

# Railway Development in Hong Kong

*by Raymond Wong Wai Man*

The development of railways in Hong Kong has seen a burst of activity in recent years, extending a local rail system first conceived in 1898. Raymond Wong Wai Man reports on the history of Hong Kong's railway systems, profiles recent and ongoing projects, and offers his views on the current challenges facing the planning of future lines.

## History of Hong Kong's railway development: the Kowloon-Canton Railway

The idea to build a railway line linking Hong Kong and Canton was conceived in 1898 by the British government, intent to strengthen its geographical and political position in southern China. After about six years of negotiations and five years of construction, the Hong Kong section of the Kowloon-Canton Railway (KCR) was completed and put into operation in 1910.

For more than 70 years, the railway was a single-track system with passing loops at each station, running from Tsim Sha Tsui in Kowloon, through the New





Territories and up to the border at Lo Wu. Trains were steam powered until the mid-1950s, when the first diesel locomotive was introduced. Steam trains were completely replaced with diesel locomotives by 1962.

The KCR was in need of modernisation by the mid-1970s. The initial programme decided on at the time was to expand the railway alignment from a single-track system to a double-track one, undergo electrification for passenger trains and upgrade the signalling system for improved efficacy and safety. These processes took about nine years to complete and were carried out in two stages. The first stage of work completed in mid-1982 for services from Kowloon to Shatin. The remaining work was put into full operation in late 1983.

As the new town areas along the train line began to grow immensely during the 1970s, the facilities within the original Kowloon terminus adjacent to the Star Ferry at Tsim Sha Tsui became insufficient to meet existing needs. A new terminus site was chosen in Hung Hom to cater for the required expansion. The initial stage of the new Kowloon station was completed in 1974 to replace the old one in Tsim Sha Tsui. The land occupied by the old station as well as the nearby tracks, unloading platforms, cargo handling zones and associated support areas were all handed back to the government, ultimately giving rise to the new district of Tsim Sha Tsui East. The current Kowloon-Canton Railway Corporation (KCRC) came into being in 1982.

Expansion of KCRC lines stopped for about 20 years after the

modernisation in the 1980s due to a number of reasons, until the commissioning of the West Rail line in late 2003. At present, the KCRC lines run 75 km in length and have 33 operational stations. These figures include the newly commissioned Ma On Shan Line and Tsim Sha Tsui Extension but do not include the KCRC's Light Rail system in the Northwest New Territories.

### **History of Hong Kong's railway development: the Mass Transit Railway**

Plans to introduce a mass transit system in the built-up areas of Hong Kong were formed in the late 1960s in light of the city's economic growth and the increasing demand for public transport services by the general public. By this stage, Hong Kong's two bus operators already could not meet the community's general transport needs.

The government ordered a consultancy study in 1968. At the end of the study, the consultant recommended building a mass transit railway system on account of about 80 per cent of Hong Kong's population living in overcrowded land corridors surrounded by mountains and sea. Traditional ways to widen or expand existing roadways were not feasible due to ownership of land in the urban areas along the population corridors. A mass passenger-carrying system that went underground was almost the only solution.

The recommendation which came out in 1970 was to build a Mass Transit



Railway (MTR) network with a total length of 52 km, comprising four lines with three in Kowloon and the other on Hong Kong Island. The final decision was made by the then-Mass Transit Railway Provisional Authority in late 1974 to introduce a reduced plan with a route length of about 16 km, linking Central District and the main residential and industrial areas of Kowloon, with 12 underground and three elevated stations. The government-owned Mass Transit Railway Corporation (MTRC) was formed in 1975 to manage and supervise the construction. The MTRC's Modified Initial System between Shek Kip Mei and Kwun Tong opened in October 1979 and by December that year the trains reached Tsim Sha Tsui. The system crossed the harbour to Central in early 1980 and the network was subsequently expanded to include the Tsuen Wan Line in 1982, the Island Line in 1985 and the Eastern Harbour Crossing connecting Lam Tin to Quarry Bay in 1989. The Tung Chung Line and Airport Express followed in 1998 and the Tseung Kwan O Line opened in 2002. At present, the MTRC's lines cover 86 km and have 50 stations under operation.

