply and distribution networks. Increases in user charges may also be considered to reduce per capita demand.

A plan is also being developed for a maintenance and replacement programme to keep above ground facilities in good operating condition. These include the Shatin Water Treatment Works which accounts for as much as 40 per cent of Hong Kong's overall daily drinking water demand and is one of the key entry points for water from Dongjiang.

The WSD is looking into alternative ways of increasing Hong Kong's water resources such as desalination. A pilot plant using reverse osmosis technology is now in operation at Ap Lei Chau. The Government's "Total Water Management" programme looks to further manage water demand and improve the quality and efficiency of freshwater supply. This is a prudent step, as it continues investigations into alternative water sources, such as desalination and waste water reuse (not necessarily for drinking water) that would reduce the demand for freshwater.

The search for alternatives is important. The current supply agreement with the Guangdong Provincial Government provides Hong Kong with water from the Dongjiang River for a fixed annual fee. The agreement does not stipulate an annual volume, but guarantees to meet the needs of Hong Kong to a reliability of 99 per cent even in extreme conditions such as drought. However, current

water shortages in China (particularly in the north) due to changing climate, overuse and wastage, mean that supply from Dongjiang to Hong Kong may not be certain in the future.

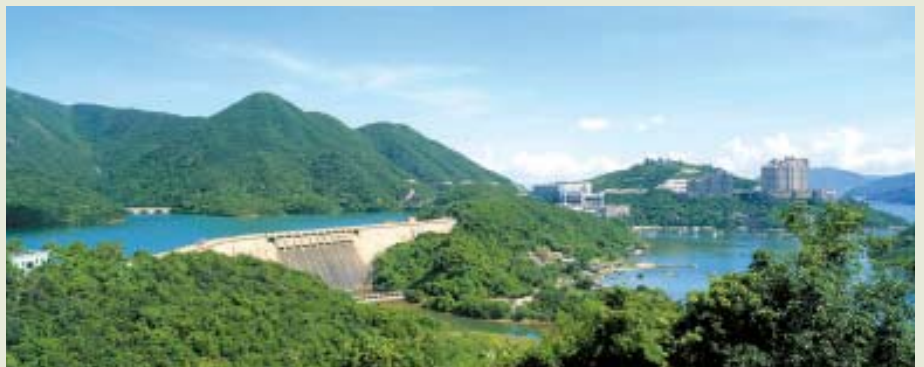
However, the price of Dongjiang water has increased more than six times in the past 20 years and the price beyond 2008 is uncertain. What is certain is that demand for drinking water in Hong Kong will depend upon population growth and per capita demand.

According to a report entitled "Projections of Population Distribution, 2006-2015", Hong Kong's population is forecast to reach 7.51 million by 2015. This will push up the consumption of drinking water. It will also increase the associated costs of treating and delivering water which are far higher than consumers actually pay.

For example, in 2004/2005 the Government spent HK\$6,430 million on water production but received only HK\$2,668 million or a 42 per cent return from consumers. The adoption of a user pays approach could recover the full cost of production. It might also encourage more careful and lower consumption.

Adding the following KPIs is also recommended:

- An indicator of the acceptable leakage rate for drinking water supply;
- An indicator of the acceptable percentage of planned water supply disruptions; and
- An indicator of the acceptable percentage of unplanned (i.e. emergency or accidental) water supply disruptions.



## Waste Water

The DSD has implemented an ambitious programme of major projects to cope with improvements in standards of living and public demands for a cleaner environment. Sewerage infrastructure is now being upgraded as part of a territory-wide sewerage extension and improvement programme.

While existing infrastructure can meet current demand, it cannot do so in a sustainable manner. Current policies are based on treating waste water only to the level that the water into which it is discharged can handle. For example, the increasing levels of bacterial pollution in the Western Harbour resulting from the current operation of Stonecutters Island Sewage Treatment Works, demonstrates that the policy is not delivering all of the environmental benefits expected.

An aggressive programme of expansion and improvement of facilities will no doubt address this in the years to come. However, the timely implementation of the sewage treatment

work developments by 2010 must be ensured to meet the increased demand for sewage treatment facilities. The underlying framework and infrastructure must be in place to connect the increasing population to the sewage treatment works in order for these developments to be beneficial.

### *Village Sewerage*

At present, some 500,000 people live in properties that are not connected to the public sewerage system. The Government plans up to 2005 were to connect the properties of 330,000 in 236 un-sewered villages to the public sewerage system and add the properties of a further 65,000 people in 2006.

This should result in improvements to many rivers and streams in the New Territories. However, it will still leave some 105,000 people in properties not connected to the public sewerage system, although some of these already receive secondary treatment by private plants. Further plans should be implemented to connect these remaining properties to the public sewer system.

### *Population Growth*

Population growth and the associated increase in waste water generation are critical when trying to project the future demand for waste water treatment. Current forecasts predict that numbers will reach 7.51 million by 2015.

The location of future populations in relation to water control zones is also important because it determines where additional waste water treatment infrastructure is required. The Western Buffer Water Control Zone is expected to experience the greatest increase in effluent discharge, partly due to sewage transfer from Hong Kong Island under the second stage of the HATS. However, the installation of an advanced disinfection facility at the Stonecutters Island Sewage Treatment Works capable of treating 1.725 Mm<sup>3</sup> of sewage a day should lead to significant improvements. The water quality in Victoria Harbour, Western Buffer, Southern and North Western Water Controls Zones will also benefit from HATS Stage 2.



Development in the Sai Kung area has increased rapidly over the last decade and is expected to increase further. This has created increased pressure on infrastructure and the receiving environment, including the Port Shelter Water Control Zone, which will have to handle the discharge from an extra 41,000 people by 2015.

There is some good news. The upgrade of Pillar Point Sewage Treatment Works will take capacity to 230,000 m<sup>3</sup> per day and decrease the pollution load discharged into the North Western Water Controls Zones.

Similarly, upgrades to the San Wai Sewage Treatment Works and Ha Tsuen Pumping Station will take capacity to 246,000 m<sup>3</sup> per day and help cope with the increased population and sewage effluent transfer from Deep Bay Water Control Zone. The corresponding reduction in sewage effluent discharge in the Deep Bay Water Control Zone will reduce the pollution load, but the water quality in Deep Bay will depend on pollution from Shenzhen.

### *Regional Issues*

The issue of water quality also has a regional dimension. Hong Kong shares its waters with Guangdong Province, so pollution control efforts on both sides must be aligned. The Shenzhen Government has plans to ensure that 95 per cent of sewage will receive proper treatment by 2020, compared to around 50 per cent presently.

Dry weather flow interception schemes for the Futian, Buji and Da Sha rivers, eradication of expedient connections throughout the special economic zones and the upgrading of the Nanshan Sewage Treatment Works from primary to secondary treatment are underway. However, the Deep Bay Water Control Zone is expected to continue to be non-compliant with the WQOs for the foreseeable future, particularly in terms of nutrient levels.

The Pearl River makes a significant contribution to nitrogen levels in the Southern Water Control Zone. The Guangdong Provincial Government is currently implementing its "Pearl River Clean up Scheme", but it will be some years before this has any measurable effect on Hong Kong waters.

Since the nutrient levels in Deep Bay, North Western and Southern Water Control Zones are strongly influenced by pollution discharges from neighbouring regions, and will remain high by the year 2030, further efforts between the Government and the Shenzhen Government/Guangdong Provincial Government should be made to resolve the cross-boundary pollution issues.

The following specific projects should be implemented in order to ensure compliance with WQOs:

- The implementation of HATS stages 2A and 2B;
- High-level treatment at Pillar Point Sewage Treatment Works and the planned San Wai works; and
- Urgent provision of sewage sludge treatment facilities (e.g. incineration) given the increase in sludge from the planned increase in secondary treatment capacity, particularly in the second stage of the HATS.

## Waste Management

While infrastructure can be constructed to provide sufficient waste collection, treatment and disposal for existing and future demand, it does not really look after the sustainability side of waste management. This is because Hong Kong's waste management infrastructure is predominantly disposal-led and is not designed to enhance waste avoidance, reuse and recycling. However, future infrastructure and policy may go some way to addressing this.

It is notoriously difficult to accurately predict future waste volume. Most models use GDP and other economic performance indicators, but these approaches fail to account for changes in behaviour.

However, changing behaviour is exactly the goal of Hong Kong's most recent Policy Framework which includes the following targets for waste reduction and recycling.

- Target 1: Reduce the amount of MSW generated in Hong Kong by 1 per cent per annum (based on 2003 levels) up to 2014.
- Target 2: Increase the overall recovery rate of MSW to 45 per cent by 2009 and 50 per cent by 2014.
- Target 3: Reduce the total MSW disposed of in landfills to less than 25 per cent by 2014.

