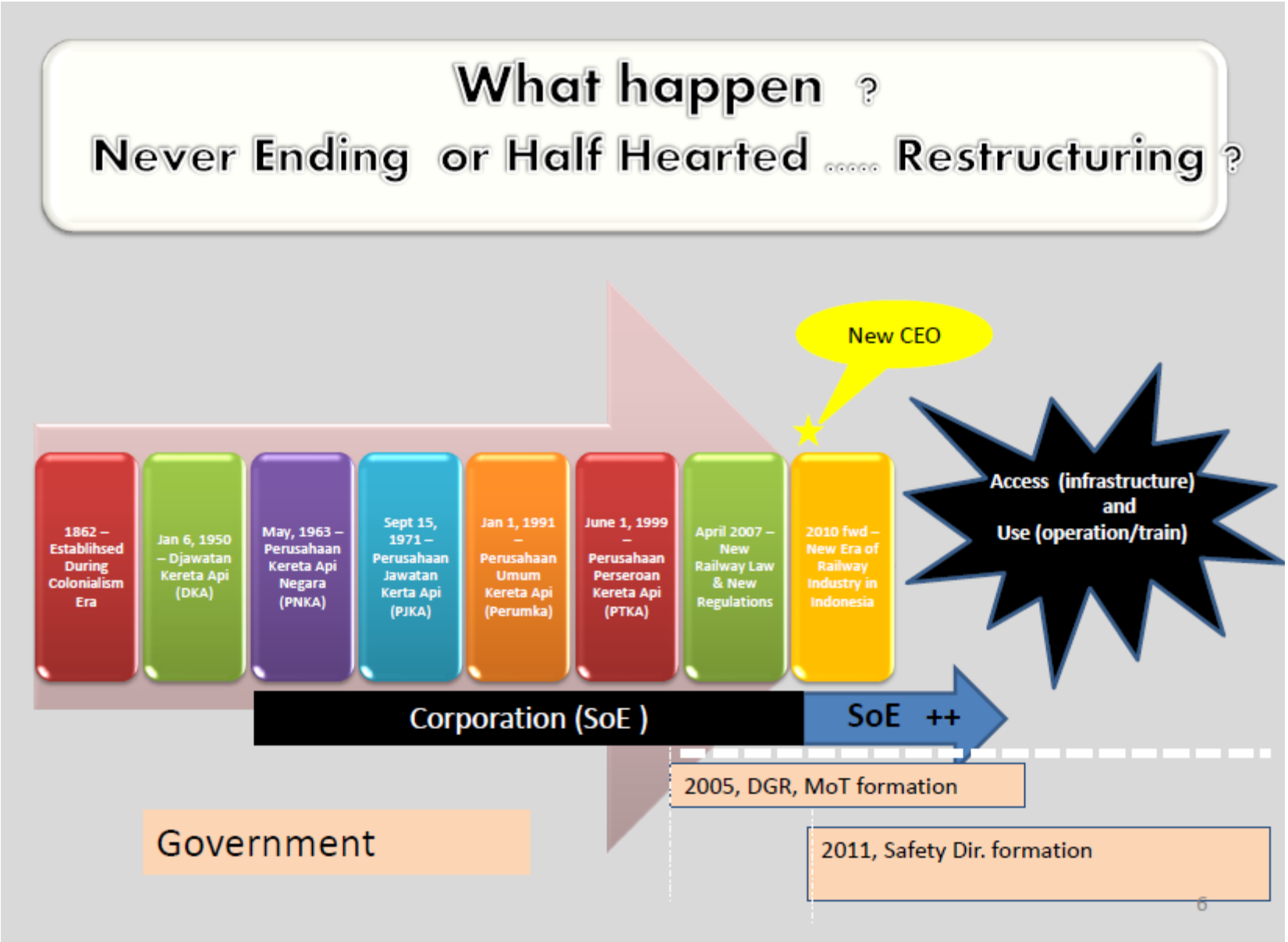
Trasportasi Berbasis Rel di Mancanegara

Prof. Ir. Leksmono Suryo Putranto, MT, Ph.D

Seminar Bidang Teknik Sipil

Potensi Pembangunan Jalur KA di Kalimantan

Palangkaraya, 26-6-2017

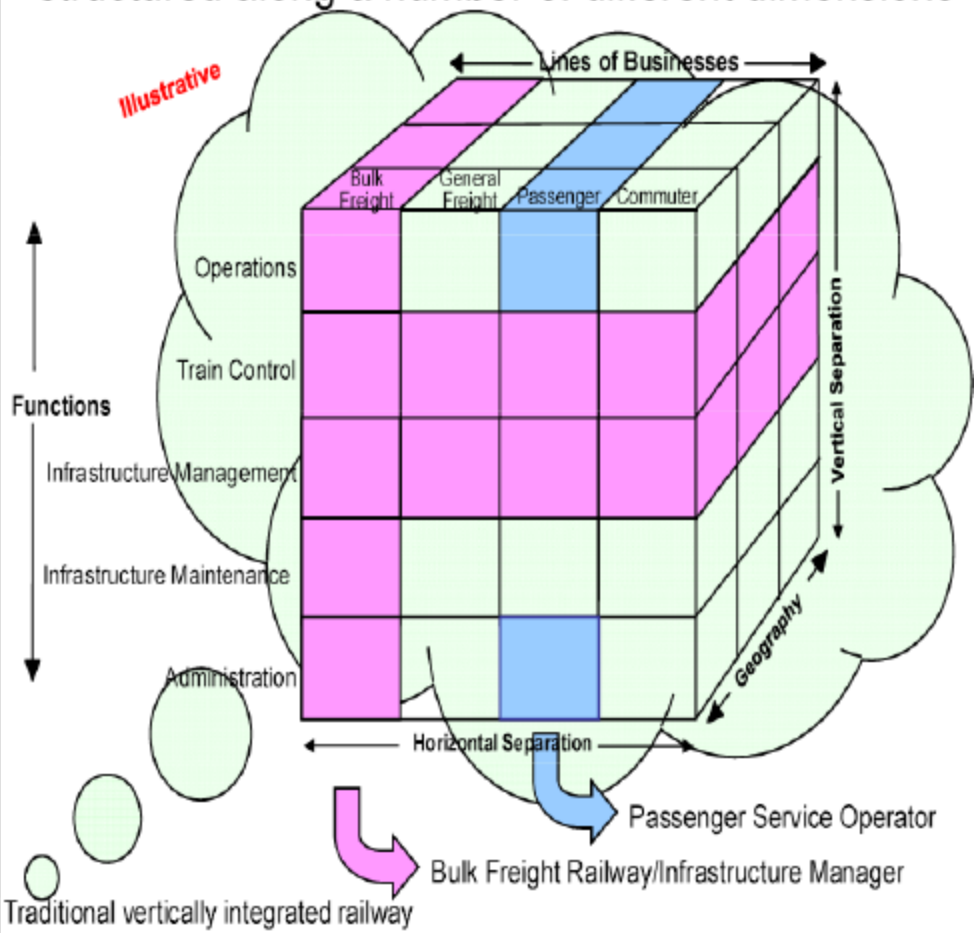


Source: Lubis (2013)

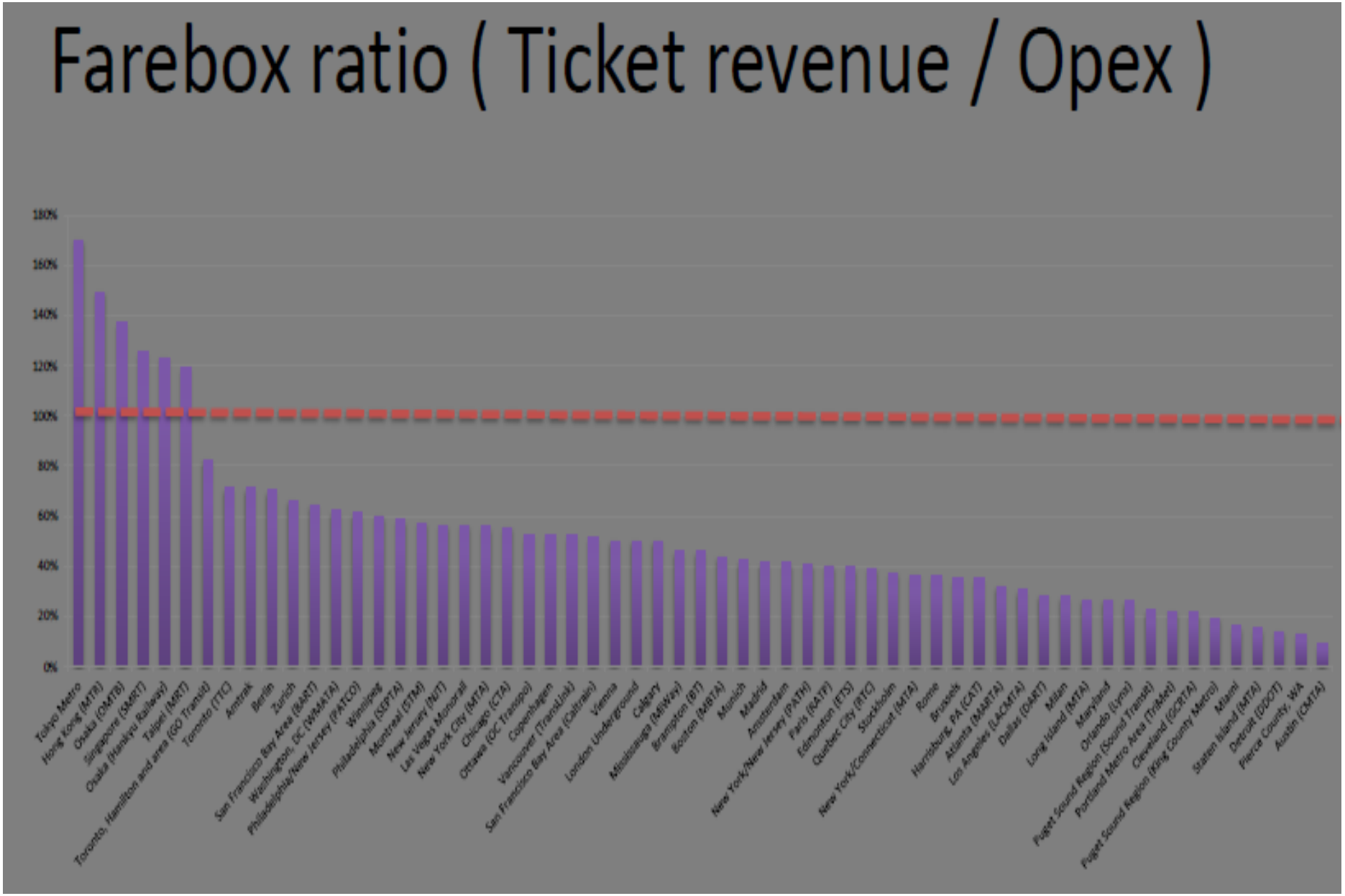
Key Issues

- Industry Structure
  - fully integrated
  - vertically integrated
  - functional separation
- Ownership and Control
  - public ownership
  - outsourcing
  - concessions
  - public share offerings
  - sale of assets or stock
- Infrastructure/Network Access
  - negotiated access
  - mandated access
  - open access
- Regulatory oversight
  - safety
  - rates
  - access
  - contract compliance
- Community Service Obligations
  - corporate governance
  - payment accountability
  - payment transparency
  - funding sources

Railways are complex enterprises and can be structured along a number of different dimensions