### **Railway development studies and strategies**

To cope with steady growth of demand and to plan for the future in a strategic manner, the large-scale First Railway Development Study was carried out by the government in 1991, focusing on the role of railways in the Hong Kong transport network and the possible expansion of the existing system under various constraints to enhance the predetermined functions in the long run. The final study report was launched in mid-1993 with several recommendations that were later approved by the government. The study report recommended construction of five new railway lines including West Rail, the Ma On Shan Line, the Tseung Kwan O Line, the Tsim Sha Tsui Extension Line and the East Kowloon Line. Apart from the East Kowloon Line, which was later deferred to form part of the proposed Shatin-Central Link, these new railway lines have been completed and put into operation since 2002.

In addition, two more new lines were also approved in 1999 to suit various strategic development purposes. These are the Lok Ma Chau Spur Line linking Sheung Shui to a new border crossing facility at Lok Ma Chau, and the Disneyland Resort Line to Penny's Bay on Lantau Island.

The Second Railway Development Study followed in 1998, aiming to provide a strategy that forms a planning framework for further expansion of Hong Kong's railway network up to 2016. Objectives stipulated in the study included relieving bottlenecks in the existing railway systems; providing rail services to strategic growth areas for housing and economic development; meeting cross-boundary passenger and freight demands;



and increasing the share of railways in the overall transport system.

In order to achieve these objectives, this study looked into a number of new railway schemes that could be combined in various options with the existing system to form expanded networks. Finally, six railway schemes were highlighted for the formation of basic network options. The schemes comprised adding the North Hong Kong Island Line, the East Kowloon Line, the Tai Wai to Diamond Hill Link (rescheduled as the Shatin-Central Link), the Fourth Rail Harbour Crossing, the Kowloon Southern Link and the Northern Link. In addition, standalone schemes such as the West Hong Kong Island Line, a Regional Express Line and the Port Rail Line were also recommended to serve specific transport needs.

Due to a number of practical reasons such as the reshaping of Hong Kong's economic structure and lower than expected population growth, the majority of the recommendations in the second study report have been suspended pending further investigation and justification.

### **Highlights of the existing railway lines built after the 1990s**

After the modernisation of the KCRC Hung Hom to Lo Wu section in 1983, no major railway work was carried out until 1994 when the MTRC Airport

**Table 1: Summary of rail projects completed since 2001**

Railway project	Commencement of 1st contract	Commission time	Length of line	Number of stations
MTRC Tseung Kwan O Line	April 1999	August 2002	9 km	7*
KCRC West Rail	October 1998	December 2003	30.5 km	9
KCRC Ma On Shan Line	November 2000	December 2004	10 km	9*
KCRC Tsim Sha Tsui Extension	March 2001	November 2004	1 km	2*
KCRC Lok Ma Chau Spur Line	October 2002	Mid-2007	7.5 km	2
Other - MTRC Quarry Bay Congestion Relief Project	September 1997	September 2001	4.2 km	3*
* Including alteration, diversion or merging into existing stations				

Express Line commenced as part of the Airport Core Projects. The peak period in Hong Kong's railway development history came by the end of the 1990s and lasted for almost six years to the end of 2004. Five new lines or railway extension projects were under construction at the same time during this period. These rail lines are in general the end-products of recommendations under the first Railway Development Strategy put forward in 1994. Table 1 summarises the data of these projects.

From the design, routing and construction point of view, each of the recent railway lines has its own features. The below are some of the highlights of these projects.

