Information Folder (2)
High Speed Railway as a Transport Innovation
The term “high speed railway / high speed rail” generally refers to those passenger rail systems in the world operating at speeds of 200-300 km/hour (km/h), or more in some cases. Compared with metro (e.g. Mass Transit Railway / MTR in Hong Kong) or commuter railway systems in many cities which usually operate at speeds of 80-120 km/h, the speeds of high speed railway systems are comparatively high. They are thus said to be a type of “transport innovation” which can greatly improve the accessibility of places and shorten journey time.

Figure 1  Comparison of speeds of different railway systems

- a) High speed railway in different parts of the world  
(Speed: about 200-over 300km/h)
- b) Airport Express in Hong Kong  
(Maximum speed: 135 km/h)
- c) Metro or commuter railway in the world  
(Speed: about 80-120 km/h)
Examples of high speed railway around the world

Japan’s Shinkansen (Tokaido Line) is the first high speed railway system in the world. It has been operated at speed over 200 km/h between Tokyo and Osaka since 1964. Nowadays, some Shinkansens operate at speed over 300 km/h and journey time is much reduced.

Besides Japan, high speed railway systems have been developed for decades in other Asian and European countries, and the network will continue to expand. Some examples of them are shown in Table 1 and Table 2 below.

<table>
<thead>
<tr>
<th>Example of high speed railway systems in Asia</th>
<th>Speed</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Shinkansen of Japan</td>
<td>240-320 km/h</td>
<td>• It is the world’s first high speed railway system.</td>
</tr>
<tr>
<td>2. National high speed railway network of China (CRH / China Railway High-speed)</td>
<td>• 300-350 km/h at surface level</td>
<td>• The Beijing-Tianjin Intercity Railway is the first high speed railway line in China (with speed of about 350 km/h).</td>
</tr>
<tr>
<td></td>
<td>• About 200 km/h in tunnels (e.g. Hong Kong)</td>
<td>• In general, 4 east-west lines and 4 north-south lines of the high speed rail network have already been set up and constructed in China. This phase of development of the network is expected to complete in 2020. It exceeds 20,000 km in length and links up most major Chinese cities, including Beijing, Shanghai and Hong Kong (the Guangzhou-Shenzhen-Hong Kong High Speed Rail).</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• From now till 2030, there is a plan to further expand the high speed rail network of China into the proposed 8 east-west lines and 8 north-south lines. More places in the central and western China will</td>
</tr>
</tbody>
</table>
### Example of high speed railway systems in Asia

<table>
<thead>
<tr>
<th>Example of high speed railway systems in Asia</th>
<th>Speed</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>be included in the network coverage. After completion, the total length of the network may reach 45,000 km.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• It is now the <strong>longest</strong> and <strong>fastest high speed railway system in the world</strong>.</td>
</tr>
</tbody>
</table>

3. The Taiwan High Speed Rail (THSR)

| Max. speed: 300 km/h |

4. High speed railway network of South Korea (KTX / Korea Train Express)

| Highest speed: >300 km/h |

Table 1  Examples of high speed railway networks in Asia

(Sources:  

### Example of high speed railway systems in Europe

<table>
<thead>
<tr>
<th>Example of high speed railway systems in Europe</th>
<th>Speed</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Trans-European Transport Network (TEN-T)</td>
<td>&gt;300 km/h (between the Netherlands &amp; Belgium)</td>
<td>• It links up the high speed railway and conventional railway systems of different European countries.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• The fully operated TEN-T high speed railway network may reach 20,000 km by 2020.</td>
</tr>
</tbody>
</table>

2. High speed railway of France (TGV)

| May reach speed of 320 km/h | • It is one of the fastest high speed railway systems in the world. |
|                           | • The length of the TGV network exceeds 1,900 km (connecting its hub-Paris with other cities in France and adjacent countries). |

3. Eurostar

<p>| May reach speed of 320 km/h | • It connects London and Paris. |</p>
<table>
<thead>
<tr>
<th>Example of high speed railway systems in Europe</th>
<th>Speed</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>4. High speed railway of Germany (ICE / InterCity Express)</td>
<td>Max. speed &gt; 300 km/h</td>
<td>• The ICE network connects major cities of Germany and adjacent countries.</td>
</tr>
</tbody>
</table>

Table 2  Examples of high speed railway networks in Europe

(3) Characteristics and impacts of high speed railway

When compared with traditional railway systems and other major road transport modes in the world, high speed railway are said to have characteristics of fast, convenient, clean and comfortable (See Figures 2 and 3). With their high speeds shown in Table 1 and Table 2 above, they are speedy and travelling time is greatly shortened.