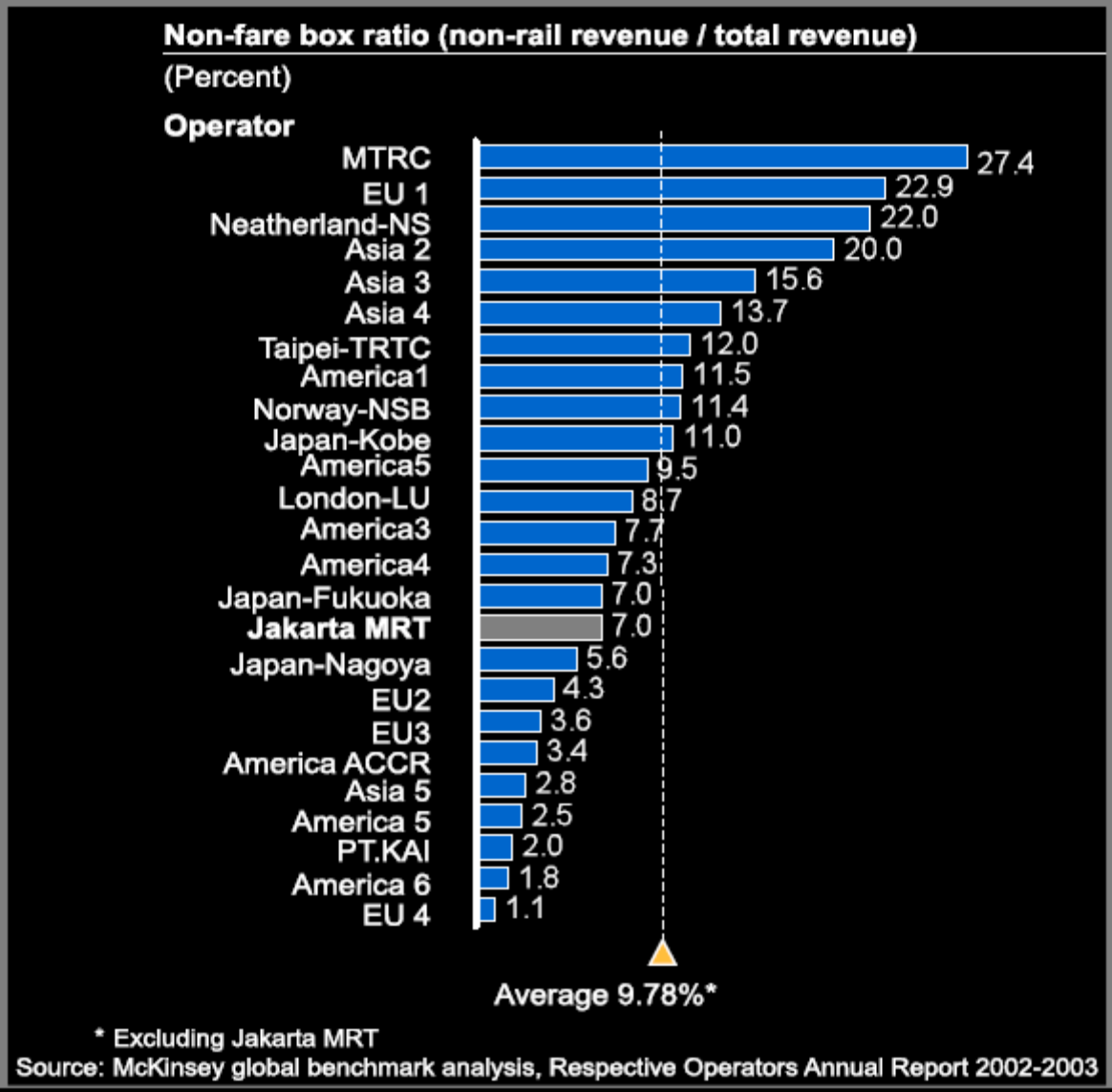


Source: Lubis (2013)



Source: Lubis (2013)

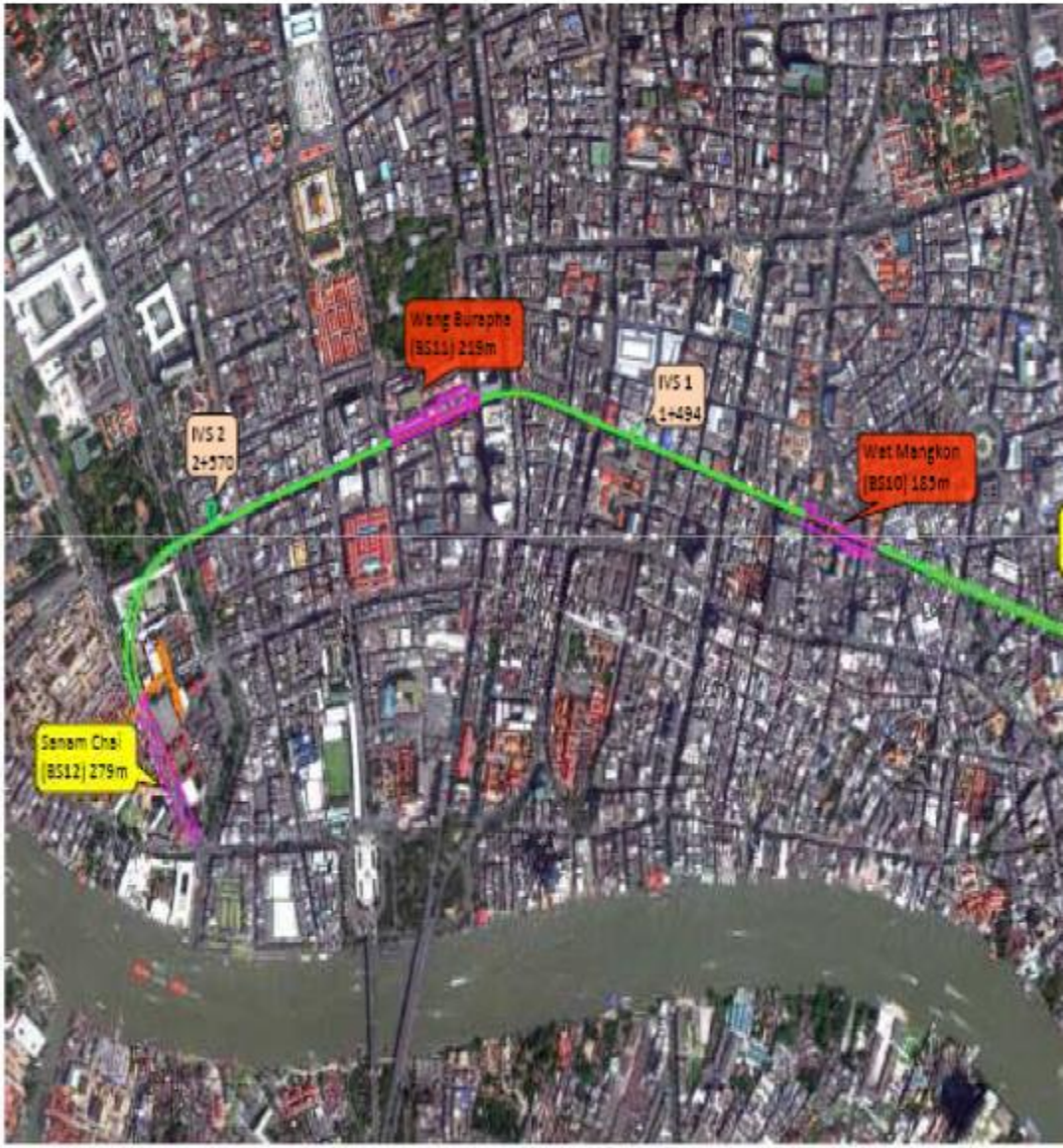
Non farebox revenue



H.WAGNER

Bangkok Metro Blue Line Extension Contr

MRTA (Mass Rapid Transit Authority) has awarded a further Package of Civil Works valued at 1.5 bn USD for construction of BLE in densely overbuilt old city center and under the river.

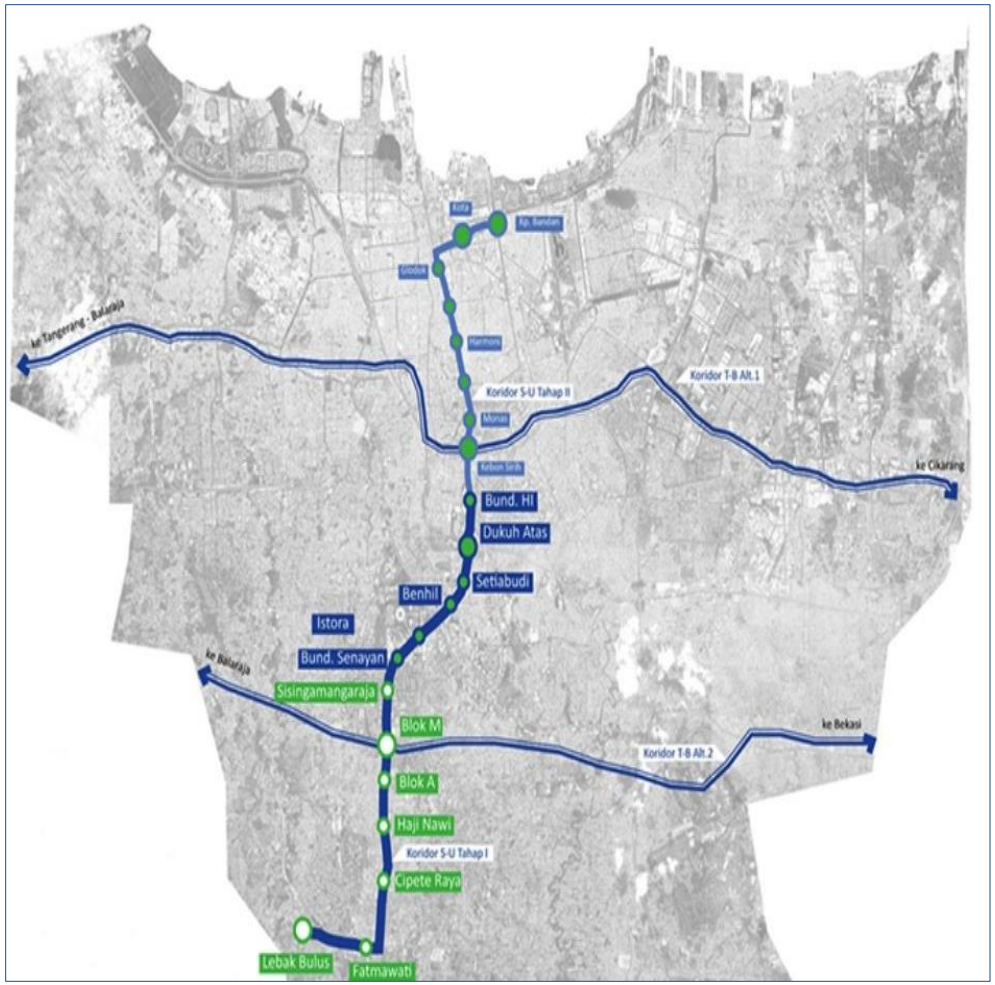


Singapore Metro Expansion

Singapore to spend $20 billion on building new MRT lines

Fakta Proyek MRT Jakarta

mrt jakarta
increasing mobility, improving life quality



Jumlah Koridor (Line)	**2 koridor** Koridor Selatan-Utara & Koridor Timur-Barat
Jumlah Stasiun	**21 Stasiun** Koridor Selatan-Utara **48 Stasiun** Koridor Timur-Barat
Panjang Jalur	**23,8 Km** Koridor Selatan-Utara **87 Km** Koridor Timur-Barat
Perkiraan Beroperasi	**2018** Koridor Selatan-Utara Tahap I **2020** Koridor Selatan-Utara Tahap II **2024-2027** Koridor Timur-Barat

Fitur Proyek MRT Jakarta Tahap I Koridor Selatan-Utara

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SKEMA STASIUN MRT KORIDOR SELATAN - UTARA
TAHAP I LEBAK BULUS - BUNDARAN HI

Panjang Lintasan	**15.7 km (9.8 Km Layang (*Elevated*) 5.9 Km Bawah Tanah (*Underground*)**
Stasiun	**13 (7 layang – 6 bawah tanah)**
Waktu Tempuh	**30 menit**
Jarak antar Stasiun	**0.6 – 2.0 km**
Headway	**5 menit (2018)**
Rolling Stock	**± 16 set kereta (96 gerbong) 1 set = 6 gerbong**
Listrik	**60 MVA**
Kapasitas Depo	**Lebak Bulus (84 gerbong)**
Target konstruksi Selesai	**2018**

LEGENDA
- Stasiun Layang
- Stasiun Bawah Tanah
- Jalur Layang
- Jalur Bawah Tanah