Achieving these targets should not be too difficult, as they have not been set particularly high. The resulting impact on total future waste production will be positive but not very significant, given that they apply only to MSW. They do not apply to construction waste, which accounts for almost 85 per cent of solid waste produced in Hong Kong.

The future of waste management in Hong Kong over the next decade is laid down in the Government's Policy Framework 2005-2014 which outlines the new infrastructure developments needed.

One of these is EcoPark in Tuen Mun Area 38, which will provide affordable, long-term rental space exclusively for the recycling and environmental industries. Estimates suggest that a fully developed EcoPark could divert up to 800,000 tonnes per year of recyclable materials away from landfill sites. Phase II of EcoPark should be advanced from 2009 as early as possible to provide a greater area for the recycling industry. Since Phase II area is currently occupied by part of the Tuen Mun Area 38 fill bank, the removal of this fill bank is required as early as possible.

A study on the Extension of Existing Landfills and Identification of Potential New Waste Disposal Sites was completed in 2003 and recommended the extension of the three strategic landfills to create up to 40 Mm<sup>3</sup> of additional capacity between 2012 and 2014. Sufficient landfill capacity should be provided for receiving the residual waste from treatment and recycling facilities.

A new HK\$800 million refuse transfer station in Southeast Kowloon is now being planned. With a tentative completion date of 2014, it will cost HK\$90 million to operate, or HK\$82 per tonne of waste. Accordingly, the Northern New Territories refuse transfer station, proposed in the WDP, now looks unlikely to be required.

The Chemical Waste Treatment Centre is being upgraded to meet more stringent emissions controls. Although the overall capacity of 100,000 tonnes per year will remain unchanged as the annual throughput is only 37,400 tonnes, additional facilities will be installed to treat clinical waste.

The most controversial component of future infrastructure plans is the concept of Integrated Waste Management Facilities (IWMF) capable of a minimum treatment capacity of 3,600 tonnes per day. Designed to use multiple technologies comprising

biological treatment, mechanical sorting and recycling, the inclusion of incineration as part of the IWMF scheme seems guaranteed to generate controversy and public concern, particularly over where the incinerators would be located.

It has not yet been decided whether the IWMF will be a single-site facility or if different components will be located in different districts. Given the need to gain public consensus on the incineration component(s), the suggested commissioning date of 2014 is perhaps rather optimistic. Further studies for the proposed IWMF, including the incineration component, should commence as soon as possible.

There is one other area of waste management that should receive attention - the need for thermal treatment of water treatment/sewage sludge/screenings and animal carcasses. Developed countries are moving to ban

organic content in landfills and therefore alternative treatment options for sludge and carcasses are required urgently.

Hong Kong also needs appropriate infrastructure for the management of construction and demolition waste. Despite the introduction of the Construction Waste Disposal Charging Scheme, the quantities of construction waste generated in Hong Kong are huge. With ongoing plans for urban redevelopment, this will only increase. Since construction waste is the largest single component of the solid waste generated in Hong Kong, further measures for its reuse and recycling must be implemented as soon as possible.

Regular reporting of progress towards the targets set in the Policy Framework would be useful, since these are appropriate to use as KPIs for waste management policy.



## Noise Reduction

As the population increases, traffic and its associated noise is also increasing. The EPD has received an average of 400 noise complaints a year for the last five years. Public concerns over road traffic noise are also rising as more residents expect to live in a quieter environment.

Although noise reduction measures have already been implemented and there are plans for future noise reduction, there are still a large number of residents living in a noisy environment and this number is likely to increase at a faster rate than future noise reduction measures can be implemented.

While road traffic noise problems are generally less severe in some countries or regions, the noise situation in Hong Kong is on a par with others, notwithstanding the fact that the density of development in Hong Kong is much higher than that in other places.

The Government has been proactive in tackling road traffic noise, including the implementation of the noise abatement programmes, to benefit about 950,000 people. Nevertheless, there is still a large population living in noisy environments.

The Third Comprehensive Transport Study completed in 1999 indicated that if the growth of traffic was not restrained, the population exposed to excessive road traffic noise would increase by 50 per cent. The latest review also revealed that there would be a 10 per cent increase in the population exposed to excessive road traffic noise by 2015.

Advanced technologies can help in reducing traffic noise exposure. Many countries are developing new technologies to produce quieter vehicles, such as electrically powered cars. Noise levels would no doubt drop if such technologies were adopted.

Controlling noise at source – actually making vehicles quieter – is another viable option and to some extent it is already happening. New bus franchises are now required to adopt commercially available technologies and products specified by the Commissioner for Transport to reduce noise emissions. The Government has also undertaken a study to look into the feasibility of controlling noise from in-use vehicles.

Rail infrastructure and mass transport system development should be given higher priority as a means of reducing road traffic noise at sensitive receiver locations.

The EPD is also undertaking a review of the night time road traffic noise criteria adopted in overseas countries. If more stringent standards for night time periods were implemented in Hong Kong, the noise environment could be further improved.

In order to improve the current situation, more resources should be allocated from various Government departments to tackle road traffic noise. A target for reducing the percentage of population exposed to excessive traffic noise should be set. While the implementation programmes of both retrofit projects and low noise resurfacing projects should be fast-tracked to meet public needs.







# Information

Chapter 4

Meeting the Challenge of the 21st Century

# Introduction


For nearly a decade, Hong Kong has been working towards the goal of being a leading digital city in a globally connected world. Driven by the Digital 21 Strategy set out by the Government in 1998, there has been significant progress.

Today Hong Kong has one of the world's most sophisticated information and telecommunications infrastructures. For example, fixed line penetration is high with 92 lines for every 100 households or 54 per cent by population. Mobile penetration is even higher at 8.8 million subscribers or 127 per cent by population. Broadband usage, at around 66 per cent of households, is among the highest in the world and the Internet Protocol Television market, thought to be the world's most mature, now comprises 700,000 subscribers or 30 per cent of all Hong Kong households.

In addition, the development of the Hong Kong Science Park and Cyberport have created strategic hubs that bring together high-technology, Information and Communications Technology (ICT) companies and professional talent from all over the world, further fuelling Hong Kong's progress.

Hong Kong is already recognised internationally as one of the top cities in the world in terms of e-Government and initiatives to improve the public services – such as a one-stop portal for electronic services and e-procurement pilot projects – and these are keeping the city at the forefront of developments.





However, maintaining this healthy picture is tricky. The ever-changing global economic background, the rapid pace of technological development and the advances in other regional cities – such as Singapore, Taipei, Shanghai and nearby Guangzhou – makes maintaining Hong Kong's position as a world digital city and an innovation gateway or hub with Mainland China a constant challenge. One of the biggest challenges is identifying exactly where Hong Kong should focus its information technology (IT) infrastructure development efforts.

This report is by no means exhaustive. However, in this Chapter you will find four priority areas which the HKIE believes deserve the attention and investment of the Government and the private sector alike. They include: Mobile Wireless Communication Technology, Digital Information Infrastructure, Human Resources Infrastructure and Working with Mainland China.

This Chapter also contains insights on some of the most promising and potentially disruptive emerging technologies and recommendations for managing one of Hong Kong's valuable technological assets – the radio frequency spectrum.

Taken together, this Chapter will provide a graded snapshot of today's situation in terms of information infrastructure development, as well as guidance on how to ensure that Hong Kong continues to be a technological leader, support a vibrant economy and deliver the digital quality of life that 21<sup>st</sup> century citizens demand and expect.

With a relatively high standard of living, small local market size and lack of natural resources, Hong Kong relies heavily on technology – particularly information technology – to maintain its status as one of the world's most competitive cities.

Keeping pace with ICT developments is therefore a matter of survival – to help Hong Kong adapt to changing business and economic situations, communicate globally and increase business efficiency and productivity. This in turn offers new opportunities for applications and services meeting business needs and demands. For example, in the telecom arena the move to convergence has created what we now call triple-play – delivering voice, data and TV services over the same broadband connections.

As a professional ICT industry body, the HKIE is committed to contributing to the future development of ICT in Hong Kong and we have a number of recommendations designed to maximise Hong Kong's position as one of the most competitive digital cities while meeting the challenges ahead and seizing new opportunities.

# The State of Present Infrastructure

## Mobile Wireless Communication Technology

If communications is the backbone of the economic development, then *spectrum* – the electromagnetic medium through which everything from voice to video and data travels – is the rocket fuel that will power the next wave of technological innovations and the economic opportunities they bring.

This makes the regulatory framework for spectrum management a key factor for any city that wishes to keep pace with the dramatic and potentially disruptive changes in technology and spectrum use that are occurring almost daily.