### **MTRC Airport Express and Tung Chung Line**

The 34 km Airport Express and the 31 km Tung Chung Line use the same route from Central to the Tung Chung New Town, where the Airport Express Line heads northeast to the Airport Terminal Building at Chek Lap Kok. The Airport Express and Tung Chung Line have six and five stations respectively with three stations serving both lines but with separate passenger facilities to control fares and ticketing. Construction highlights of the railway lines include the following:

- 18 km of the rail tracks were laid at grade, 3.5 km was constructed in cut-and-cover tunnels and 5.5 km was built in the form of viaducts using the precast segmental method. 6 km of tracks were laid inside three tunnels:

one on Tsing Yi linking Tsing Yi Station and the Tsing Ma Bridge, one in the Lantau approach and another 1.5 km inside the cross-harbour tunnel tube. The remaining 2.5 km was placed inside the inner decks of the Tsing Ma Bridge and the Kap Shui Mun Bridge.

- Hong Kong Station, Kowloon Station and Tung Chung Station were built underground with podium-type superstructures used as station concourses. The other three stations are elevated structures. Non-standard design was adopted to enhance the identity of each station.

• One of the most difficult parts of tunnel construction was the approach section from Hong Kong Station to the cross-harbour tunnel, which was built with the cut-and-cover method in the newly made ground of the Central Reclamation. Difficulties came from the tunnel's proximity to seawalls as well as the diversion arrangements for a major storm water discharge culvert system crossing the tunnel structure during the construction process.

- A high-precision roller-type expansible rail track was provided inside the approach section of the Tsing Ma Bridge on the Tsing Yi side to allow for the expansion movements of the Tsing Ma Bridge's 1,900 m deck.

### **MTRC Tseung Kwan O Line**

More than 90 per cent of the Tseung Kwan O Line's 12.5 km total length is laid underground. 6.5 km is inside three drill-and-blast tunnels and the rest is in cut-and-cover tunnels. Some of the major construction features of the project include the following:

- There are no elevated structures such as viaducts in the entire track alignment of the Tseung Kwan O Line.

• The new line was extended from the existing Kwun Tong Line at Lam Tin Station with the addition of a diversion tunnel leading to the new Yau Tong Station.

- A merging connection into the existing track of the Eastern Harbour Crossing was provided, heading from Yau Tong Station and including a 900 m approach tunnel section formed with the open-cut method in hard rock.

• The line is split into two legs after Tseung Kwan O Station, one proceeding north towards Po Lam and the other heading southeast towards Area 86 in Tseung Kwan O South where the depot is located.

- All the stations except Po Lam have the main structures and station platforms constructed underground. The average size of these stations is about 50 m by 380 m for eight-car train services.

- Geotechnical conditions along the rail alignment are difficult. Shallow



rockhead in Grade I hard rock was located from Lam Tin Station almost continually eastward up to Tiu Keng Leng Station. Further east, the cut-and-cover tunnels run in newly reclaimed land, with a 500 m section laid an average of 80 m from the temporary seawall.

- All the track alignment was built in undeveloped land or preserved areas for construction of the rail line. The cut-and-cover tunnels crossed existing roadways at only four locations, at which temporary traffic diversions had to be arranged during construction.

### KCRC West Rail

Construction of West Rail involved building nine stations, developing a 32-hectare maintenance depot and laying 88 km of track along a route comprising 13.4 km of viaducts, 14.7 km of tunnels in various forms and 2.4 km of surface alignment. There are two interchange stations to the MTRC Tung Chung and Tsuen Wan Lines at Nam Cheong and Mei Foo Stations respectively. Connection provisions are also located at Nam

Cheong and Kam Sheung Road Stations for links to the future Kowloon Southern Link and Northern Link (connecting to the Lok Ma Chau Spur Line). Listed below are some of the major construction features of the project:

- Three stations (Nam Cheong, Mei Foo and Tsuen Wan West) have the main station structures built underground. Kam Sheung Road Station is constructed at grade. The remaining stations are elevated structures which connect to viaducts. The average size of each structure is about 60 m by 400 m, designed for serving nine-car trains.

- At Nam Cheong Station, work was near the MTRC Airport Express Line, with underpasses below the MTR tracks to allow for construction of interchange platforms between the two lines.