Peta Rute Proyek MRT Jakarta Tahap I
Koridor Selatan-Utara

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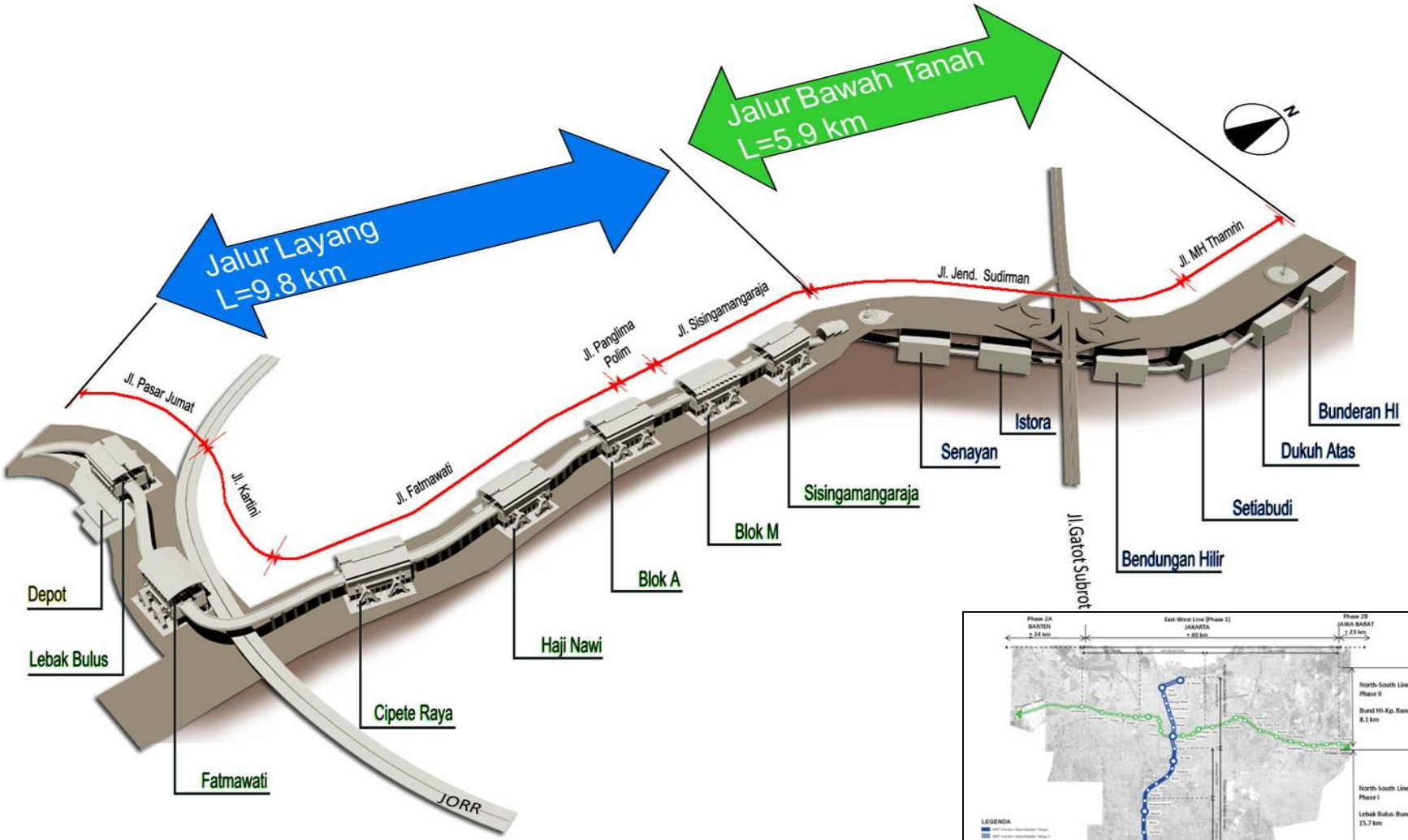

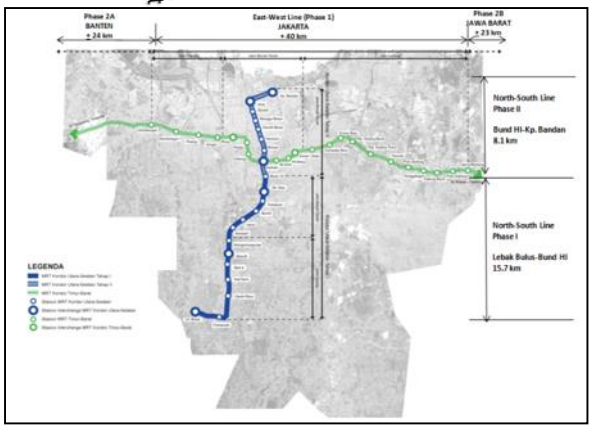

Ilustrasi Stasiun MRT Jakarta

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Underground Station

Platform Level
Concourse Level
Information Signage
Platform Screen Door
Underground Track

Underground Station

Elevated Station

Elevated Track
Platform Level
Concourse Level
Pedestrian plaza
Pedestrian bridge connect to other building

Elevated Station

- Bundaran HI
- Dukuh Atas
- Setiabudi
- Bendungan Hilir
- Istora
- Bundaran Senayan
- Sisingamangaraja
- Blok M
- Blok A
- Haji Nawi
- Cipete Raya
- Fatmawati
- Lebak Bulus

Ilustrasi Stasiun Layang Blok M

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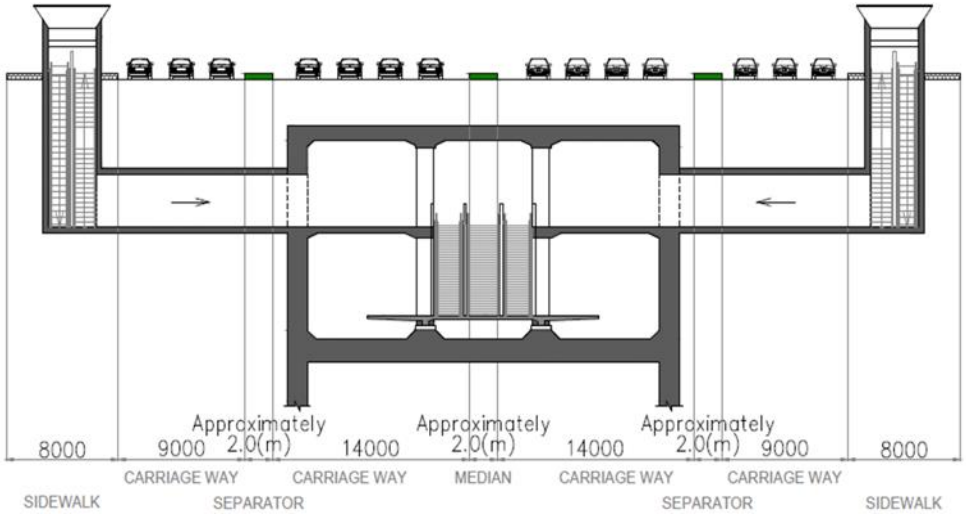
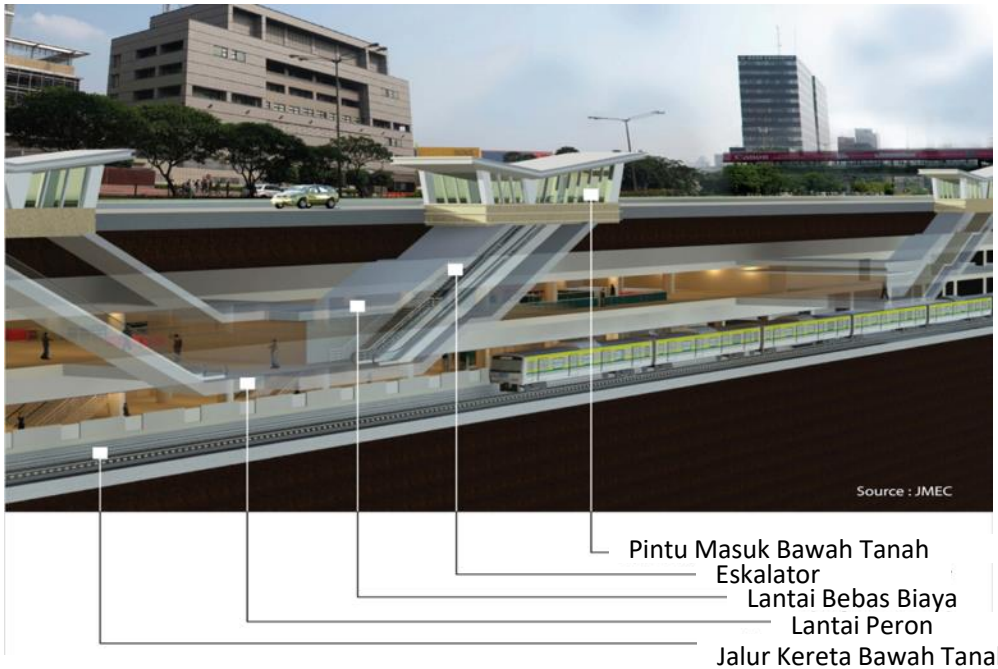
Ilustrasi Tipikal Stasiun Bawah Tanah





Proses Konstruksi *Underground* (1)

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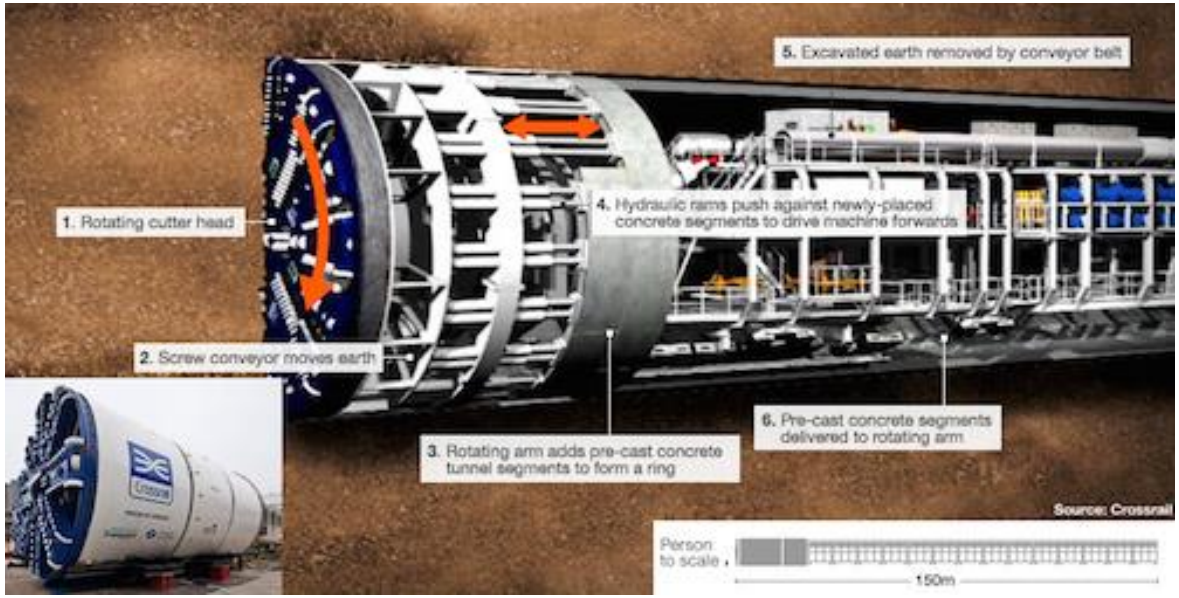
> Proses konstruksi *underground* akan menggunakan *Tunnel Boring Machines* (TBM) menembus lapisan tanah untuk menghubungkan satu stasiun dengan stasiun lainnya.

Tunnel Boring Machines (TBM) dioperasikan oleh kontraktor yang sudah berpengalaman di proyek MRT luar negeri

Mengapa Bored Tunnels?

- Memaksimalkan penggunaan lahan
- Mengurangi dampak pada permukaan tanah
- Penimbangan akan program kerja
- Kekurangan lahan untuk pembangunan terowongan cut & cover
- Meminimalisasi kerusakan lingkungan



Proses Konstruksi *Underground* (2)

Proses Pembangunan Stasiun Bawah Tanah

Dampak dari Konstruksi Terowongan Cut & Cover

Proses Konstruksi *Underground* (3)

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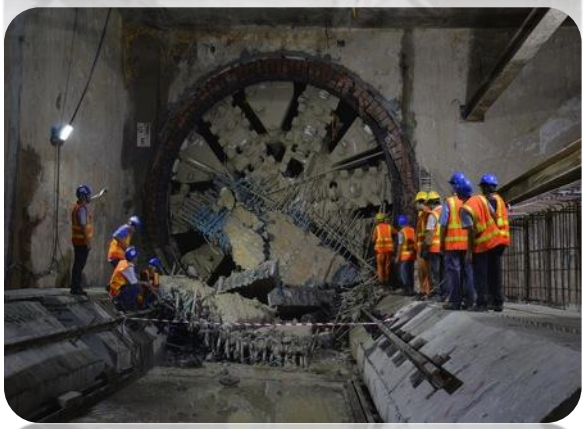
> Proses Tunnel Boring Machines (TBM) menembus lapisan tanah untuk menghubungkan satu stasiun dengan stasiun lainnya.





Proses Konstruksi Layang

Proses Konstruksi Jalur MRT Layang pada prinsipnya hampir sama dengan proses konstruksi jalan layang

Rekayasa Lalu Lintas Proyek MRTJ (2)

Ilustrasi Rekayasa Lalu Lintas Konstruksi *Underground*

> Rekayasa lalu lintas dilakukan untuk memastikan jalur lalu lintas yang terdampak pembangunan proyek MRT Jakarta tetap dapat digunakan untuk aktivitas sehari-hari.