The Government recently took the bold step of merging the Broadcasting Authority and Telecommunications Authority into a unified regulator known as the Communications Authority. This move was in line with international trends and facilitates the efficient, effective and coordinated regulation of a converging electronic communications sector.



The HKIE fully supports this development and recommends that the Government play a more proactive role in strengthening Hong Kong's leading position as a telecommunications and broadcasting hub. There are a number of areas where it should focus, including:

- Identifying the best spectrum management framework for Hong Kong;
- Fostering a conducive environment for development of new technologies and business opportunities; and
- Promoting communication infrastructure construction and emergence of new wireless services.

These and other key areas are the subject of in-depth discussion in this Chapter.

### *Identifying the Best Spectrum Management Framework for Hong Kong*

Spectrum is a finite natural resource. It underpins the operation of all forms of broadcasting, fixed and wireless telecommunications as well as essential services such as defense, transport, emergency services and healthcare. New and innovative technologies that make more efficient use of this valuable resource benefit both consumers (with the introduction of new services) and the economy.

For the last decade, most geographies have relied on the centralised "command and control" (C&C) approach, with a spectrum manager making decisions. However, as rapid technological advancements and dynamic market developments cause demand to exceed supply, "C&C" can hold back development. A responsive and transparent

spectrum management policy is therefore needed to enable the community to reap maximum benefits from deployment of the spectrum.

Many countries, including the US, UK, Canada, New Zealand and Australia have decided to take the market-based approach for their spectrum management. This approach is more effective when competing commercial demands for spectrum and market forces lead to the most valuable use of the spectrum. Hong Kong has also explored this approach with the Office of the Telecommunications Authority (OFTA) holding one auction – namely that for 3G licenses – in which bidders paid the maximum of a fixed reserve price or a percentage of network turnover. However, more work needs to be done in order to ensure the efficient and effective use of the spectrum which, in turn, facilitates the emergence of new technologies and services to the market.

Accordingly, the HKIE recommends that the Government focuses on identifying the best spectrum management framework for Hong Kong and commissions professional bodies, or universities to conduct the study. They should bear in mind the following important considerations:

- Strengthening Hong Kong's strategic position as a world city and the gateway between the Mainland and the world by facilitating the provision of key services in Hong Kong which are deployed, or will be deployed, globally or in the Mainland. Examples include 3G and Time Division Synchronous Code Division Multiple Access services to facilitate voice and data roaming services for the large number of Mainland business visitors and tourists.
- Facilitating the most economically and socially efficient use of spectrum.
- Facilitating the introduction of advanced and innovative communications services while preserving national and homeland security, enabling public safety, and encouraging scientific research.
- Clarifying spectrum allocation and assignment procedures to encourage investment by the industry.
- Developing the means to address the spectrum needs of critical governmental missions.



### *Spectrum Allocation Planning for New and Emerging Technologies*

There are a number of emerging technologies - such as WiMAX and Ultra-Wideband (UWB) - that are expected to be widely adopted. However, like all wireless technologies, they will require radio spectrum.

The successful deployment of these new solutions will require the Government to be more responsive when it comes to spectrum regulation policies, and take early steps to accommodate promising future technologies, such as dynamic spectrum allocation and mesh wireless networks – that offer tremendous potential.

There are challenges, such as balancing the interests and investments of existing license holders, but this is not new. The award of 2G licenses had an impact on fixed line operators, and the award of 3G licenses impacted 2G players. However, Hong Kong as a whole has benefited. The investors in new technologies such as WiMAX will have to take the risk of future obsolescences – it is not a government responsibility to regulate to allow for return on investment.

### *Fostering New Technologies and Business Opportunities*

New technologies and innovations – such as WiMAX, UWB, wireless mesh, cognitive radio – are continuously creating new types of applications and services. The Government can help by creating an environment where new technologies and new business opportunities can flourish.

Hong Kong should also strengthen its position as an innovation gateway hub to export its own research and development (R&D) output, exchange innovation between Mainland China and other countries, which will in turn create more business opportunities for all three parties.

### *Promoting an Effective R&D Environment*

Research and developments in ICT has a major impact on many industries and the economy as a whole. In Hong Kong most of the R&D work is done by universities, but Hong Kong has yet to successfully establish any significant “brand-recognition” for its R&D output.

Governments in other countries make significant R&D investments. For example, the European Union has plans to invest over € 9 billion in research on information and communications technologies. Closer to home, the Government in Taiwan has allocated US\$112 million for the public and private sector funded M-Taiwan programme that is implementing the “TW-WiMAX Blueprint” and intends to invest up to US\$1.2 billion by 2008 on a comprehensive wireless broadband mobile communication network and environment.

Trial spectrum has also been provided to international and local WiMAX players to speed up the deployment of new technologies.

The Government promotes cooperation between the universities and the private sector and provides some R&D funds. However this could be boosted by strengthening links between telecommunication service providers, universities and R&D centres.

As an international trade and financial centre, Hong Kong is a gateway for business between Mainland and overseas and is well placed to foster technological cooperation. Hong Kong could also use its advantage to strengthen its position as an innovation gateway hub.

However, commercialising R&D means targeting the global market. The Government could assist that process by:

- Helping local R&D centres to more actively explore opportunities for cooperation, technology exchange and transfer;
- Identifying and lining up overseas partners for cooperation with the local R&D centres and universities; and
- Establishing and promoting the image of Hong Kong as a mature R&D output centre.

At the same time, Hong Kong's ICT industry should continue to strengthen its strong capabilities in the integration and application of systems and technologies.

### *Promoting Construction of Communication Infrastructure and New Wireless Services*

As people increasingly rely on ICT at home and at work, meeting the demand for frequencies and usage is a challenge that the Government cannot ignore. It is therefore essential that the Government promotes communication infrastructure construction and the emergence of new wireless services.

The HKIE's advice on this issue is threefold. We believe that the Government should:

- Coordinate with network operators to create a truly wireless city where ICT networks can be accessed anytime, anywhere;
- Consider opening up more license-exempted bands to facilitate the emergence of new wireless mobile services; and
- Set up a Government Radio Network (GRN) as an inter-operable communications platform for disciplined forces and Government agencies to achieve greater efficiency and better coordination, especially in the course of emergency situations.

Let's review these recommendations in depth.

#### • **Creating a Truly Wireless City**

By 2006, some 743 wireless access points had been registered with OFTA. However, to create a truly wireless city, the Government must play a coordinating role to avoid unhealthy competition amongst network operators. It could, for example, contract different companies to build the wireless system in different areas, and it could start with WiFi hot spots to cover the Government premises, MTR/KCR stations and major shopping malls.

Take Taiwan as an example. When Taipei set up its wireless infrastructure, the Government took on a coordinating role and assigned different companies to build the wireless system in different areas: State-run Chunghwa Telecom Co (中華電信) covers the general Hsinyi District, and Qware Systems Inc (安源資訊) is in charge of Mass Rapid Transit stations.

By making Hong Kong a truly wireless city, the Government can utilise many exciting applications. For example, the advances in wireless sensor networks (WSNs) has opened up new opportunities in the healthcare system. The future will see the integration of abundant existing specialised medical technology with pervasive, WSNs.

WSNs extend healthcare from the traditional clinic or hospital setting to the patient's home, movement, and his/her daily activity. As the world's population ages, those suffering from diseases afflicting the elderly will increase. With a smart wireless healthcare system, the WSN collects data automatically according to a physician's specifications, removing some of the cognitive burden from the patient and providing a continuous record to assist diagnosis. This will significantly reduce the cost and inconvenience of regular visits to the physician.



- **License-exempted Bands for New Wireless Mobile Services**

License-exempted spectrum can be exploited for the development of future useful wireless spectrum applications such as WiFi networks. For example in airports, it can be used for short range communications such as making payments or linking up devices such as communicators and laptops. Evidence from overseas shows that in places where license-exempted operations are allowed, individual bandwidth use has increased and a wide range of innovative services based on standards such as WiFi and Bluetooth are being provided. It is therefore recommended that the Government consider opening up more license-exempted bands to support the emergence of new wireless mobile services and business opportunities.

- **Government Radio Network**

The downside of growing public and commercial demand for mobile and wireless communications is that it can lead to radio spectrum congestion and cross-network interference. This has many implications, particularly for emergency situations. Accordingly, a dedicated radio communication network for Government agencies is desirable.

A GRN is a system of interconnected repeater sites – mobile, portable and static radio transceivers – used by Governments for radio communications. Frequencies are allocated dynamically to each “talk group” (group of connected radios) as required and are only activated in areas (“cells”) which contain radios belonging to that “talk group”.