Figure 2  The train compartment of a high speed railway in China (1st class)
High speed railways also have the following characteristics:

- **High capacity**;
- **High energy efficiency** and *environmentally-friendly*;
- **High level of reliability**;
- **High level of safety**; and
- **Stimulus of economic growth**.

Taking the Tokaido Shinkansen of Japan as an example, Tokaido Shinkansen was claimed to support Japan’s economic growth since its inauguration in 1964. It links the 3 largest cities of Japan—Tokyo, Nagoya and Osaka, with a total of 342 trains daily (about 1,300 seats per train) in 2013-14. As such, both the capacity and frequency are high. The average daily passenger ridership of Tokaido Shinkansen reaches 424,000 in 2014 but the annual average delay is only 0.9 minute/operational train (i.e. high level of reliability). With sophisticated technology and continuous safety-related investment, the safety level of Shinkansen is also very high and there is no accidents resulting in fatality or injury to passengers onboard since its commencement of operation in 1964. (Source: Central Japan Railway Company—About the Shinkansen, http://english.jr-central.co.jp/about/outline.html)

In many cases, high speed railway is an alternative and competitive transport mode to **short-haul flights** too. Journeys of up to 1,000 km (i.e. **short to medium distance trips**) are much faster by high speed railways than by air transportation. The check-in and security check processes are simpler for high speed railway (i.e. **lower**

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1 “Business class” and “premium class” seats are only available on some Mainland high speed trains. For the “Vibrant Express” (high speed rail trains of Hong Kong), only first class and second class seats are available.
terminal time) than air transport, so time can be saved. Moreover, as most airports are located outside the main downtown area of many cities but the termini of many high speed railway systems are located at city centres, travelling time to and from high speed railway termini are usually much shorter. They are also less influenced by bad weather conditions (e.g. typhoons), and equipped with more spacious and comfortable train compartments when compared with planes. Passengers may continue to use their mobile phones and internet/Wi-Fi services in high speed railway.

When compared the level of carbon emission of high speed railway with that of road transport (e.g. coach or bus) and air transport, the carbon emission per passenger per km of a Eurostar trip (for example) is only about 25% and 15% of road and air transport respectively. (Source: MTR—Express Rail Link, http://www.expressraillink.hk/en/home/)
As mentioned in Part (A), the distribution pattern of the National high speed railway network of China has planned to be further expanded from the “4 east-west lines and 4 north-south lines” (Figure 4) earlier into “8 east-west lines and 8 north-south lines” (Figure 5) until 2030. The Guangzhou-Shenzhen-Hong Kong High Speed Rail is a part of the present 25,000 km high speed railway network of China.

The route of the Guangzhou-Shenzhen-Hong Kong High Speed Rail is 142 km long and includes two main sections—(i) the Mainland Section (Shenzhen to Guangzhou) and (ii) the Hong Kong Section (Figure 6). The Mainland Section is in full operation for years and the Hong Kong section has begun operation on 23 September 2018. Since its operation, passengers from Hong Kong may reach different Mainland cities without/with changing trains and the journey time between Hong Kong and the major cities of the Mainland will be greatly shortened. According to the

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2 “Guangzhou-Shenzhen-Hong Kong High Speed Rail” was also called “Guangzhou-Shenzhen-Hong Kong Express Rail Link” in the construction period.
“High Speed Rail User Guide (published on 10/9/2018)” of the MTR (Figure 7), High Speed Rail connects Hong Kong with 44 Mainland stations without interchange in its early stage of operation in 2018. Table 3 (P.12-15) shows the basic information about the Hong Kong Section of the Guangzhou-Shenzhen-Hong Kong High Speed Rail (Hong Kong Section).