Kegiatan dan Jadwal Konstruksi Tahap I Koridor Selatan-Utara

Pekerjaan Yang Tengah Dilakukan

Pekerjaan Pengupasan Jalur Hijau & Relokasi Utilitas di Jalan Sudirman

Pekerjaan *Test Pit & Soil Investigation* di Fatmawati dan Lebak Bulus

Pengerasan jalan untuk menyediakan lajur pengganti

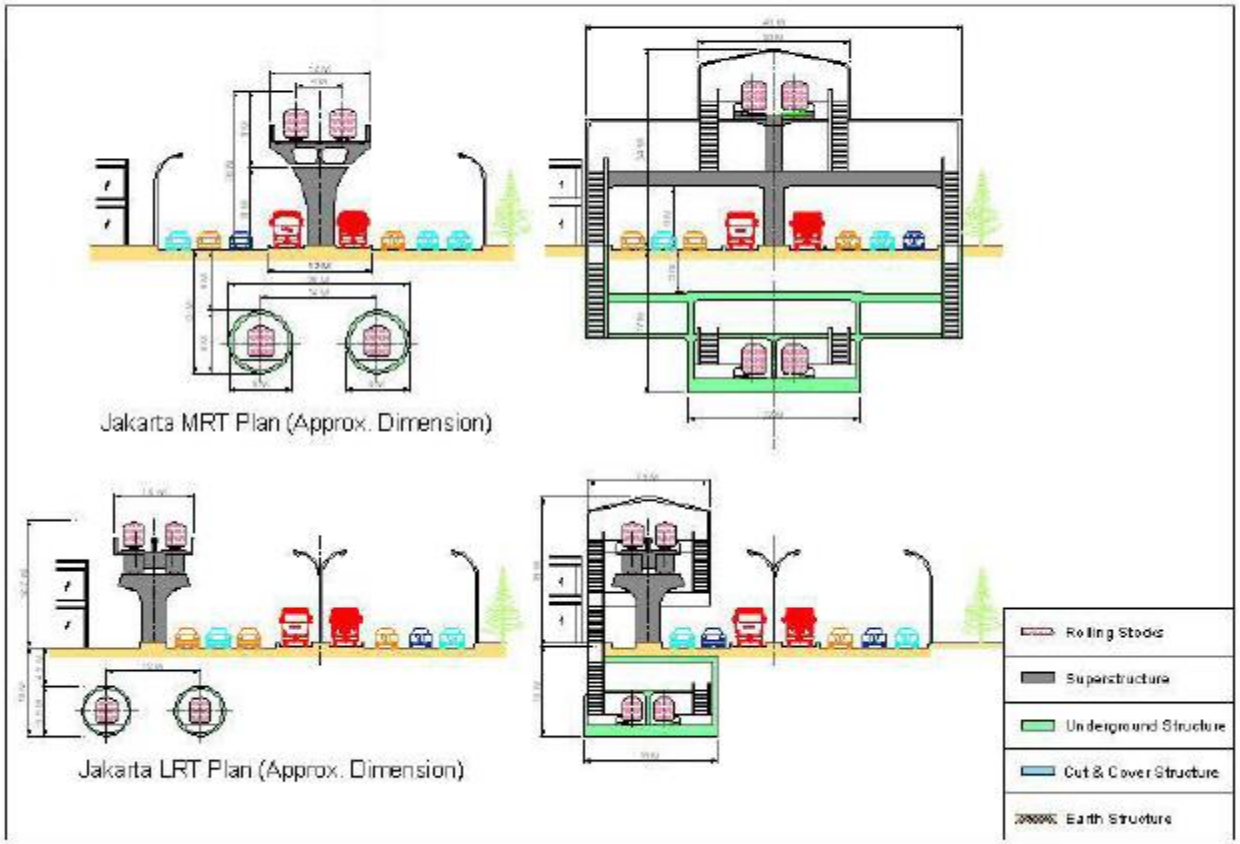
Waktu Konstruksi Sejak *Groundbreaking*

No.	Nama Kegiatan	Durasi (Bulan)
1	**Konstruksi**	**57**
1.1	**Sipil (Layang: CP101, CP102, CP103)**	**55 (-1)**
1.1.1	Desain, Survey, Konstruksi Struktur dan *Finishing*	53
1.1.2	*Depot Equipment*	31
1.1.3	Product Services (*training, manual*, dll)	9
1.2	**Sipil (Bawah Tanah: CP104, CP105, CP106)**	**57**
1.2.1	Desain, Survey, Konstruksi Struktur dan *Finishing*	53
1.2.2	Product Services (*training, manual*, dll)	15
1.3	***Railway Systems & Trackwork* (CP107)**	**44 (-12)**
1.3.1	*Installation Trackwork* & E/M	19 (-3)
1.3.2	*Design and Procurement* (Track & E/M)	35 (-13)
1.4	***Rolling Stock* (CP108)**	**45 (-7)**
1.4.1	*Assembly*	2
1.4.2	*Design and Fabrication*	37 (-7)
2	***Testing***	**7**
2.1	*Integration Testing & Commissioning*	4
2.2	*Trial Run*	3

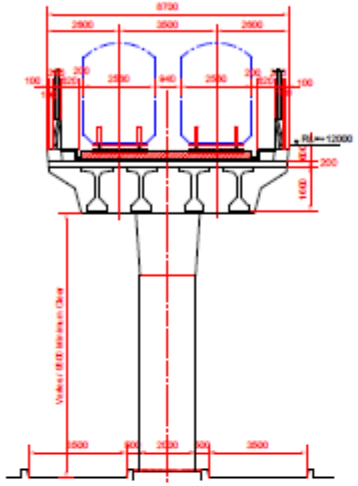
Perkiraan Operasi Pertama
Februari 2018

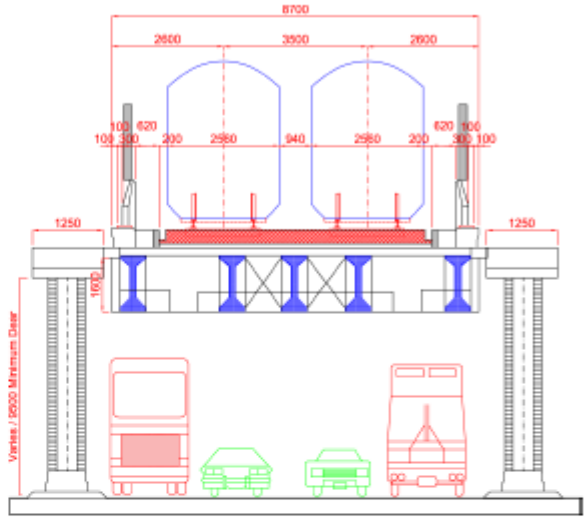
Perkiraan Layanan Penuh
Mei 2018

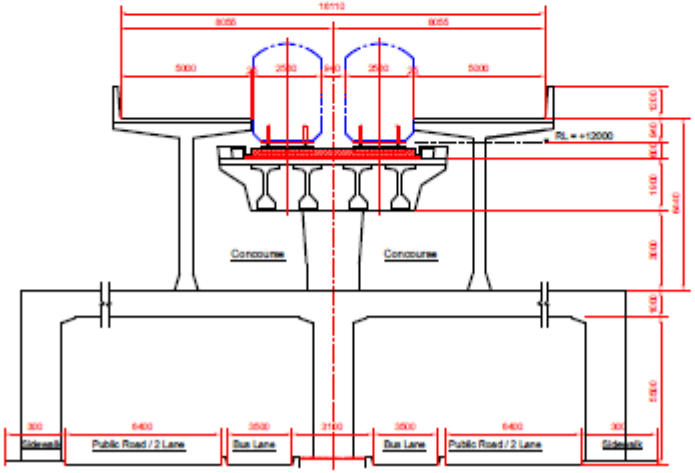
Cross profile comparison



LRT Typical Elevated Cross Section







A bit of History ...

0. Indonesia Railway = the Dutch Heritage
1. From WB REP (1990s) → Railway Law # 23 / 2007
2. Railway Revitalization (2008 – 2011)

   - Normalize exsting railway backlog

   - Institutional reform, human resources dev.

   - Quick win projects
3. 2011 – present : Cosmetics, pragmatism, structural change ?

   (Monorail PFI) enthusiasm !

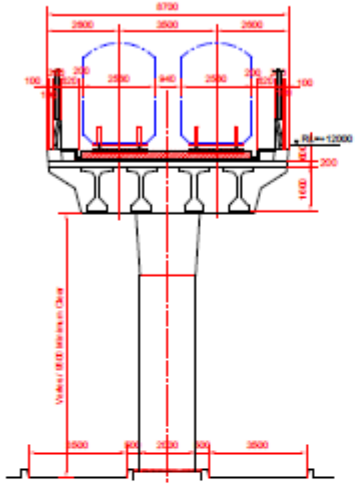
Definition of railway restructuring

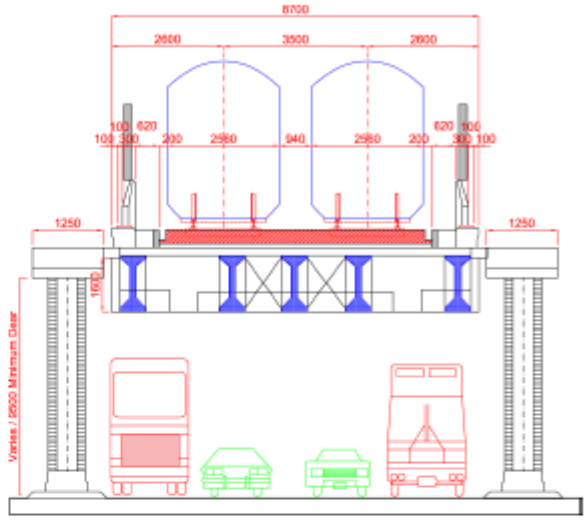
The United Nations (2003) defined railway restructuring as;

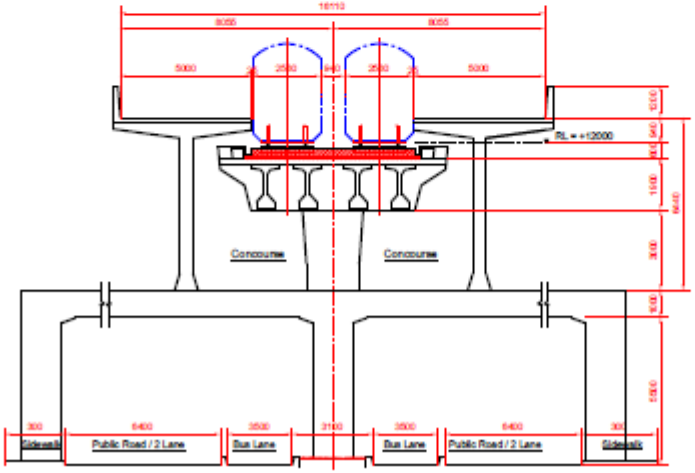
> *"The adaptation of railway industry structures, institutions and business processes in response to changing customer needs and technological change".*

Noted progress on European railway (Vertical Separation)
"Economic Effects of Vertical Separation in Railway Sector"
(van de Velde & Nash, 2012)