A single government radio infrastructure would provide the following benefits:

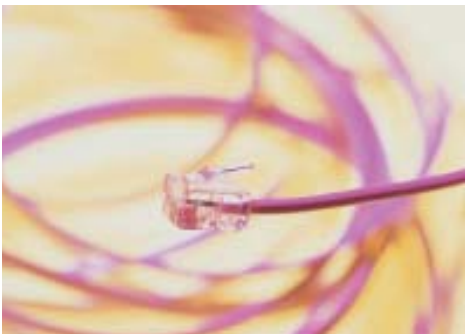
- Quicker and easier communications;
- Faster message delivery time and improvement in emergency services response times;
- Network coverage usually significantly greater than that provided by commercial providers;
- Handle significantly greater communication loads compared to individual agency networks;
- Enable inter-agency personnel to communicate at and around major accident scenes; and
- Emergency call features when placed in a life-threatening situation.

## Digital Information

Hong Kong is more than a world city. For more than a century, it has been a telecommunications hub connecting the world. Today, Hong Kong has one of the largest external communications capacities in the Asia Pacific, with more than 1,100 Gigabytes per second via fibre-optic cable and satellite communication links. Internally, the digital information infrastructure is one of the best in the world.

However, as the Taiwan earthquake in December 2006 demonstrated so graphically, there is room for improvement in infrastructure and the business environment such as:

- Strengthening contingency planning for critical infrastructure;
- Creating a more conducive business environment; and
- Implementing electronic operations by the Government and non-governmental organisations.



### *Contingency Planning*

The 2006 Taiwan earthquake had a significant impact on Hong Kong's telecom and internet traffic. The productivity lost due to damaged telecom cables was substantial, and so was the impact on Hong Kong's reputation as a telecommunications hub.

The Taiwan earthquake revealed that there has not been sufficient regulation of the measures operators should provide when disasters occur and there is a clear need to strengthen contingency planning for Hong Kong's critical information infrastructure.

Accordingly, the Government must consider how the construction of strategic information infrastructure should be sponsored. Whether done in whole or in part by the Government, it would allow operators to build on the platform and better serve the information needs of Hong Kong.

Looking specifically at the Taiwan earthquake, it seems clear that the Hong Kong is better advised to look Northward to Mainland China as an alternative to the traditional East/West undersea cables.

### *Creating a Conducive ICT Business Environment*

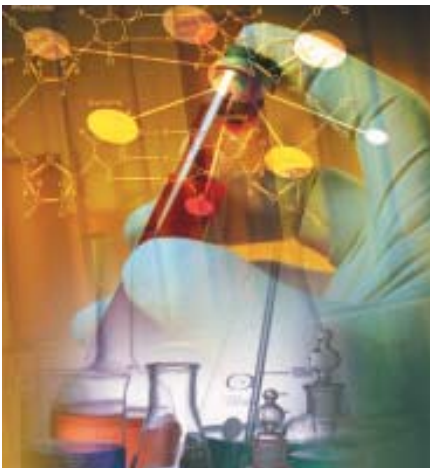
Compared with other disciplines such as engineering, IT projects have very high failure rates. Many reasons are given for this, including a lack of recognised standards and practices, issues in project and contractual management and problems in procurement process, but the need for improvement is undisputed.

Hong Kong is well placed to influence the development of a more favourable business environment for the industry. Since it outsources over 90 per cent of its IT projects to

external contractors, it can spur the adoption of best practices as part of the bidding process.

Project management is one of the key factors in successful IT projects and the Office of the Government Chief Information Office (OGCIO) is strengthening the training of user managers. The success ratio of IT projects could also be improved by employing qualified IT professionals to manage and deliver these projects.

In addition, cost management, milestone tracking, quality management, communications, procurement and risk management are key factors to successful IT project management. The Government should promote and recognise these skillsets as an integral part of project management training and as prerequisites in IT project outsourcing.



### *Conditions of Contract and Assessment Practices*

Successful IT projects begin with a well-prepared contract that balances risks between the customer and vendor. The Government follows this approach in the field of construction where, as the largest employer in the industry, it shares most of the risks.

Taking that lead, a task force involving the contractors, professional bodies and Government departments could be set up to standardise and continuously review the conditions of contracts. This has been successful in other disciplines and countries and proven feasible and accepted by the industry.

There are a number of factors that require thorough scrutiny:

### **Measurement**

There is no standard measure for the value of IT projects or work done. It would be useful for the Government to work with academia and the IT industry to develop methods of gauging the size, scope and resource requirements of IT projects and determine their total cost.

### Quality

Lack of specified quality requirements for IT projects in tenders sometimes lead users to reject a system they feel does not meet their expectations. It is important that the Government work with the industry to develop measurable quality standards to facilitate project delivery by contractors and system acceptance by users.

### Consistency

There is a lack of consistency in the level of detail contained in Government tender specifications. The scope of functional specifications for budgeting purposes should be defined better, taking industry practices into account.

### Standards and Practices

To minimise discrepancies in expectations and disputes, a set of standards and practices commonly adopted by the Government and industry should be devised and followed.

### Change Procedures

In IT projects, changes are usually dealt with administratively by a Project Steering Committee. The Government should consider introducing change management mechanisms in the conditions of contract for IT contracts, similar to those adopted in engineering works contracts.

### Flexible Assessment

As technology advances, counter-proposals are sometimes unavoidable. A suitable mechanism should be devised to handle the alternatives submitted by contractors.

Finally, given the importance of the quality of IT projects, in the procurement exercise, emphasis should be placed on service and product quality to minimise the disadvantages of a "lowest bid wins" situation.

### *Opening up Intellectual Property (IP) Rights in Government Projects*

Hong Kong is a small but dynamic ICT market and local firms naturally look overseas for opportunities. For instance, Hong Kong is a leader in terms of the implementation of e-Government and e-Public services and many such projects and systems could be successfully marketed and replicated overseas. However, such moves have been hindered by the fact that the ownership of the IP rights developed for Government IT systems are vested in the Government.

In 2006 the Government launched a three-year pilot scheme to open up IP rights ownership in new Government IT systems, vesting the IP rights in the contractor that developed the system. This is an encouraging initiative that provides the local IT industry with the opportunity to showcase its capabilities with its made-in-Hong-Kong products and services and will undoubtedly help the growth and expansion of the industry both locally and overseas.

However, IP typically has a short shelf life. To grasp the opportunity, the Government should implement the scheme and further strengthen Hong Kong's position as a premier ICT hub in the region.

### *Electronic Operations for Government*

The Government has successfully implemented numerous “e-Government” services which are recognised internationally. To streamline the entire service provision processes and enhance efficiency and productivity, internal processing should also be electronic rather than paper-based.

Accordingly, the Government should migrate its internal processes electronically as far as possible to match the external e-Public services which are 100 per cent electronic already, and adopt electronic record keeping and filing for archival retention. It should also encourage quasi-government and non-governmental organisations to join the initiative by providing incentives such as subsidies on the electronic migration.

Additionally, it is also recommended that the Government further promotes and reinforces the importance of information security message.

### *Further Promoting the Application of Existing Technologies to Improve Future Living*

If we can further exploit the application of existing technologies in an astute or innovative manner, the benefits to our future living standards could be beyond expectations. One example is the application of information technology in the healthcare industry. While Hong Kong already has an “E-Health Consortium” initiative in place, further exploration of the use of IT in healthcare such as the forming of an all-area coverage wireless network, should be encouraged.

We recommend the Government further promote and encourage the application of existing technologies in various aspects of our life such as healthcare, with a view to further improving the future living standards of our citizens.

## Human Resources

Hong Kong’s position as a leading world digital city depends on a strong, professional ICT workforce. Equally important is a community that can understand the benefits of ICT and is willing to adopt technologies to bring new competitive advantages to businesses to further advance Hong Kong’s ambitions as a knowledge-based society.

Reconciling these two sides of the ICT picture requires a mixture of initiatives executed in parallel, pioneered by the Government and supported by the industry. They include the following ideas, which are discussed in depth below:

- Heightening the status and professionalism of IT personnel in Hong Kong;
- Raising public awareness and understanding of ICT; and
- Strengthening IT training and encouraging continuing professional development.

### *Heightening Professionalism and Status of IT Personnel in Hong Kong*

In a real sense, ICT professionals are the architects of Hong Kong’s position as a digital hub in Asia. Nevertheless, ICT has not generally been regarded as highly as other engineering disciplines.

A major reason may be that ICT has not been viewed as professional and has lacked recognised standards and practices. To resolve this problem and attract new talent, ICT must be “professionalised” and new standards and practices adopted and enforced. This will go a long way in boosting the status of ICT personnel and bring other more tangible benefits, such as reducing the percentage of ICT project failures.