- Mei Foo Station's work involved crossing the two major traffic routes of the MTR tunnel of the Tsuen Wan Line and the Kwai Chung Road Flyover. Immediately after leaving the station, the rail line heads into the drill-and-blast tunnel of the south Tsing Kwai Tunnel. A 150 m section of tunnel was





constructed in three phases under Ching Cheung Road, where complicated traffic diversions were made.

- For Tsuen Wan West Station, the underground station structure was constructed in newly reclaimed land where three main discharge culvert systems and other water intake mains were located at both ends of the station. The south portal of the 5.4 km West Rail Tai Lam Tunnel is 400 m from the north end of the station.

- Kam Sheung Road Station is an elevated station structure in a podium-type open platform design. The track was connected to the station's east end at grade and to the viaduct at the west heading in the Au Tau direction.

- Yuen Long Station's elevated station structure was built in an enclosed platform within a podium base where future development will be provided on the podium top. The location of the station is within environmentally sensitive land with a number of ponds and marsh areas. Careful clearance and compensatory or reinstatement works to the wetlands had to be carried out during the station's construction.

- At Long Ping Station, the elevated station structure was constructed on top of the two surface water channels of the Yuen Long Nullah and Shan Pui River. In order to cater for the required diversion works for some major buried services along the surrounding roadways, the station was constructed in two main phases. The station has a podium-type design with an open platform exposing steel portal-type ribs to form part of a visual enclosure.

- Tin Shui Wai Station bears a close similarity to Long Ping Station in

design. It was also constructed in two main phases due to how it crosses Ping Ha Road with a 60 m span. Unlike Long Ping Station where the ground level is used as a public transport interchange, a new Light Rail stop is provided at grade in Tin Shui Wai Station.

- Siu Hong Station is an elevated structure above the Tuen Mun Nullah. The construction period was divided into two separate periods each year, one each for rainy and dry seasons (with changes usually at March and November), in order to allow continual discharge of storm water during the wet summer period. Due to the lack of working space on the nullah surface, the first deck of the station structure was constructed using a temporary suspended platform supported by four rows of gantries that could be slid forward to the next span on rollers. The main deck of the elevated station measures about 65 m by 700 m to accommodate public interchange facilities at both ends.

- Tuen Mun Station is also located directly on top of the Tuen Mun Nullah. In addition to the difficulties the location posed, the construction of the station structure encountered two critical constraints. Construction work was affected by tidal action due to the station being close to the exit of the Tuen Mun Nullah to the sea. The other was the requirement to maintain 24-hour traffic for Pui To Road and Light Rail services. As a solution, the station structure was constructed in three phases: the north and south sections with Pui To Road and the Light Rail track in between and the 80 m span linking these two portions. In order to provide a column-free link section, this portion was constructed using a long-span structural steel design.

- During construction of the 30.5 km rail alignment, more than 15 major traffic crossover points were implemented, requiring complicated temporary diversion arrangements that made planning and co-ordination of work very difficult.

### KCRC Ma On Shan Line

The Ma On Shan Line was built as an extension of the KCRC East Rail and went into operation in December 2004. The 11.4 km rail line has 9.1 km of its route supported on elevated track while about 2.3 km of the alignment runs at grade. Altogether nine stations are located along the line, of which six have open designs with free-standing elevated station structures. Two stations are constructed under podium structures. The terminus station at Tai Wai is an extension to an existing KCRC station and includes a much larger building area for the future expansion of the Shatin-Central Link. Listed below are some of the major features of this project:

- The majority of the viaduct sections were erected and constructed with the precast segmental launching method. In order to achieve the best





effectiveness and meet differing site environments, two types of launching gantries in the form of overhead and underslung systems were used for launching.

- During construction of the line, the viaduct crossed six major traffic junctions where very complicated temporary traffic rearrangements or diversions were carried out to make erection works more convenient.