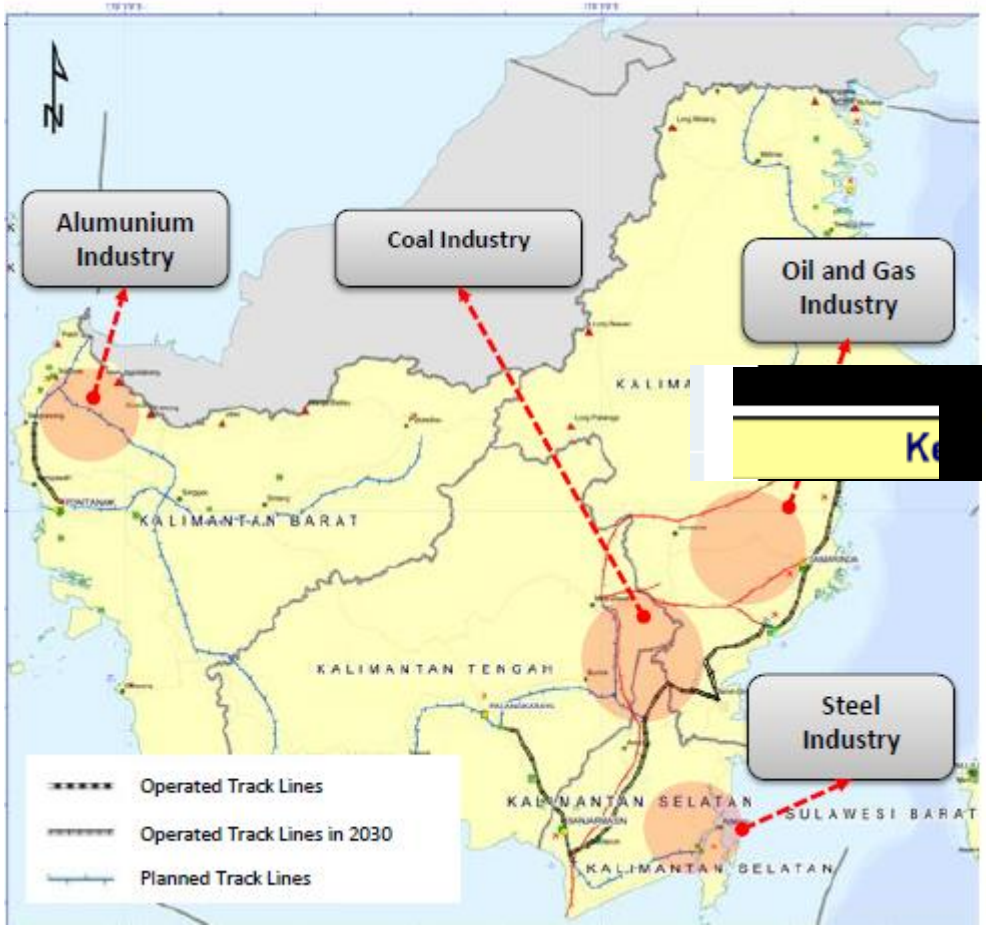
LRT Typical Elevated Cross Section





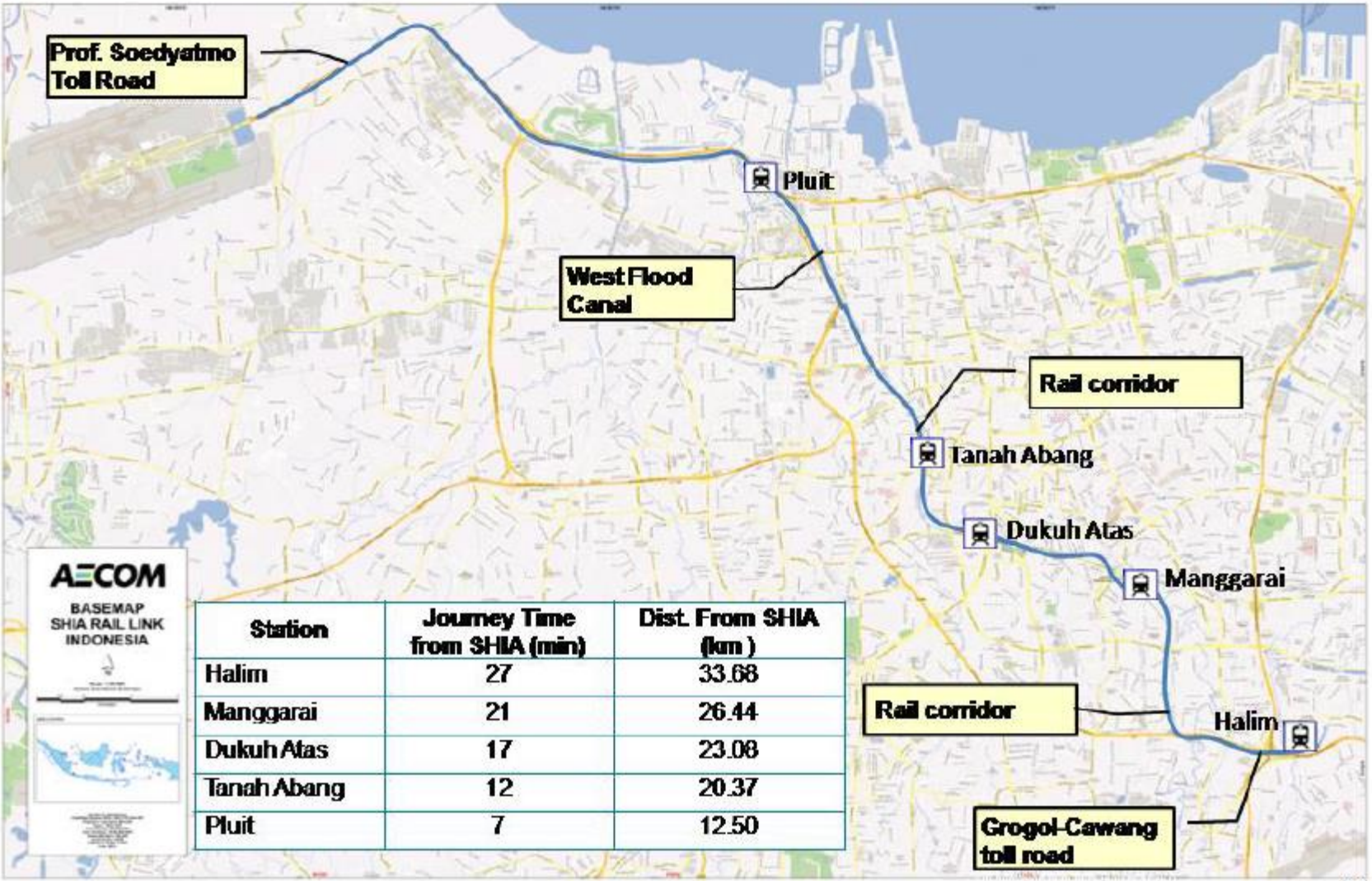


Planning for Rail Infrastructure – Kalimantan Island



- Railway line to connect: Banjarmasin-Balikpapan-Samarinda-Bontang-Tenggarong-Kotabangun, Banjarmasin-Palangkaraya, Pontianak-Mempawah-Singkawang;
- Railway line connecting mining area to port: Samarinda, Balikpapan and Banjarmasin;
- Railway line linking coal area: Puruk Cahu – Bangkuang, Bangkuang – Lupak Dalam, Kudangan – Kumai, Muara Wahau – Lubuk Tutung, Bontang – Sangkulirang – Tanjung Redep, Tanjung Barabai – Martapura – Banjarmasin, Tanjung – Buntok – Muara Teweh.

The Preferred Alignment



Station	Journey Time from SHIA (min)	Dist. From SHIA (km)
Halim	27	33.68
Manggarai	21	26.44
Dukuh Atas	17	23.08
Tanah Abang	12	20.37
Pluit	7	12.50