Figure 4  The 4 east-west lines and 4 north-south lines of the National high speed railway network in China
Figure 5  The planned 8 east-west lines and 8 north-south lines of the National high speed railway network in China – A more complete coverage of high speed railway network extending to the central and western part of China
Figure 6  The two main sections of the Guangzhou-Shenzhen-Hong Kong High Speed Rail

Figure 7 The High Speed Rail User Guide (10/9/2018)
The Guangzhou-Shenzhen-Hong Kong High Speed Rail (Hong Kong Section)

The high speed rail train of Hong Kong – “Vibrant Express”.

Alignment/route:

Length: About 26 km (connecting Hong Kong with Shenzhen)

Speed: Running at 200 km/h within Hong Kong and may up to 350 km/h in the Mainland Section. It is the fastest cross-boundary land transport in Hong Kong.

The speed of the Vibrant Express is shown in the train.
**Terminal:** West Kowloon (no intermediate station within Hong Kong)

**Nearby MTR stations:** (1) Kowloon MTR Station (Tung Chung Line and Airport Express Line) and (2) Austin MTR Station (West Rail Line) connect Hong Kong West Kowloon Station (high speed rail) with footbridges, subways, travellators, escalators and lifts.

<table>
<thead>
<tr>
<th>Footbridges (left) and subways (right) linking Austin MTR Station and West Kowloon High Speed Rail Station</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Footbridges and travellators linking the Kowloon MTR Station and the West Kowloon High Speed Rail Station</th>
</tr>
</thead>
</table>

**Other transport facilities at the terminal or nearby areas:**
- Public transport interchange (for connections with buses, minibuses and taxis)
- Coach parking facilities
- Station parking and loading facilities
- Cross-harbour ferry pier – Star Ferry
- Cross-border ferry terminal – China Ferry Terminal (to Macau & the Mainland)
- Cruise terminal at Harbour City
Cross-border ferry and cruise terminals near the West Kowloon High Speed Rail Station

Train services:
- Both “short-haul train / shuttle service” to nearby Mainland cities (including Shenzhen and Guangzhou) and “long-haul train service” to other Mainland cities with longer distance from Hong Kong (e.g. Shanghai and Beijing) are provided. In 2018, the high speed rail connects Hong Kong with about 44 Mainland stations without interchange.
In its early stage of operation, the High Speed Rail (Hong Kong Section) has a train to Shenzhen or Guangzhou every few to about 30 minutes. Depending on the demand in the future, the design of the Guangzhou-Shenzhen-Hong Kong High Speed Rail allows for a frequency of one train every 3 minutes.

**Minimum journey time (estimated) to major Mainland cities (in 2018):**
- Between Hong Kong & Futian, Shenzhen: about 14 minutes
- Between Hong Kong & Shenzhenbei: about 19 minutes
- Between Hong Kong & Guangzhou: about 47 minutes
- Between Hong Kong & Shanghai Hongqiao: about 8.25 hours
- Between Hong Kong & Beijingxi: about 9 hours

**Fare (in September 2018):**
- **Hong Kong to Futian, Shenzhen:** Second Class - RMB¥68 (i.e. HK$78 according to the exchange rate in September 2018); First Class - RMB¥109 (i.e. HK$125)
- **Hong Kong to Shenzhenbei:** Second Class - RMB¥75 (i.e. HK$86); First Class - RMB¥120 (i.e. HK$138)
- **Hong Kong to Guangzhou:** Second Class - RMB¥215 (i.e. HK$247); First Class - RMB¥323 (i.e. HK$371)

Table 3  Basic information of the Hong Kong Section of the Guangzhou-Shenzhen-Hong Kong High Speed Rail
② 東網—高鐵香港段接通全國16城市 赴京只需9小時,
③ MTR—High Speed Rail
(1) Locational advantages of the West Kowloon terminal of the Guangzhou-Shenzhen-Hong Kong High Speed Rail (Hong Kong Section)