A number of industrial and professional bodies in Hong Kong are already advocating increased professionalism in the IT industry.



Providing a progressive path for IT engineers, the HKIE promotes IT professionalism by setting standards in training and education, accreditation and qualifying IT professionals as professional engineers. The Engineers Registration Board currently accepts the HKIE Corporate Membership in the Information Discipline or equivalent as a recognised professional qualification for registration under the Engineers Registration Ordinance.

The HKIE is now chairing a task force on “Professional Qualifications for IT Practitioners” which has representations from 14 IT organisations and societies. In 2002 it signed a Reciprocal Recognition Agreement on professional qualifications with the British Computer Society and another with the Hong Kong Computer Society in 2005. The Corporate Membership of the HKIE (Information Discipline) and Full Member of the Hong Kong Computer Society are now recognised as substantially equivalent.

Work remains to be done to professionalise the industry. Engineering practices such as standards, codes of practice, standard terms and conditions of work should be developed and promoted. And focus should be placed on raising the standards and practices to at least be on par with other engineering disciplines.

The support of the Government in the recognition and promotion of ICT professionalism is also critical, and it should lead by example. The OGCIO itself should join professional bodies such as the HKIE and obtain relevant ICT professional qualifications, and coincidentally create a team of strong and qualified IT professionals to manage IT Government projects.

Joining professional bodies will keep the Government abreast of the latest industry developments and participating in the development of standards and best practices in the industry may also lead to fewer disputes between contractors and the Government on IT projects. Serious disputes could be dealt with by an HKIE-led panel with representatives from both the Government and the industry and resolutions used as a reference to follow in any similar cases in future.

### *Raising Public Awareness and Understanding of ICT*

While the Government has implemented a range of ICT initiatives as part of its Digital 21 Strategy – including the Science Park, Cyberport and the hosting of ITU 2006 – the general public does not have a good picture of the overall vision and the plans for the development of Hong Kong's ICT.

Since community commitment is important, especially when it comes to adoption of new technologies, it is a good idea for the Government to step up awareness building initiatives to promote knowledge and understanding of ICT in all segments of society. The goal of this activity should be to:

- Increase the community's awareness of ICT's role in maintaining Hong Kong's competitive edge;
- Encourage business and the community to exploit the potential business and social benefits that ICT can offer; and
- Attract more talented people to join the ICT industry.

### *Strengthening IT Training and Encouraging Continuing Professional Development*

The pace of change in the IT industry is phenomenal, with whole bodies of knowledge supplanted by new technologies that appear almost daily. Therefore it is essential that the ICT workforce keep up-to-date through continuing professional education or lifelong learning.

The Hong Kong Computer Society has recently launched the first IT Professional Certification scheme in Hong Kong. This is an encouraging start and hopefully the Government will lead by example by supporting IT staff that wish to obtain the qualifications. In time, the industry should follow suit.

However, to build for the future, you need a firm foundation. That means that the Government must strengthen IT training in primary, secondary and tertiary education. Universities and tertiary institutions are also the cradle of many of our future ICT professionals. The Government should support these educational institutions in reforming and steering their ICT programmes in the right direction, meeting academic requirements and the needs of the industry and market.

## Working with Mainland China

Over the years, the Central Government of the People's Republic of China has invested huge amounts in the technological development of the country. Hong Kong, as an international trade and financial centre, and due to its geographical proximity, has become an effective gateway for overseas companies to tap into the Mainland market and for Mainland enterprises to expand abroad. Hong Kong is therefore well placed to foster technological cooperation between the Mainland and overseas corporations.

In its recently released National 11<sup>th</sup> Five-year Plan – which for the first time included Hong Kong – the Central Government set out a clear objective of strengthening innovation and upgrading the technology capability of industries. Hong Kong should take this golden opportunity to support the technological growth of Mainland China and enhance its position as the innovation gateway hub between the Mainland and the rest of the world.

To help companies in Hong Kong understand what they can do to realise these opportunities, a task force should be set up to define key action items for the ICT industry to support and benefit from the latest Five-year Plan.

The HKIE is prepared to provide a forum for this task force, so that representatives from the industry, stakeholders, professional bodies and academia can contribute in the discussions.



# Key Issues and Recommendations

As a professional ICT industry body, the HKIE is committed to the future of ICT in Hong Kong. The following issues and recommendations are designed to maximise Hong Kong's position as one of the most competitive digital cities while meeting the challenges ahead.

## Mobile Wireless Communication Technology

The HKIE recommends that the Government play a more proactive role in strengthening Hong Kong's leading position as a telecommunications and broadcasting hub. There are a number of areas it should focus on, including:

- Identifying the best spectrum management framework for Hong Kong;
- Fostering a conducive environment for the development of new technologies and business opportunities; and
- Promoting communication infrastructure construction and the emergence of new wireless services.

New technologies and innovations – such as WiMAX, UWB, wireless mesh, cognitive radio – are continuously creating new types of applications and services. The Government can help by creating an environment where new technologies and new business opportunities can flourish.

Overseas experience shows that in places where license-exempted operations are allowed, individual bandwidth use has increased and a wide range of innovative services based on standards such as WiFi and Bluetooth are springing up. The Government should consider opening up more license-exempted bands to support the emergence of new wireless mobile services and business opportunities.

Hong Kong should also strengthen its position as an innovation gateway hub to export its own R&D output and exchange innovation between Mainland China and other countries, which will in turn create more business opportunities for all three parties.

#### *Promoting an Effective R&D Environment*

Research and development in ICT has had a major impact on many industries and the economy as a whole. However, commercialising R&D means targeting the global market.

The Government can assist that process by:

- Helping local R&D centres to more actively explore opportunities for cooperation, technology exchange and transfer.

- Identifying and lining up overseas partners for cooperation with the local R&D centres and universities.
- Establishing and promoting the image of Hong Kong as a mature R&D output center.
- The Taiwan earthquake of December 2006 demonstrated there is room for infrastructure improvement including, strengthening contingency planning for critical infrastructure. Hong Kong should also look Northward to Mainland China as an alternative to the traditional East/West undersea cables.





- The Government must consider how the construction of strategic information infrastructure should be sponsored, whether in whole or in part, so that operators might build on this strategic platform to better serve the information needs of Hong Kong.
- IT projects have high failure rates for a number of reasons including a lack of recognised standards and practices, issues in project and contractual management and problems in procurement processes. There is a clear need for improvement in all of these areas.
- Cost management, milestone tracking, quality management, communications, procurement and risk management are key factors to successful IT project management. The Government should promote and recognise these skillsets as an integral part of project management training and as prerequisites in IT project outsourcing.
- In 2006 the Government launched a pilot scheme to open up IP rights ownership in new Government IT systems, vesting the IP rights in the contractor that developed the system. Since IP typically has a short shelf life, the Government should implement the scheme and further strengthen Hong Kong's position as a premier ICT hub in the region.

## Digital Information

### *Electronic Operations for Government*

- The Government has successfully implemented numerous public “e-Government” services which are recognised internationally. The Government should migrate its internal processes electronically as far as possible and adopt electronic record keeping and filing for archival retention. The Government should also encourage quasi-government and non-governmental organisations to join the initiative.
- Additionally, it is also recommended that the Government further promotes and reinforces the importance of the information security message.

### *Further Promoting the Application of Existing Technologies to Improve Future Living*

- The Government should further promote and encourage the application of existing technologies in various important aspects of our lives such as healthcare, with a view to further enhancing the future living standards of our citizens.



## Human Resources

### *Heightening the Professionalism and Status of IT Personnel in Hong Kong*

- ICT must be “professionalised” and new standards and practices adopted and enforced, to boost the status of ICT personnel and bring other tangible benefits such as reducing the percentage of ICT project failures.
- Focus should be placed on raising ICT standards and practices to at least be on par with other engineering disciplines.
- The Government should lead by example. The OGCIO should join professional bodies such as HKIE and obtain relevant ICT professional qualifications. This will also create a team of strong and qualified IT professionals to manage Government IT projects.

### *Raising Public Awareness and Understanding of ICT*

- The general public does not have a good picture of the overall vision and the plans for the development of Hong Kong's ICT. Therefore the Government should step up awareness-building initiatives to promote knowledge and understanding of ICT in all segments of society.

### *Strengthening IT Training and Encouraging Continuing Professional Development*

- It is essential that the ICT workforce is kept up-to-date through continuing professional education or lifelong learning. The Government must strengthen IT training in primary, secondary and tertiary education.