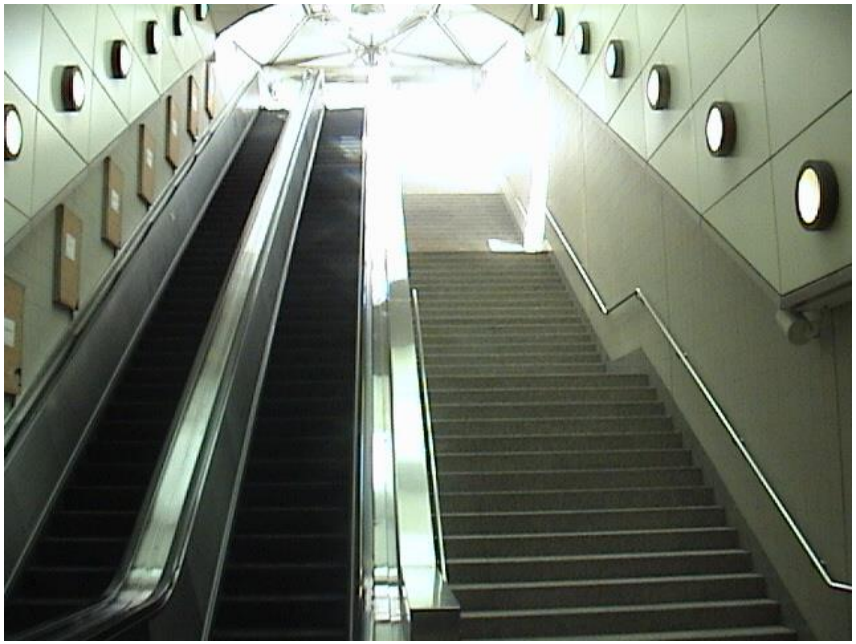
Bangkokt MRT 1

Bangkok MRT 2

Bangkok MRT 3

Bangkok MRT 4

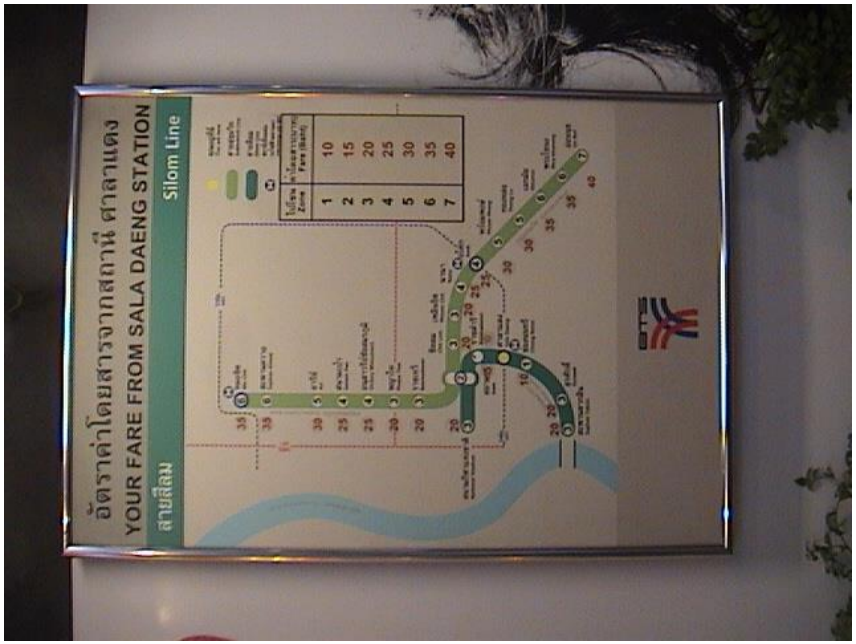
Bangkok MRT 5



Bangkok MRT 6

Bangkok Sky Train 1

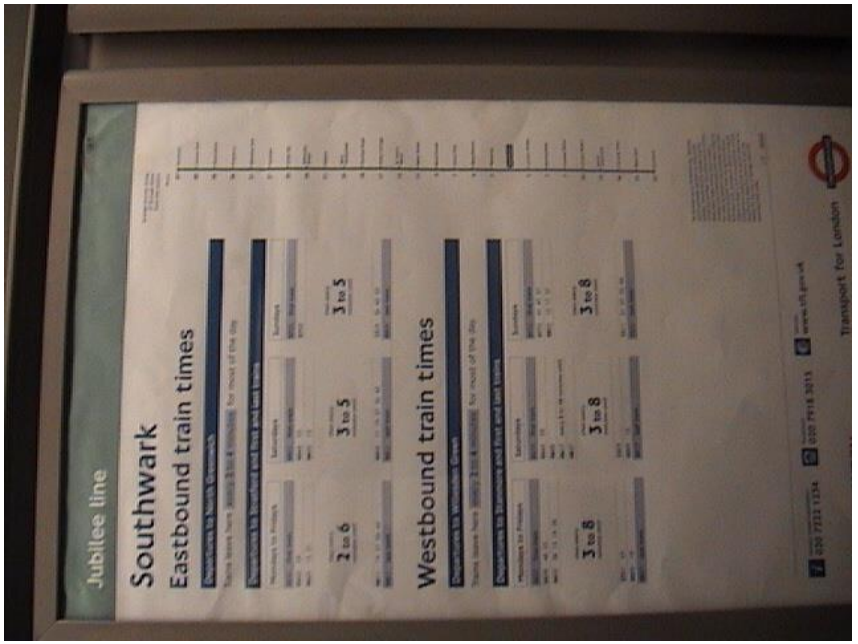
Bangkok Sky Train 2



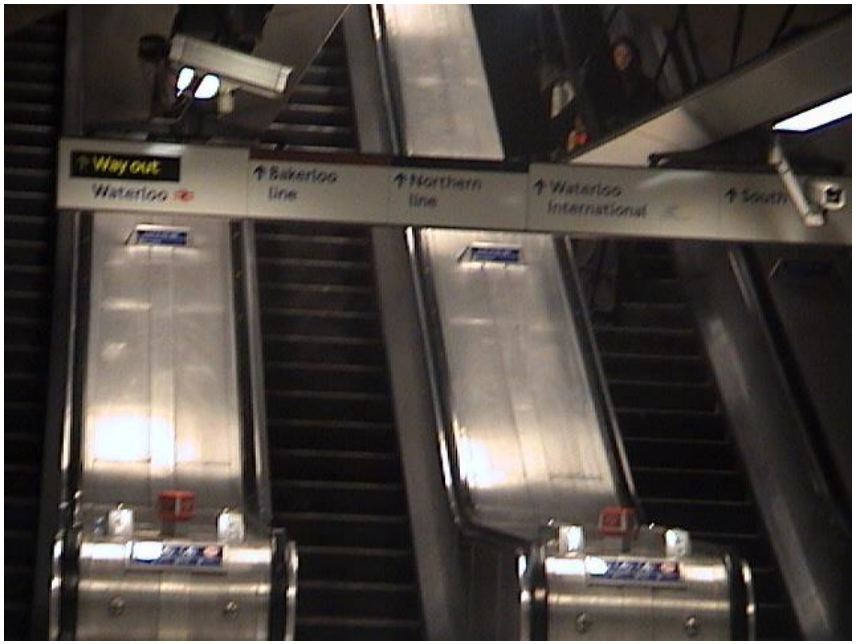
Dalian Tram 1

Dalian Tram 2

London Tube 1



London Tube 2

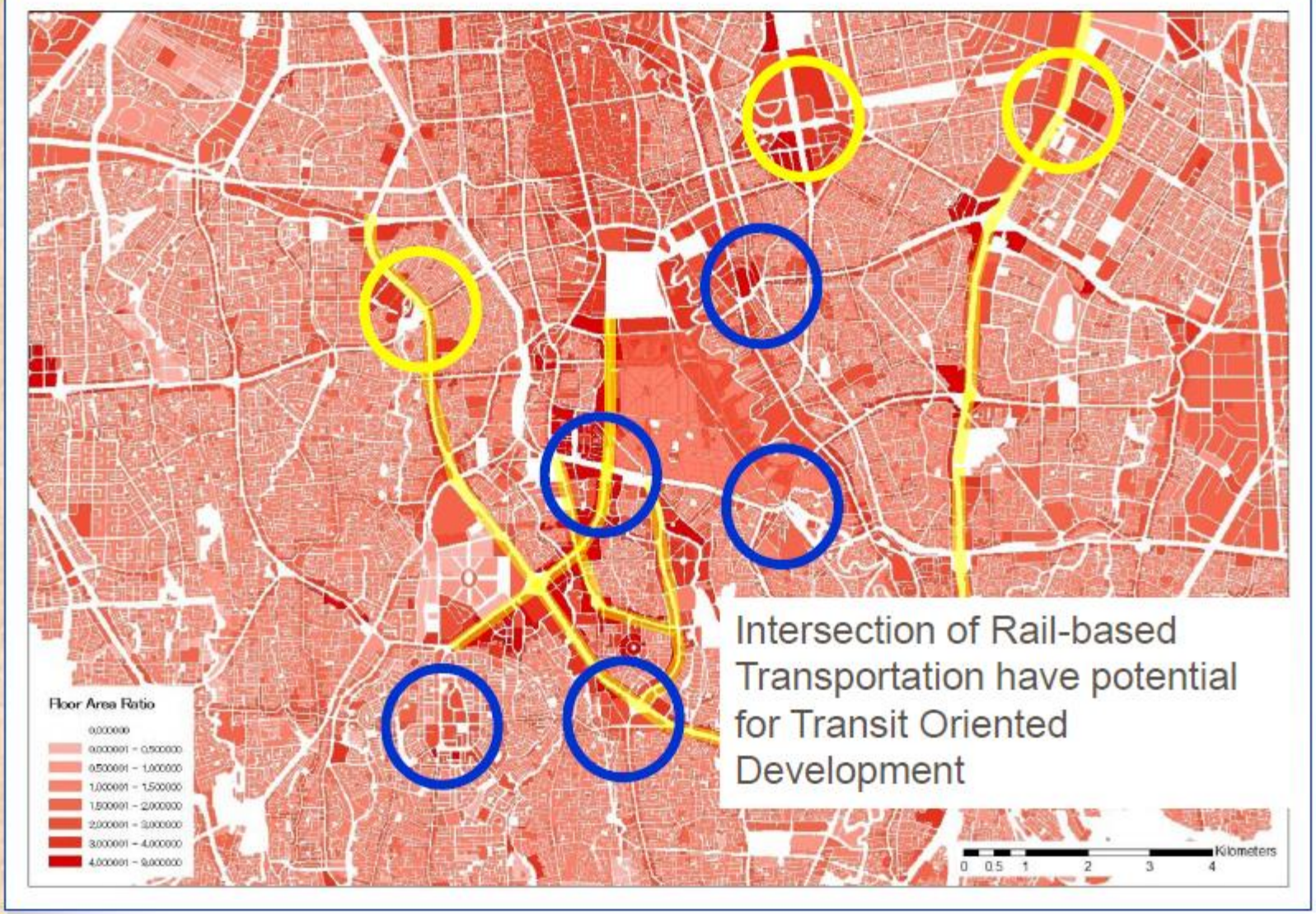


London Tube 3

London Tube 4

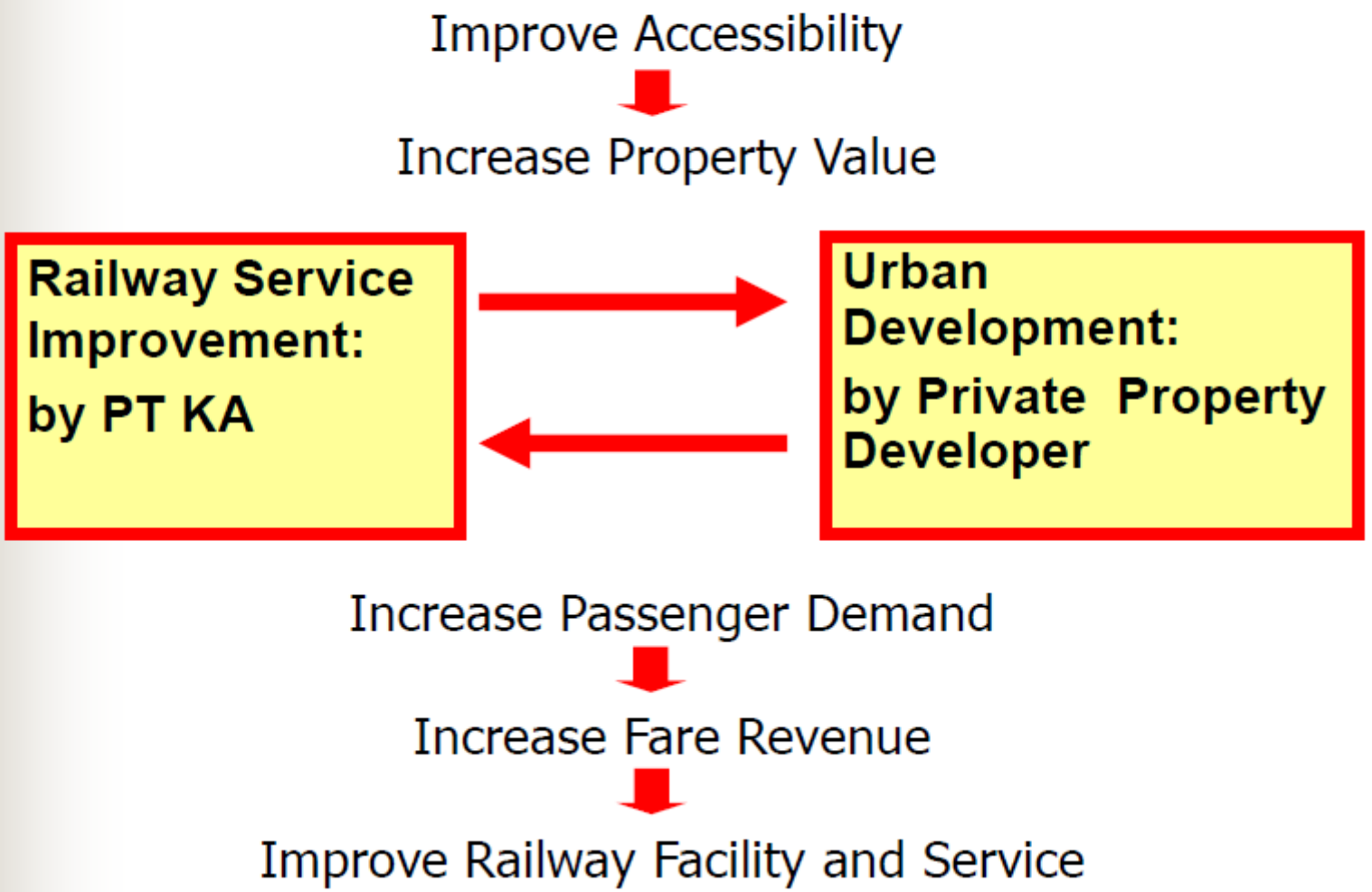
London Tube 5

Floor Area Ratio in CBD of DKI Jakarta



Source: Wachi (2013)

Capture of Development Benefits through Cooperation in Public Sectors



Source: Wachi (2013

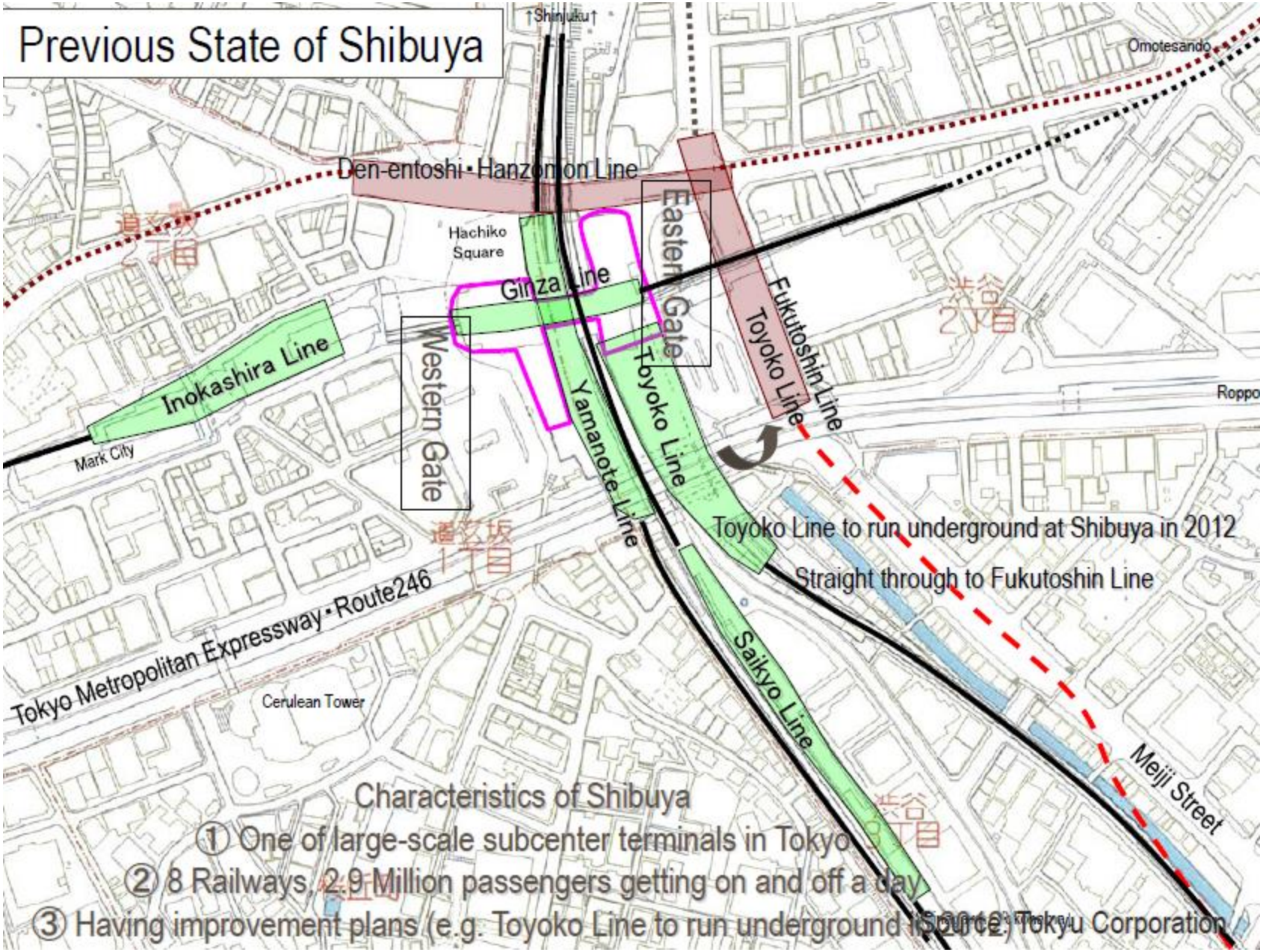
Business Development related to Railway in Japan