The West Kowloon terminal of the Guangzhou-Shenzhen-Hong Kong High Speed Rail (Hong Kong Section) is located within the city centre / major urban areas of Hong Kong (Figure 8). The major urban areas of Hong Kong includes the commercial areas around the Victoria Harbour, e.g. the Central, Admiralty, Wan Chai and Causeway Bay on the Hong Kong Island, and Tsim Sha Tsui on the Kowloon side. With high level of accessibility, these major urban areas are the commercial and tourism centre of Hong Kong (Figure 9). For example, the Central is the central business district (CBD) of Hong Kong. With high level of accessibility, the land rent of the Central is high and many high order goods and services can be found there. After arriving at Hong Kong, passengers of the High Speed Rail can reach various business, shopping and tourism centres in Hong Kong conveniently.

Figure 8 The location of the West Kowloon terminal of the Guangzhou-Shenzhen-Hong Kong High Speed Rail (Hong Kong Section)
The West Kowloon Cultural District, various museums and shopping centres can be found near the West Kowloon High Speed Rail Station.

Besides, the West Kowloon terminal is well-connected with two MTR stations next to it—Kowloon MTR Station and Austin MTR Station (Refer to Figure 10 and Table 3 for details). Geographically, the terminal is located at the central part of Hong Kong and passengers of the High Speed Rail can go to many different districts / areas of Hong Kong by MTR in about half an hour (Table 4). For example, the estimated journey time from the West Kowloon terminal to Shatin or Tung Chung is 25 minutes.
Figure 10  Two photographs showing the location of the West Kowloon High Speed Rail Station in relation to the Kowloon and Austin MTR Stations

<table>
<thead>
<tr>
<th>District / area in Hong Kong</th>
<th>Estimated journey time from the West Kowloon High Speed Rail Station (by MTR or Airport Express)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tsim Sha Tsui</td>
<td>5 minutes</td>
</tr>
<tr>
<td>Central</td>
<td>10 minutes</td>
</tr>
<tr>
<td>Tsuen Wan</td>
<td>10 minutes</td>
</tr>
<tr>
<td>Yuen Long</td>
<td>20 minutes</td>
</tr>
<tr>
<td>Shatin</td>
<td>25 minutes</td>
</tr>
<tr>
<td>Tung Chung / Hong Kong</td>
<td>25 minutes</td>
</tr>
<tr>
<td>International Airport</td>
<td>25 minutes</td>
</tr>
<tr>
<td>Taikoo Shing</td>
<td>30 minutes</td>
</tr>
<tr>
<td>Kwun Tong</td>
<td>35 minutes</td>
</tr>
</tbody>
</table>

Table 4  Estimated journey time from the West Kowloon terminal of the High Speed Rail to different areas in Hong Kong
(2) Impacts of the Guangzhou-Shenzhen-Hong Kong High Speed Rail

The Guangzhou-Shenzhen-Hong Kong High Speed Rail is fast, convenient and comfortable (Figure 11). After the operation of the Hong Kong Section in 2018, passengers of the High Speed Rail can enjoy those special characteristics (or advantages) of high speed railway listed on P.5-7 earlier. Besides, the following impacts of high speed railway will also be found:

![The comfortable environment of a 1st class train compartment of the Vibrant Express](image)

Figure 11   The comfortable environment of a 1st class train compartment of the Vibrant Express

a) Travel time and the concept of one-hour living circle:

The high speed and frequency of the Guangzhou-Shenzhen-Hong Kong High Speed Rail and associated high speed railway network of the Mainland can significantly shorten travel time between Hong Kong and Mainland cities. As there is no intermediate stations within the Hong Kong Section, travel time from Kowloon West terminal to Futian (city centre of Shenzhen) and Guangzhou, can be greatly reduced to about 14 and 47 minutes (for those trains without intermediate stops) respectively. Besides, the frequency of the train services is quite high as there is a train to Shenzhen and / or Guangzhou every few to about 30 minutes. In short, more Mainland cities will be included in the daily commutable area of Hong Kong and “one-hour living circle” within the Zhujiang Delta region can be materialized. According to the estimation by the Mass Transit Railway (MTR), the Guangzhou-Shenzhen-Hong Kong High Speed Rail can help to save 39 million hours of travelling time every year and bring us
HK$90 billion economic benefits in 50 years (Source: MTR—Express Rail Link, http://www.expressraillink.hk/en/home/).