## Working with Mainland China

- Hong Kong is well placed to foster technological cooperation between the Mainland and overseas corporations. Hong Kong should take the opportunity to support the technological growth of Mainland China and enhance its position as the innovation gateway hub between the Mainland and the rest of the world.
- To help companies in Hong Kong understand what they can do to realise these opportunities, a task force should be set up to define key action items for the ICT industry to support and benefit from the latest Five-year Plan. The HKIE is happy to provide a forum for this task force so representatives from the industry, stakeholders, professional bodies and academia can contribute in the discussions.





Chapter 5

# Transport

The Way Ahead

# Introduction

Tourist guidebooks can tell you a lot about a place. In Hong Kong's case, most of them begin with how easy it is to get around the city thanks to an excellent public transport network.

The picture they paint is fairly accurate. Hong Kong does enjoy a comprehensive and reliable transport system and it makes an important contribution to sustaining the economic growth and prosperity of the city.

The HKIE has examined the current state of transportation infrastructure in Hong Kong, reviewing a number of key areas including the ability for infrastructure to meet today's needs as well as future requirements. The result is a number of recommendations. They include ways to ensure that development of transportation infrastructure does not deplete the resources for future generations and will proceed in a sustainable and holistic manner, in balance with economic, social and environmental concerns.

Chief among these are the development of the rail network and better use of the road network as part of an Intelligent Transport System (ITS). Other ideas include promoting education and strengthening awareness of what sustainable development really means. Perhaps the most visionary concept is the idea of using transport as an instrument to tackle the problem of climate change.



# The State of Present Infrastructure

## Overview

Hong Kong is often described as a small and crowded place where the pace of life is fast. The transport infrastructure is responsible for part of that reputation. Hong Kong people rely heavily on the public transport systems for their daily travel. They are now making some 11 million journeys each day, of which 7.1 million trips are by bus, tram, mini-bus or taxi. Some 3.95 million rail trips are made each day on MTR, KCR and Light Rail Transit trains.

However, the population is expected to grow from the current level of approximately 7 million to 8.8 million by 2031, which has clear implications for the transportation infrastructure.

In the 1980s and 1990s, the Government placed a high priority on upgrading Hong Kong's overall infrastructure and has carried out many ambitious transport infrastructure development programmes including the Airport Core Programme (ACP) project as well as the development of the railway network. These projects have allowed Hong Kong to remain competitive despite a population explosion that has seen the number of people grow by 50 per cent in the last 30 years.

However, the picture is not uniformly bright. The expansion of the road network has not kept pace with the growth of traffic and average car journey speeds are declining. Between 2002 and 2005, they dropped by 7 per cent in urban areas and 9 per cent in the New Territories.

There are also other signs that the road network in the urban areas is under severe pressure and that the transport infrastructure in the New Territories cannot keep pace with development. There is also a lack of infrastructure for deployment of an ITS on the road network in Hong Kong, a situation where Hong Kong lags behind many other comparable cities.

Transport infrastructure is one of the arteries of a society. Good transport systems enhance productivity by reducing travel time, while unreliable networks can have direct costs both to the community and businesses because of reduced productivity. Continual investment and development of Hong Kong's transport infrastructure is therefore important to reduce congestion and enable Hong Kong to remain competitive.



Road Fast Facts	
Roads (total)	2,000 km
Hong Kong Island	436 km
Kowloon	449 km
New Territories	1,070 km
Registered vehicles	500,000
Tunnels	11
Bridges and flyovers	1,000
Subways	400

## Roads

Possessing one of the most challenging environments in which to design, build, operate and maintain a road network, Hong Kong has done very well. Despite having one of the highest vehicle densities in the world, it has one of the safest road systems compared with other major cities, due in a large part to the funds allocated annually by the Government for maintenance and improvements.

However the expansion of the road system is not keeping pace with the increasing vehicle numbers which is slowing average car journey speeds. There are other challenges as well, aging bridges, tunnels and pavements require increased maintenance, while the lack of an ITS means existing roads are not used as efficiently as they could.

### *Congestion an Increasing Problem*

Congestion is an increasing problem that can undermine confidence in the reliability of the road network in urban areas and access to our airport and seaport. And, looking further afield, Hong Kong is clearly in need of better links to neighbouring cities in the PRD and beyond, supported by convenient and efficient border crossings.

A closer examination of the vehicles on our roads offers valuable insight into who is using the roads and for what.

Certainly, the number of licensed motorised vehicles in Hong Kong has climbed slowly over the last decade, from 74.33 to 76.61 per 1,000 people, but these figures are still considerably lower than neighbouring cities. Vehicle densities in nearby Macau and Singapore are over 200 per 1,000 people and the figures for the UK and US are more than 500 and 700 respectively.



The fastest growing sector in the last decade has been motorcycles, which rose 5 per cent each year to reach 34,000 in 2005. Private cars grew just 2.1 per cent a year, but there are considerably more of them – 350,000 in 2005.

### *Growth in Goods Vehicles*

Significantly, the number of Light Goods Vehicles has dropped, from 96,000 in 1995 to 75,500 in 2005. This is partly a result of the reduction in small-scale manufacturing industries in Hong Kong. On the other hand, the number of Medium Goods Vehicles on the roads increased by 11 per cent during same period.

The biggest increase is in the number of Heavy Goods Vehicles (HGV), which has risen 91 per cent in the last decade, largely on the back of increasing cross-border traffic between Hong Kong and the Mainland resulting from China's rapid transformation into an international manufacturing hub.

This is an important finding because the rising number of HGV, including container vehicles, is putting increased pressure on existing highways. This is of particular concern because the original design specifications for performance attributes such as turning radii and weaving lengths may have been based on a lower proportion of HGV.

### *Maintaining the Infrastructure*

Hong Kong's Highways Department is quite strict when it comes to the design of roads, bridges and tunnels, as well as the provision of maintenance during their operational life. Unlike some developed countries, sufficient funds are made available annually to ensure that the infrastructure is adequately maintained. Moreover, the Government is exploring more innovative ways to keep things running smoothly.

One example is the Government's Maintenance, Operation, Management contract with a private operator for the Tsing Ma Control Area. The feedback has been very positive and, upon completion of Route 8 between Sha Tin and Tsing Yi in 2008, a similar control area will be established.

### *Safety First*

In spite of the increase in the number of vehicles using Hong Kong's roads the number of fatal accidents continues to fall. According to the 2006 Annual Transport Digest, over the past decade the number of fatal accidents each year has dropped by 40 per cent to 140. The number of serious traffic accidents has also dropped by about 18 per cent to 2,500 a year.

Hong Kong has a safety record of 22 fatal accidents per 1,000,000 population, compared well to many other cities, such as Kuala Lumpur (195), Bangkok (145), Auckland (71), Seoul (49), Singapore (46) and Greater London (29).

## Rail

For a city of Hong Kong's size and aspirations, the rail network is relatively small. Our trains run reliably, but not very far. And the network is not fully interconnected with other rail systems or other transportation options.

The RDS-2 commissioned by the Hong Kong Highways Department was completed in 2000. It recommended railway expansion schemes up to 2016 as well as a number of very-long-term railway options beyond 2016. Unfortunately, these projects have not commanded a high priority.

However, that is changing. Developing the rail system is one of the cornerstones of the Government's three-pronged policy on transport. And the importance of significantly extending the rail network is becoming clear. That includes not only expansion within Hong Kong but strategic links and connections to the Mainland that look beyond Guangdong and reach deeper into the southern China geographic area.

### *One of the World's Busiest Rail Systems*

While the existing rail network may be smaller than Hong Kong really needs, it is certainly very reliable, thanks to the high levels of maintenance conducted by both railway operators – the Mass Transit Railway Corporation (MTRC) and KCRC – which are presently engaged in merger talks.

The MTRC's 91 kilometre network of 53 stations is recognised as one of the world's busiest systems and carries more than 2.4 million passengers every day. The KCRC currently operates three railway lines and a Light Rail network between Yuen Long and Tuen Mun. Some of its 31 stations interchange with the MTRC network. There are plans for further development of the network including the Shatin-Central Link, a Northern Link, the South Island Line and an Express Rail Link to China.

Despite the reliability of Hong Kong's rail system, compared to other major cities such as Shanghai, Tokyo, or London, it is still too small to be used as the backbone of the Hong Kong's passenger transportation system.

### *The Cost of Development*

Both railway operators enjoy development rights above stations and depots which allows them to partially fund the cost of their railways from the development revenue. These developments are typically joint-ventures between the railway operators and local property developers and represent a form of Public-Private Participation (PPP).

This arrangement has meant Government funding of the railways can be reduced and also allows fares to be kept at an affordable level compared to other cities. For example, Hong Kong's minimum charge for the shortest distance travelled is HK\$4.0 while in Tokyo it is HK\$10 and in London it is HK\$45.