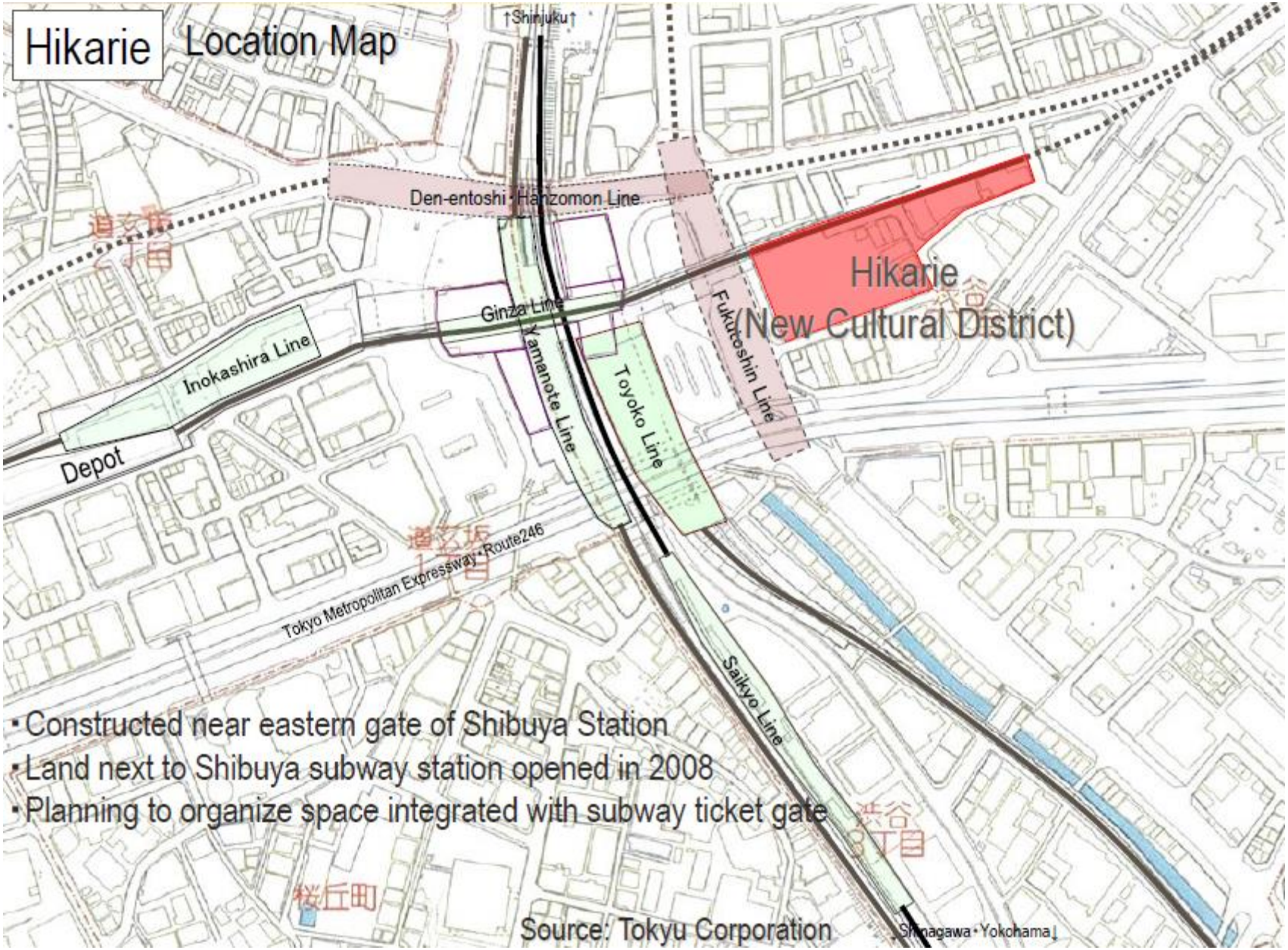
Hikarie Project

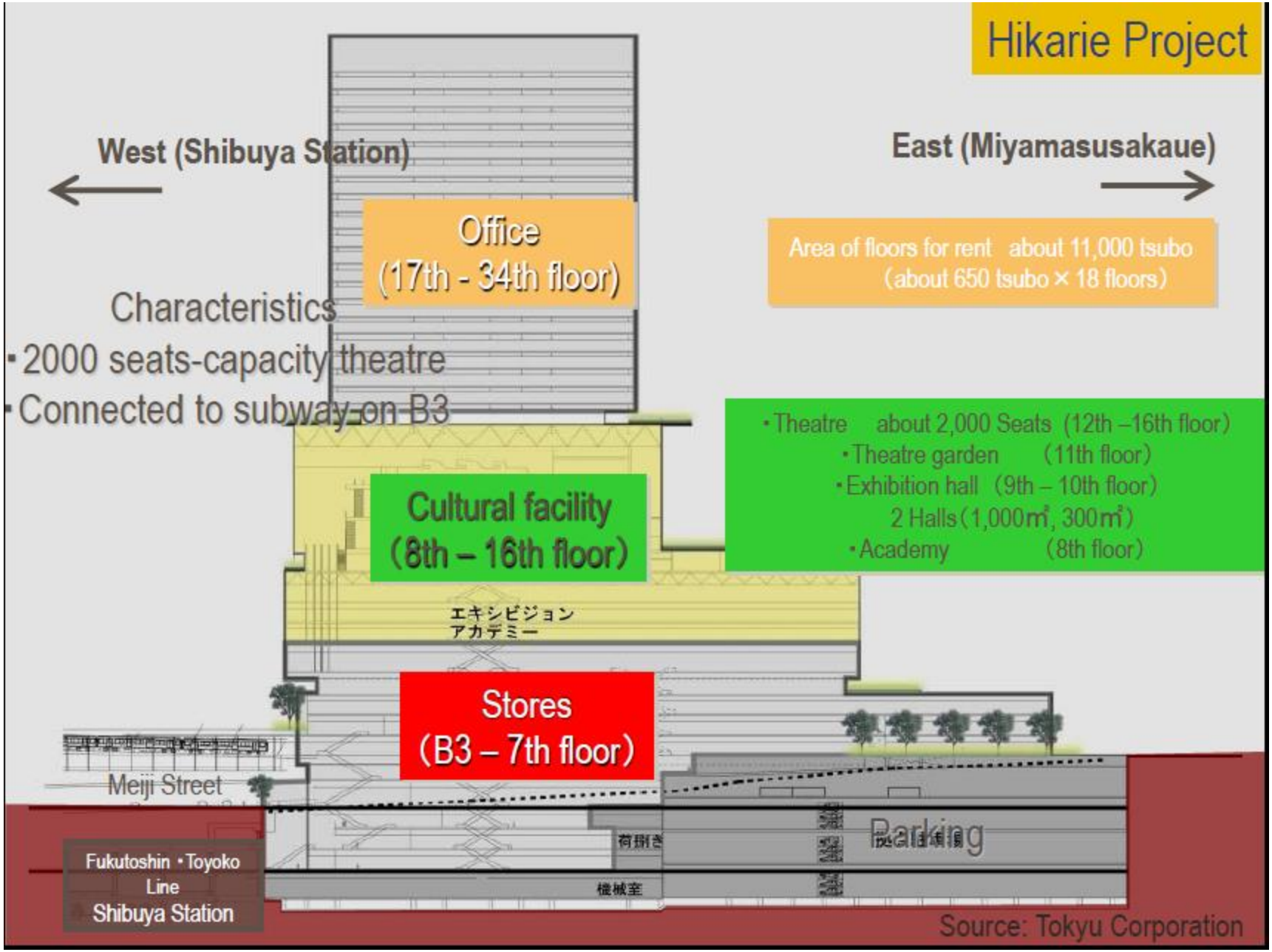
Example of
High-rise Commercial Facility Development
At Terminal Station, Shibuya
By Tokyu Railway Company Ltd

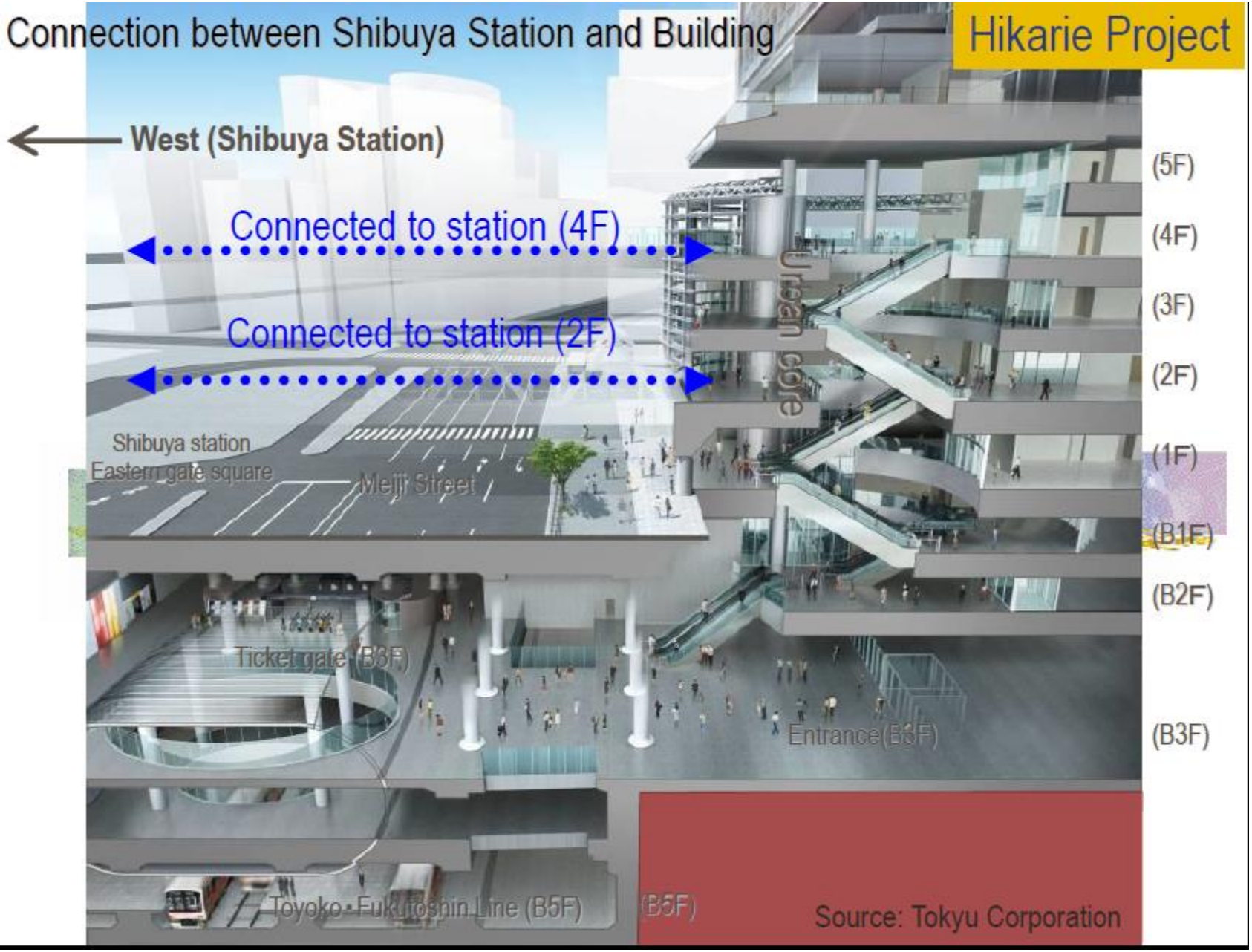
Building height	About 182m
Number of floors	34 levels above ground and 4 levels below
Ground area	About 9,600㎡
Planned total floor area	About 144,000 ㎡
Building area	About 7,800㎡

Source: Tokyu Corporation


Previous State of Shibuya
↑Shinjuku↑
Omotesando
Den-entoshi・Hanzomon Line
Hachiko Square
Ginza Line
Eastern Gate
Fukutoshin Line
Toyoko Line
Inokashira Line
Western Gate
Yamanote Line
Tokyo Metropolitan Expressway・Route246
Cerulean Tower
Saikyo Line
Meiji Street
Toyoko Line to run underground at Shibuya in 2012
Straight through to Fukutoshin Line
Characteristics of Shibuya
① One of large-scale subcenter terminals in Tokyo
② 8 Railways, 2.9 Million passengers getting on and off a day
③ Having improvement plans (e.g. Toyoko Line to run underground in 2012)
(Source) Tokyu Corporation