b) **Development of transport hubs or new growth poles:**

As many successful cases in the world, railway stations with high speed rail services are usually developed into transport hubs in their respective areas. It is because there is usually high demand on other public transport services at these stations. Major high speed rail stations along the Guangzhou-Shenzhen-Hong Kong High Speed Rail (e.g. Hong Kong West Kowloon and Futian) then will certainly be developed into transport hubs in the Zhujiang Delta Region (Figure 12 and Figure 13). With the development of new facilities, these stations are also new “growth poles” which create new activity nodes within cities.

![Figure 12](image1.jpg)

Figure 12 The interior and exterior of the High Speed Rail Hong Kong West Kowloon Station
Figure 13  The floor plan and interior of the High Speed Railway Futian Station (underground). As shown on the floor plan, the High Speed Railway Futian Station is well connected with the Shenzhen Metro and other public transportation means.
However, some railway stations of the Guangzhou-Shenzhen-Hong Kong High Speed Rail are located at suburban areas with sufficient supply of land (e.g. Guangzhounan Station) (Figure 14 and Figure 15). These stations are quite far away from the original city centres which are destinations of passenger traffic at present. Time is needed for these stations to be developed into new growth poles in the future.

Figure 14  High Speed Rail Guangzhounan Station and its surrounding areas
c) Connectivity between Hong Kong and the Mainland, and associated socio-economic impacts:

The full operation of the Guangzhou-Shenzhen-Hong Kong High Speed Rail in 2018 not only connects Hong Kong with nearby Mainland cities (like Shenzhen and Guangzhou), it also links Hong Kong with the present 25,000km national high speed railway network of the Mainland. With enhanced connectivity with the Mainland, economic activities and cultural exchange between Hong Kong and different Mainland cities can be further strengthened. These in turn brings socio-economic benefits (including more job opportunities and bringing more tourists) to both places.

d) Environmental impacts:

It is argued that all railway systems, including the high speed railway, are more environmentally friendly than the majority of road, water and air transport modes. They use less energy and emit less carbon and pollutants. For example, it is estimated that the amount of energy consumption and carbon emission of high speed railway is only about 1/6 and 1/10 of that of aircraft respectively (Source: Tokaido Shinkansen, Central Japan Railway Company, 2009).
Concerning the Hong Kong Section of the high speed railway, it is mainly run in tunnels and its negative impact on the surrounding environment and local communities can be greatly reduced. In turn, it helps the sustainable development of Hong Kong and nearby areas. Moreover, the design of the High Speed Rail Hong Kong West Kowloon Station is environmentally friendly and green (Figure 16). The station itself includes a “Green Plaza” (Figure 17) and a “Sky Corridor / Sightseeing Deck” (Figure 18) which provides lots of green areas and open space for its passengers and visitors. Last but not least, the giant glass curtain walls of the station comprise over 4,000 glazing panels which bring daylight into the atrium and reduce the demand on electricity (Figure 19).

Figure 16  The “green” interior of the High Speed Rail Hong Kong West Kowloon Station
Figure 17  The Green Plaza of the High Speed Rail Hong Kong West Kowloon Station
Figure 18  Sky Corridor of the High Speed Rail Hong Kong West Kowloon Station

Figure 19  The giant glass curtain walls of the High Speed Rail Hong Kong West Kowloon Station bring daylight into the atrium
e) *Competition with other transport modes:*

As discussed on P.5-7 earlier, the operation of the Guangzhou-Shenzhen-Hong Kong High Speed Rail (like other high speed rail systems) have substantial impacts on the development of other transport modes. For examples, it is able to compete with short to medium distance air transport services with lower transport cost and terminal time. In the next information folder (i.e. Information Folder (3)), there is a case study on modal choice and competition to illustrate the possible impacts of the introduction of the high speed railway on the selection of transport modes for trips between Hong Kong and Guangzhou.
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