## Seaport Links

Hong Kong's success has always been based on two things – a fortunate geographical location at the foot of China and at the centre of Asia. Our position as a hub for trade, services and, increasingly, information, make international land, sea and air links critically important. And, as befits Hong Kong's status as Asia's World City, these gateways need to be world class and easily accessible. It is therefore vital for Hong Kong's future that these links are not unnecessarily constrained and that investments are made to ensure continued accessibility.

Hong Kong is home to one of the world's largest seaports. The development of the port is another example of the successful PPP approach that the Government has adopted to develop infrastructure in Hong Kong. The recent Container Terminal No. 9 project on Tsing Yi Island is a good example, with the land provided by the Government whilst the berth and port facilities were developed by business – the private sector port operators.

The main container port is located in Kwai Chung in West Kowloon. It has grown tremendously in the last 30 years and in the 1970s, the Lung Cheung/Ching Cheung Road was built to provide better access. This road has been expanded twice, from an original two-lane road to the present dual three-lane configuration. It is now part of Route 7, a trunk road linking Tseung Kwan O in the South Eastern New Territories to Kwai Chung in the West.

Road links to the rest of Hong Kong were improved after the completion of the West Kowloon Expressway which was part of the ACP works. Additional connections to the container terminals will come on-stream in 2009 when the Route 8 Network is completed and will provide additional connections, particularly for container traffic travelling to and from the Mainland and the Airport.

While Hong Kong's location has made the seaport a success, local weather conditions such as typhoons also cause problems. The road links to and from the container port often become congested when a storm is on the way as container vehicles flood in to use the back-up storage and parking areas.

Occasionally the effect of this congestion spreads to the road network beyond the immediate vicinity of the port area, although the Transport Department has contingency plans ready to mitigate the impact of the congestion and maintain the efficiency of the port.





## Airport Links

Propelled by steady regional and international economic expansion and the surging demand for air transport services, Hong Kong International Airport at Chek Lap Kok set new records in the financial year 2006/07. The airport handled more than 45 million passengers and 3.57 million tonnes of cargo, with 283,000 aircraft landing or taking off during the year.

### *New Infrastructure*

Before it could take over from the venerable but limited facility at Kai Tak, the new Chek Lap Kok airport needed a completely new transport infrastructure including road, rail and sea access – and it has them. Completed in 1997, five additional roads serve the new airport and its supporting community, including the North Lantau Highway, the Lantau Link, the Cheung Tsing Highway, the Tsing Kwai Highway and the West Kowloon Highway. They are aided by two tunnels, namely the Cheung Tsing Tunnel and the Western Harbour Crossing.

A purpose-built 34 kilometre rail link runs from Central all the way to Chek Lap Kok, and was recently extended to include the newly completed AsiaWorld-Expo conference and exhibition centre. Passengers enjoy world-class in-town check-in facilities at Hong Kong and Kowloon stations and dedicated trains run an express service from the airport to special stations in the urban areas where travellers can change to other forms of transport. The railway also provides a domestic service to Tung Chung new town, relieving the Nathan Road Corridor of the MTR, serving new developments on the West Kowloon Reclamation and providing a third cross-harbour rail link.

### *Threat from China*

While Hong Kong's airport is undoubtedly the most efficient in the region, the city's position as a logistics centre for China is under threat from the air and port developments on the Mainland. The key to success is ensuring that access for people and goods to and from the other cities in the PRD is faster and easier than Hong Kong's regional competitors.

The recently completed Deep Bay Link and Shenzhen Western Corridor, and the Route 8 Network which is expected to be completed in 2009 will undoubtedly improve links between the container port and the Mainland. However, to continue as the primary logistics centre in East Asia, Hong Kong really needs an additional road link to the "Airport Island". This would ensure that congestion along the North Lantau Highway does not affect the efficiency of the airport in terms of either people or cargo.



## Cross Boundary Links

In many ways, Hong Kong is what it is because of where it is – at the foot of China. Today Hong Kong is China's primary gateway for goods and services, visitors and investment. And, as our economy becomes ever more tightly linked, so must our transport systems.

The current cross-boundary links with the Mainland are at eight immigration control points, namely:

- Lo Wu Terminus (KCRC East Rail or "boundary train");
- Hung Hom Station (through train);
- Man Kam To Control Point;
- Lok Ma Chau Control Point;
- Sha Tau Kok Control Point;
- China Ferry Terminal;
- Macau Ferry Terminal; and
- Hong Kong International Airport.

Improvements are underway, at Lok Ma Chau with the arrival of the KCRC railway line from Sheung Shui. This will relieve pressure on the only railway crossing point at Lo Wu.

### *We are not Alone*

Hong Kong is not working alone. The Guangdong Government has plans to expand its road and rail infrastructures, adding more than 5,000 km of roads and 15 railway lines. The Hong Kong-Shenzhen Western Corridor route, which has just opened, connects the North-West New Territories to Shekou and will become the main crossing point for the Western part of the Hong Kong.

In addition to the three existing road crossings at Lok Ma Chau, Man Kam To and Sha Tau Kok, a further crossing point at Liantang/Heung Yuen Wai to the east of Man Kam To, is now being planned by Shenzhen authorities and the Government to facilitate the fast growing cross-boundary traffic.

On the rail front, the present Shenzhen railway network plan envisages a total of 15 lines, comprising three regional lines, eight sub-regional lines and four district lines, some of which are already in place or close to completion. The Shenzhen District Line 1 now connects with the KCRC East Rail at Lo Wu Station while the District Line 4 now being built will connect with the KCRC Spur Line at Lok Ma Chau.

### *Future Plans*

The new high-speed road and rail links such as the Hong Kong-Zhuhai-Macau Bridge and express cross-border rail links currently being planned will push the convenient 1-2 hour travel boundaries much further out, putting more places within easy reach of Hong Kong.

However, to accommodate the increasing amount of business between Hong Kong and the Mainland, it is clear that the present crossing points must be expanded. The question is which ones and by how much?

Hong Kong's future planning must take a strategic perspective which begins with an analysis of precisely how Hong Kong wants to engage with the Mainland. Only then can the appropriate number and type of cross border links be determined, designed and implemented.

## Sustainable Development and Climate Control

In simple terms, sustainable development in transport infrastructure means development that achieves an improved economic, social and environmental balance without depleting the resource of future generations. However, there is no standard way to achieve sustainable development. Every community's situation is unique.

There is no single point at which a community arrives at sustainability – it's a moving target that requires a community to continually learn about itself, its external influences and emerging opportunities.

### *A Three-pronged Approach*

Hong Kong's current three-pronged transport policy was developed into multi-faceted transport strategy in 1999. Entitled "Hong Kong Moving Ahead – A Transport Strategy for the Future", it is intended to provide a safe, efficient and reliable transport system to meet the economic, social and recreational needs of Hong Kong in an environmentally acceptable manner.

This three-pronged approach to sustainable transport development is sound in principle and similar policies are being promoted and adopted in major cities all over the world.

## Project Planning and Implementation

### *Environmental Impact*

Since the enactment of the Environmental Impact Assessment Ordinance in 1998, Environmental Impact Assessment (EIA) has become the key component of environmental planning and decision-making in Hong Kong. It concentrates on two goals:

- (1) Preventive reduction and mitigation of undesirable effects; and
- (2) Encouraging and seeking public participation in the planning and decision-making process before irrevocable decisions are made.

The principles of prevention and mitigation guide the EIA process. However, this “end-of-pipe” approach tends to focus on analysis and criticism rather than producing creative solutions.

### *Controlling Climate*

There are ways to measure sustainability, such as determining the Ecological Footprint of an activity. Sadly, humanity's total Ecological Footprint is more than 23 per cent larger than what the planet can cope with through regeneration. This overshoot must be addressed before the planet's ecological resources are depleted.

Emissions from transport systems are a significant and growing contributor to Hong Kong's overall greenhouse gas emissions. And the implications are not pleasant.

The recent Stern Report in the UK noted that carbon emissions which contribute to global climate change will have serious long-term economic impact, not to mention the social costs.

Transport can play an important role as part of a macro-economic response to the climate change challenge. It is essential, both from an economic and environmental perspective, that the environmental impacts of transport are fully reflected in decision-making.

### *Implementation is Important*

In recent years, the planning and implementation of projects has met many hurdles which are causing serious problems leading to delays in the availability of much needed infrastructure. Clearly, there is a gap between the project intention and the way the planning process actually works in practice. It is only recently that planners and decision-makers have come to a better understanding of the social consequences of projects and realise the inadequacies of the current process.

There is a clear need to relate the planning to the available input on resources and conceived output goals. This is a vital step if we are to integrate the financial, engineering, environmental and social aspects. It will improve the planning process by promoting rather than avoiding problem solving. We see the need for more coordinated efforts within the Government and the stakeholders in the whole process which should involve more consultation right at the inception of a project as well as at its various stages.