- The Ma On Shan Line crossed two water channels near the Shek Mun Station and Tai Shui Hang Station, with widths of about 45 m and 15 m respectively. Most difficult was the section at the Siu Lek Yuen channel near Shek Mun Station. Two portal frames with foundations of bored piles were constructed on the bed of the waterway by the provision of a cofferdam supported by sheet piles.

- Apart from the Wu Kai Sha Station and the depot at Tai Wai, there are no property developments above the station structures along the line. The majority of the station structures have elevated open station designs with island platforms and decked roofs supported on steel columns and slightly-curved steel beams. The superstructures are formed using the cast-in-situ method by the use of metal formwork for the columns and large panel or gang forms for the vertical elements. The average size of each station is about 25 m by 220 m on plan.

- The stations for the line are designed to provide for four-car trains at the current stage. However, all the station structures have provisions for extension to serve eight-car trains after addition and alteration works when future development requires this.





### **KCRC Tsim Sha Tsui Extension**

The 1 km KCRC Tsim Sha Tsui Extension extends from the existing Hung Hom Station to Tsim Sha Tsui. It runs underground below Salisbury Road and ends at the new East Tsim Sha Tsui Station, which was constructed under the previous Wing On Plaza Garden and Middle Road Children's Playground. Some of the construction features can be summarised as follows:

- The only new station on the line is the East Tsim Sha Tsui Station. Alteration and extension work was also done to the platforms of the existing Hung Hom Station to change it from a terminus to a normal station.
- Very complicated permanent diversion arrangements were carried out for traffic and passengers due to the difficult built-up conditions in the vicinity of

the two stations. Such provisions included construction of 1.2 km of pedestrian subway systems (with one 750 m long drill-and-blast tunnel), building a new crossing over roadways into the International Mail Centre and KCRC Cargo Handling Bay at Hung Hom, the repositioning of a series of pumps and salt-water intake facilities along the seawall of Salisbury Road, protection arrangements for the cross-harbour water and gas mains, and co-ordinating with the construction of a new road underpass at the final stage next to the East Tsim Sha Tsui Station.

- The tunnel linking the two stations was constructed in a cut-and-cover manner with an average distance of 25 m from the existing seawall. Numerous buried utility services would have been interrupted so diversion or reprovisioning





arrangements were required.

- Construction of a 20,000 sq m transfer slab was carried out for protection when passing the tunnel approach of the Cross Harbour Tunnel near the International Mail Centre.

- Construction of the new 80 m by 260 m East Tsim Sha Tsui Station located on both sides of Chatham Road South saw many engineering difficulties, such as the shallow rockhead stratum, working close to the foundations of existing structures and the temporary diversion arrangements for busy traffic on nearby roads.

### **KCRC Lok Ma Chau Spur Line**

The KCRC Lok Ma Chau Spur Line is the second boundary crossing railway, linking existing facilities at Sheung Shui Station with a new station in the restricted area of Lok Ma Chau. The 7.5 km route comprises about 0.8 km of at-grade track, 4.4 km inside a tunnel and 2.2 km laid on viaducts. Besides the provision of the required immigration facilities and a two-level footbridge to

Huanggang in China, the design of the station terminus on both sides incorporates the necessary interchange with the Shenzhen Metro Line 4. Some of the major construction features of this project are as follows:

- The alignment passed through a highly environmentally sensitive area with unique ecological value, especially in Long Valley and the wetland conservation area at Lok Ma Chau. As a result, a more expensive method to build the 4.4 km tunnel — using a tunnel boring machine — was chosen for the section beneath Long Valley.

- To allow for continual services of the East Rail to Lo Wu, a 600 m permanent rail line diversion to East Rail on the north section of Sheung Shui Station was carried out at the early stage of the project. This included the addition of a new pair of up and down track lines, one at grade and one in a tunnel box constructed with the open-cut method. Since the diversion work was done near five 1.2 m diameter water pipes supplying water from mainland China, stringent protection and monitoring control was introduced to ensure the pipes would not be disturbed during the work process.