# Key Issues and Recommendations

To sustain Hong Kong's productivity and ensure continued economic success, the transport system must reflect the economic and social changes that are shaping the city's transport needs. To enable the system to deliver the right level of service, the HKIE proposes a number of recommendations in the following areas to facilitate the sustainable development of Hong Kong's transport system.

## Roads

### *Make Better Use of the Road Network with ITS*

Hong Kong is one of the few international cities that does not have an advanced IT infrastructure built into its road system. Therefore, we have not been able to deploy advanced technologies in transport management to make better and more sustainable use of our road system.

The lack of an ITS on Hong Kong's road network verges on embarrassing and puts Hong Kong years behind other major world cities. To increase the efficiency of our road network, a major effort must be mounted on the construction and installation of basic infrastructure to support the deployment of ITS on our road network.

## Rail

### *Develop the Rail Network*

As a city that strives to be efficient, sustainable and world class, rail should be Hong Kong's preferred mode of transport. Unfortunately, the current rail development strategy is on a line-by-line basis which leads to slow and piecemeal implementation due to cost-benefits having to be justified on a single line basis.

As a result there are major deficiencies in Hong Kong's rail coverage, including the lack of a North-South link on Hong Kong Island, or East-West link in the New Territories and Kowloon.

The focus should therefore be changed and should look at the complete network coverage in urban areas instead of concentrating on developing lines along the highest density routes. Compared to overseas cities, Hong Kong has no long distance rail network to speak of. A rail hierarchy system offering different services, including high speed and direct rail links to neighbouring cities should be set up as a priority.

In short, Hong Kong should draw on the experience of other world class cities, including London and Tokyo, whose urban rail networks are much more comprehensive. Hong Kong should implement full rail coverage in urban areas that spreads to surrounding areas in a hierarchal manner, and extends outside Hong Kong, deep into China and beyond.

## Seaport Links

### *Additional Link*

Hong Kong is home to one of the world's largest seaports. To maintain its position and meet future needs, the port must also have robust connections to the rest of Hong Kong as well as across the boundary into Mainland China. However, at present the port is connected only by road, although plans are afoot to introduce a goods rail service to the port area. This additional link is vital and should be implemented as soon as possible.

## Airport Links

### *Single Crossing, Single Point of Failure*

All the transport infrastructure to Hong Kong's airport depends on the single road/rail crossing – the Lantau Link which connects mainland Kowloon to Lantau Island. Any disruption to the Link would cause tremendous difficulties, preventing passengers and cargo from accessing or leaving the airport.

The Government is currently investigating the feasibility of a crossing from Tuen Mun to the "Airport Island" at Chek Lap Kok which would not only provide a strategically important second link to Lantau, but could also relieve the North Lantau Highway. Again this additional crossing should be implemented at an early date.

## Cross Boundary Links

### *Expand Regional Links*

One of the reasons for Hong Kong's success is its unique identity, and it would be a shame to lose it. However it is impossible to ignore the rapid development in the Mainland and we must work together more closely.

The sensible course is for Hong Kong to build on the strengths and opportunities offered by the Mainland and look beyond the PRD. That means developing a shared vision together with Mainland authorities for the development of cross boundary transport systems.

In the past, distance has been a major constraint for transport systems, but today it is the travel time that matters, not distance travelled. The new high-speed road and rail links such as the Hong Kong-Zhuhai-Macau Bridge and express cross-border rail links currently being planned will push the convenient 1-2 hour travel boundaries much further out, putting more places within easy reach of Hong Kong. That's good news for Hong Kong. It means that by developing transport systems that compress travel times, Hong Kong could reach deeper into the Mainland and build on the strength of coastal and northern China instead of concentrating on southern China alone.

Of course, for that vision to succeed, boundary crossings must be fast, convenient and unimpeded. Therefore transport infrastructure should be planned and developed with these aims in mind. The provision of boundary crossing facilities should be evaluated on a vision-led basis taking into consideration the role of Hong Kong within China under the “One Country, Two Systems” policy together with unprecedented economic development of the Mainland, rather than the current approach of relying on simplistic forecasting of future demand.

In short, Hong Kong must build on the strengths and opportunities offered by the Mainland and look beyond the PRD to develop a shared vision together with Mainland authorities for the development of cross boundary transport systems.





## Sustainable Development and Climate Control

### *Sustainability Impact Assessment (SIA)*

The introduction of an SIA process for infrastructure and urban developments as a requirement for Government projects in Hong Kong is a step in the right direction towards sustainability, but this still lacks proper recognition.

The Government does require an SIA for major infrastructure proposals to be conducted by the relevant bureau or department before public consultation. These findings can be incorporated into the consultation documents used during the Continuous Public Engagement period recently adopted by Government departments as part of an enhanced public consultation process.

### *Controlling Climate*

To date, climate change has not featured prominently in debates on the development of transportation infrastructure and with recent global concerns, this should be addressed as part of the implementation process for any new proposals.

Although transport is not the sole contributor to climate change, and reductions need to be made in all sectors, acting intelligently and immediately for transport infrastructure development is an effective pro-environment pro-growth strategy. Moreover, it can be achieved through pricing environmental costs, promotion of low carbon technologies and measures to encourage behavioural change.

## Project Planning and Implementation

### *Establish an Infrastructure Authority*

Experience has shown that the planning and delivery of major transport infrastructure projects in Hong Kong has been inefficient and prone to delays. To some extent, this is due to the rise in the public's desire to be involved in the process. However, much more uncertainty is caused by:

- Unclear Government priorities and overall policies;
- Complex and overlapping procedures;
- Multiple decision makers; and
- Conflicting Government departments.

To alleviate these problems, the HKIE recommends setting up a new Infrastructure Authority to plan and deliver major transport infrastructure projects in the same way that the Hong Kong Housing Authority and Urban Renewal Authority operate. In fact, this recommendation is already reflected in the Development Bureau which was established in July 2007.

### *Education and Strengthening of Awareness*

Sustainability has different meanings and implications to different people. During our interviews with experts and stakeholders, almost all had their own views on what sustainable development is and how it should be addressed.

Accordingly, the HKIE recommends that the Government takes the lead in initiatives to increase the understanding and awareness of the public-at-large as well as decision makers on the various aspects of sustainable development in transport infrastructure. This is the best way to develop policies, investment decisions and personal behaviour to improve the quality of life for today's society and that of future generations.

### *Engage the Public*

In the past, the public has been consulted in the development process from planning to implementation stages. And, until recently, such consultation was deemed sufficient. However, with rising political awareness and without appropriate community engagement, the development process can easily be hijacked by small groups of highly vocal people.



The HKIE recommends that the public and stakeholders should be re-connected and re-engaged. They should be consulted and engaged at every stage of the development process. From the onset, the public and stakeholders should be engaged in establishing the vision for the transport system prior to any plan being drawn up. After the vision and objectives have been established, the public and stakeholders should continue to be engaged in the planning, design and implementation stages.

### *Involve Professional Bodies*

Professional bodies could play a major role in the sustainable development of Hong Kong's transport infrastructure as well as encouraging the community to be involved and engaged in the development of sustainable transport infrastructure.

Accordingly, the HKIE recommends that professional bodies:

- Play their part in raising public awareness on sustainable development;
- Assist the Government in research and the establishment of tools to assess sustainable transport infrastructure;
- Take the lead in advising the Government on the establishment of indicators and parameters;
- Establish a vision and objectives for the benefit of the community; and
- Assist and advise the Government on transport policy to achieve objectives.

It is essential that professional bodies are seen to be wholly independent and not merely a Government mouthpiece. Professional bodies, such as the HKIE, should publicly offer views of the professions on major local issues such as the Star Ferry Pier demolition. There are also opportunities for professional bodies to play a significant role in commentating – on a neutral basis – on disputes between project proponents and objectors.

### *Increase Private Sector Involvement*

In recent years there have been significant moves in the global market to treat infrastructure as a diversification opportunity for investors and financial institutes.

Hong Kong has a long history of private sector involvement in transport infrastructure development. However, despite history and evidence demonstrating efficiency can be achieved through private sector involvement, Hong Kong has been moving too slowly in engaging the private sector in the development and management of transport infrastructure.

To further develop and maintain our infrastructure at a world-class level, Hong Kong must actively engage the private sector in the development, management and operation of transport infrastructure. The timing for pursuing private sector involvement is now. Public private sector engagement should be offered with certainty and transparency with the aim to benefit all parties including the public-at-large. The sharing of risks should be on an equitable basis.

# Acknowledgements

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