- A 30 m by 220 m box structure was formed in Kwu Tung using an open-cut arrangement with sides supported by diaphragm walls for use as an emergency access point and the removal of the excavated spoil during the tunnel boring process. The structure will be used as a new station in the future when development in the area requires it.

- The viaduct was constructed with the precast segmental launching method by the use of two sets of underslung launching girders. The 2.2 km viaduct has an average span of 35 m and holds the up and down tracks, each formed by precast box-section segments and integrated by in-situ rigid slabs on top and stiffening diaphragms at intervals.

- The four-level Lok Ma Chau Terminus is a giant structure accommodating the railway station, immigration areas and customs facilities, as well as a link bridge to Huanggang at the Shenzhen side. A large amount of precast elements — up to 70 per cent of the total concrete volume — were used to construct the terminus building structure.

### Future railway lines

Owing to dramatic changes in the economy and social structure of Hong Kong since the second Railway Development Strategy was launched in 2000, the majority of proposed rail lines stipulated in railway strategic developments have been suspended pending the justification of various factors.

However, in order to provide a link between West Rail and the built-up areas beyond its southern end, the government decided to proceed with the Kowloon Southern Link in 2002 to connect the KCR East Tsim Sha Tsui Station to West Rail's Nam Cheong Station. On completion of this line, a U-shaped route will enable passengers travelling from Lo Wu Station on East Rail to reach the southern tip of Kowloon and continue on to the northwest New Territories on the West Rail line.

In September 2002 the government invited the KCRC to proceed with detailed planning and design of the Kowloon Southern Link project. This rail line will be about 3.8 km in length and will have a station located in the West Kowloon area. Construction is expected to get underway in mid-2005 and the forecast completion date is 2009.

Another proposed large-scale railway development is the Shatin-Central Link. This line is one of the priority rail projects recommended in the Railway Development Strategy 2000. It will form a new rail link between Tai Wai in the New Territories and the central business district on Hong Kong Island via the Southeast Kowloon development area. The line is being designed to increase the cross-harbour and Shatin-Kowloon rail capacities and is also intended to redistribute flows and relieve the other railway lines in Hong Kong and Kowloon.





Since the award of the Shatin-Central Link contract to the KCRC in June 2002 based on its submitted proposal, the Corporation has carried out a comprehensive review of the scheme with a view to develop a proposal for the line that would best serve the public. Based on the KCRC's latest proposal under consideration, on a territory scale the preferred scheme consists of a north-south railway corridor from Lo Wu to Central by extending East Rail across the harbour to Central. An east-west railway corridor would meanwhile be formed by the extension of the Ma On Shan to Tai Wai Rail Link to Hung Hom. The scheme would enable the Hung Hom Mass Transportation Centre to become a more convenient interchange for passengers.

Since the government has invited Hong Kong's two rail corporations to enter merger talks to integrate their networks and bring increased efficiency to the public and long-term cost effectiveness, as well as the discovery of certain design complications in the Central-Wanchai Reclamation project where the Shatin-Central Link would run through, the design and implementation detail of the line has been temporarily suspended pending clarification of various situations.

For the rest of the proposed new lines or extension schemes as highlighted in the Railway Development Strategy 2000, a definite timeline cannot be set at the present stage. Railway development is now undergoing a critical review process to fit new outcomes. The possibility of a change of course in the development rationale may not be unexpected in the future.

### **Difficulties in future railway development**

Studies in the 1980s and 1990s indicated that the population and economic growth of Hong Kong was highly positive and that significant investment in overall transportation development was vital to satisfy future needs. In light of this, development of railway lines was prioritised due to their large carrying capacities and environmental friendliness in operation. However, entering into the 2000s a number of uncertainties have arisen that have prompted demand for a more critical review of the overall situation. Some of the more critical issues among these unfavourable factors are listed below.

*Fall in rail-based passenger demand.* The daily passenger demand has dipped since 1999, down by 1.5 per cent from 3.47 million to 3.42 million daily. This figure has already taken into account the increase in cross-boundary travel but not the changes in other economic factors. Demand for railway services in newly developing regions is not as previously expected.

*Change in overall social and economic structure.* The slowing down of growth and the aging of the population, the lower number of immigrants from the mainland and the rapid drift of trading and logistics support into China have

decreased the prospects of railway development to meet the actual demand as expected. The statistics recorded after the opening of the KCRC's West Rail and Ma On Shan Line are examples to show the situation.

*Cost of railway development and construction.* The construction cost of a railway in the hilly and built-up environment of Hong Kong is often ranked as the highest in the world. This is not to mention the stringent environmental concerns as set under the current statutory requirements for the building of railway lines. In previous years when the property market was stronger, the cost could easily be covered by the granting of land and property development rights by the government. More recently, strong resistance has been encountered from developers concerned that the supply of land in this manner would destabilise the fragile property market. The government is nowadays reluctant to support railway development in this way.

*Impact to other service providers.* Under a situation of market equilibrium, public transport operators have developed saturated routing to serve every region with expected demand. The introduction of a new railway may significantly affect such a situation and create reluctance and resistance from the general public and service providers.

*Long periods of planning and construction.* The total time required to complete a railway project takes about nine to ten years. The process includes a detailed project feasibility study which covers aspects including alignment design, station location and layout planning, engineering feasibility, impact assessments on traffic and environment, interfacing considerations, land requirements, patronage, and programme and cost estimates. After that, it follows the detailed Environmental Impact Assessment and obtains the Environment Permit from the government, and also goes through public consultation, resolving identified problems and objections, obtaining approval from the Legislative Council, arranging acquisition of land by resumption or other processes, tendering and selecting the appropriate contractors. Finally, it reaches the construction stage which ultimately includes the testing and commissioning that takes at least half a year before a line can be put into operation.

*Lengthy consultation and legislative processes.* Consultation and legislative processes are a means to monitor the planning of large-scale developments to meet the public interest. However, such a process to a certain extent creates a number of uncertainties in the planning and development of a new railway project. The consequences affect not only the timing of the development but also elevate the cost (both in construction and opportunity costs), in particular when the critical political culture of Hong Kong over recent years is taken into consideration.

## Conclusion

Railway development has undergone a fruitful period since the mid-1990s. More than 85 km of railway lines have been added since then, with another 12 km due to complete in the Disneyland Resort Line and Lok Ma Chau Spur Line in 2005 and 2007 respectively. These two projects will bring the total railway length to about 175 km.

In fact, background situations and development factors are usually highly dynamic and inter-related. In the planning process of a railway line, inappropriate decisions involving such a huge investment may create unreconcilable damage or losses in the long-term development of Hong Kong. At the same time the public has to pay accordingly for any requirements or to satisfy any special needs, no matter how stringent they are. The balance is very difficult to achieve. Too many considerations or too high a standard being set may have limitations and drawbacks. As a result of this difficult balance, there has been no new line finalised for construction since 2003.

The planning of the Shatin-Central Link is a good example to serve as a conclusion to this paper. The possible future merger of the KCRC and MTRC is a critical issue that makes detailed reconsideration of the existing rail network essential. However, other equally important issues such as resistance from opposing groups and the legal processes that may follow add numerous uncertainties in the planning of the line. In particular, the line has a huge amount of technical considerations for how it lands on Hong Kong Island, where marine works and reclamation would be required in order to accommodate the alignment. This does not include the complicated co-ordination between countless government bodies and private parties that have concerns or interest in the development. The final decision would have to go through an extremely exhausting negotiation

process in which political concerns may overrule other economical, technical and engineering factors. This could make every party, with the possible exception of some opposing groups, feel extremely frustrated and significantly lower their motivation in the development, as well make the end product become more fragile and easily challenged by opposing parties and the general public. In this way, it seems that a shadow may be cast on future railway development in Hong Kong.