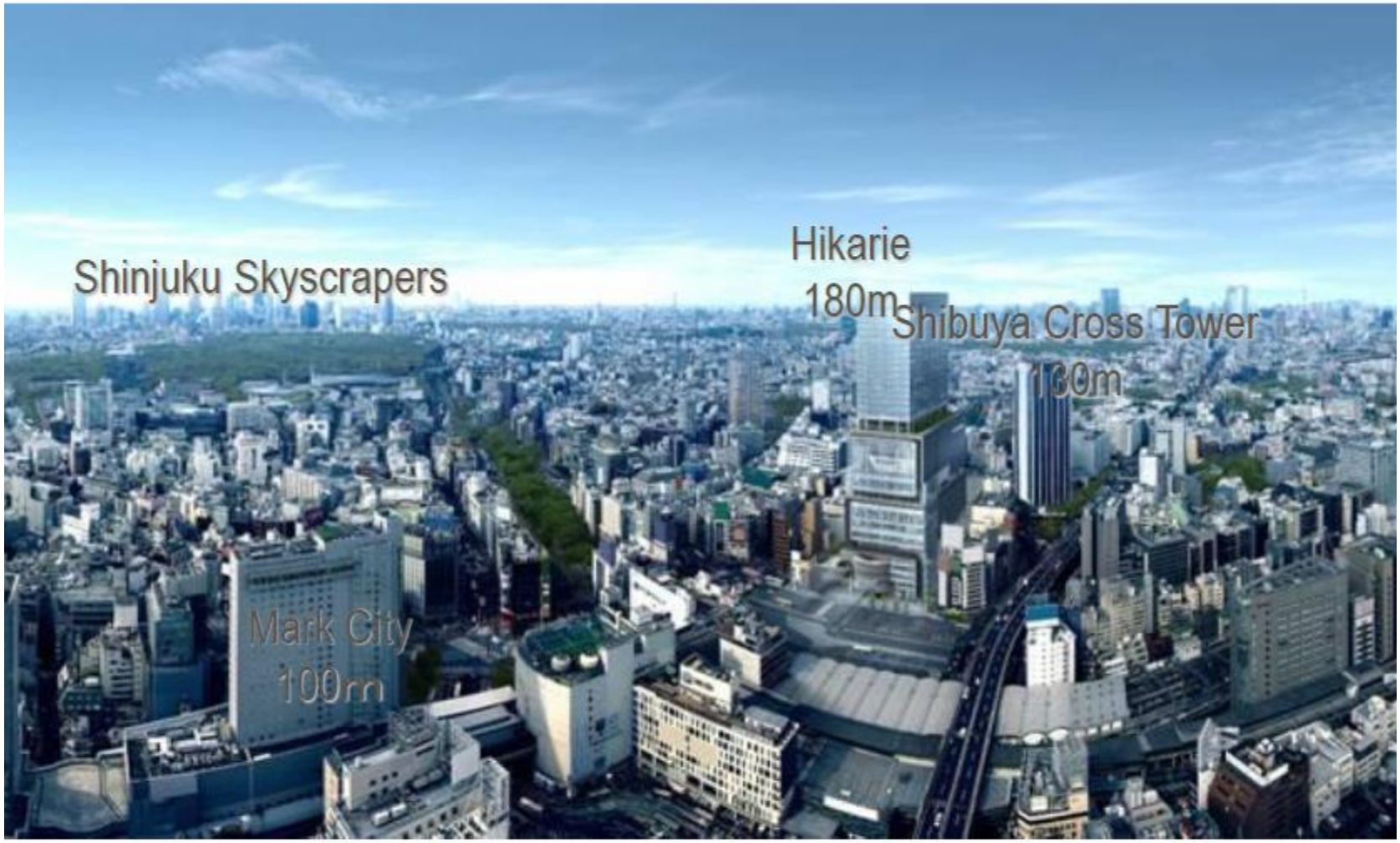

Hikarie Location Map
↑Shinjuku↑
Den-entoshi・Hanzomon Line
Hikarie
(New Cultural District)
Ginza Line
Fukutoshin Line
Inokashira Line
Kamanote Line
Toyoko Line
Depot
Tokyo Metropolitan Expressway・Route246
Saikyo Line
・Constructed near eastern gate of Shibuya Station
・Land next to Shibuya subway station opened in 2008
・Planning to organize space integrated with subway ticket gate
Source: Tokyu Corporation
↓Shinagawa・Yokohama↓


Hikarie Project
West (Shibuya Station)
East (Miyamasusakaue)
Office
(17th - 34th floor)
Area of floors for rent about 11,000 tsubo
(about 650 tsubo × 18 floors)
Characteristics
・2000 seats-capacity theatre
・Connected to subway on B3
・Theatre about 2,000 Seats (12th –16th floor)
・Theatre garden (11th floor)
・Exhibition hall (9th – 10th floor)
2 Halls (1,000㎡, 300㎡)
・Academy (8th floor)
Cultural facility
(8th – 16th floor)
エキシビジョン
アカデミー
Stores
(B3 – 7th floor)
Meiji Street
Parking
荷捌き
機械室
Fukutoshin・Toyoko
Line
Shibuya Station
Source: Tokyu Corporation


Connection between Shibuya Station and Building
Hikarie Project
West (Shibuya Station)
Connected to station (4F)
Connected to station (2F)
Urban core
Shibuya station
Eastern gate square
Meiji Street
Ticket gate (B3F)
Entrance (B3F)
Toyoko・Fukutoshin Line (B5F)
(B5F)
(5F)
(4F)
(3F)
(2F)
(1F)
(B1F)
(B2F)
(B3F)
Source: Tokyu Corporation

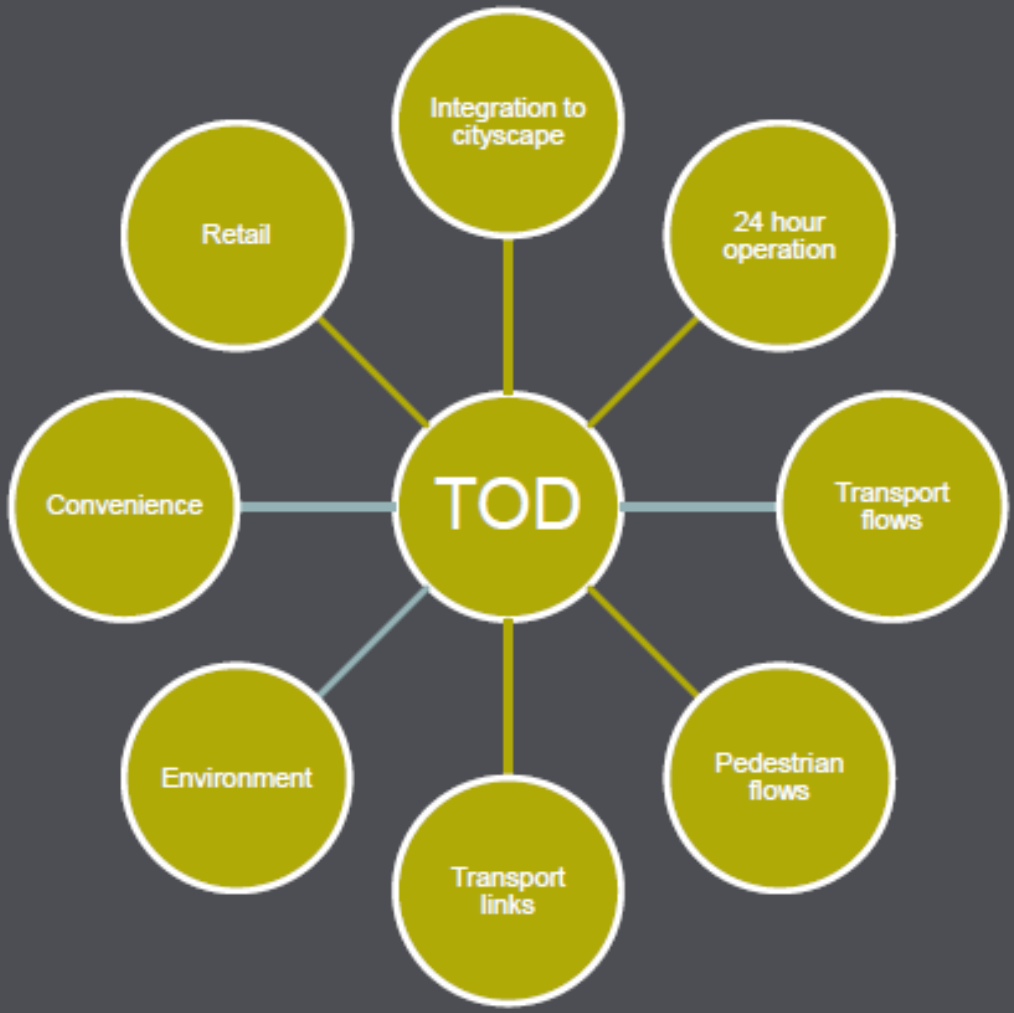
Source: Wachi (2013)

Source: Wachi (2013)

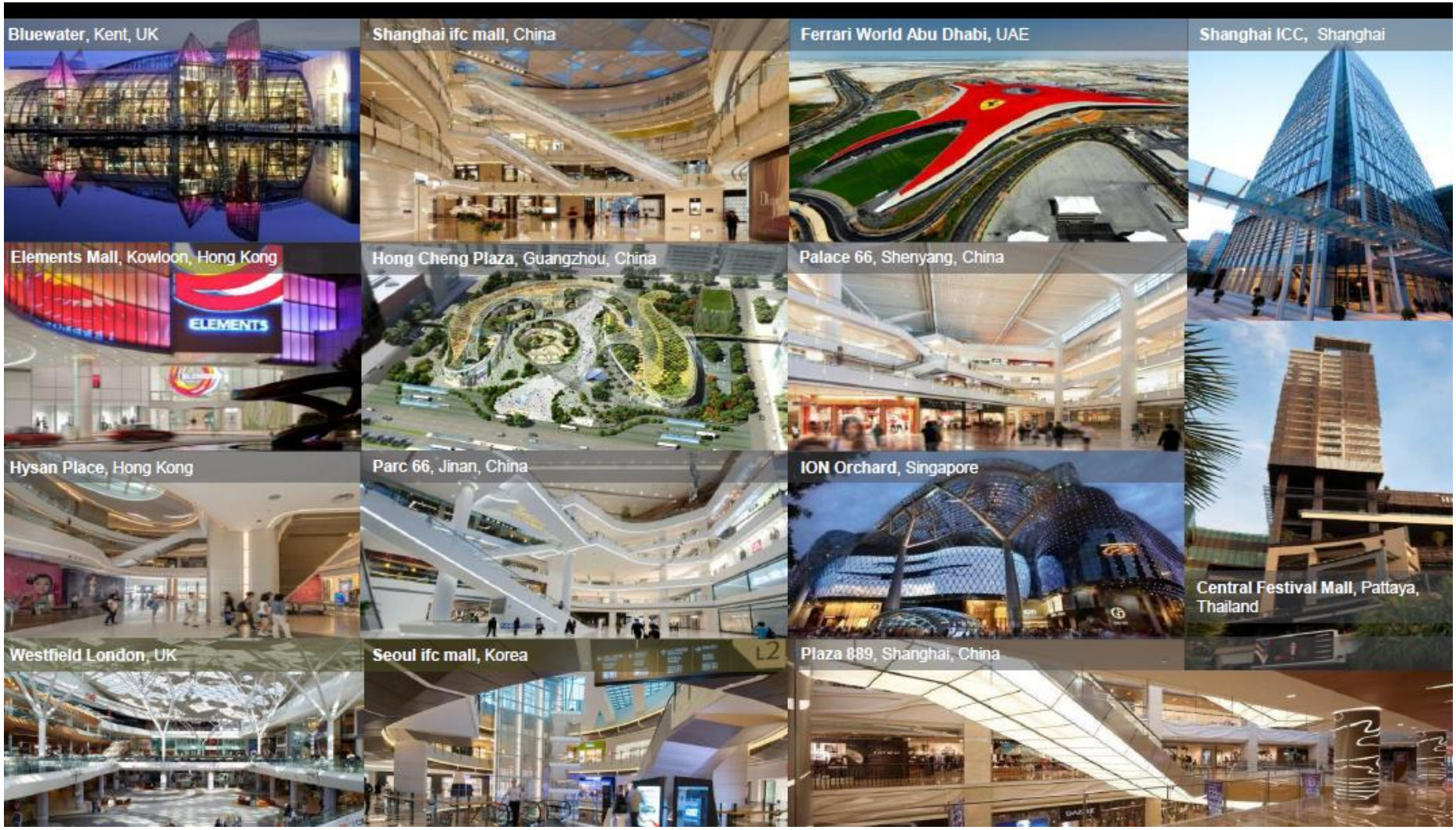


Source: Wachi (2013)

TOD considerations



Source: Chua (2013)



Source: Chua (2013)

ION Orchard, Singapore

Source: Chua (2013)

Source: Chua (2013)

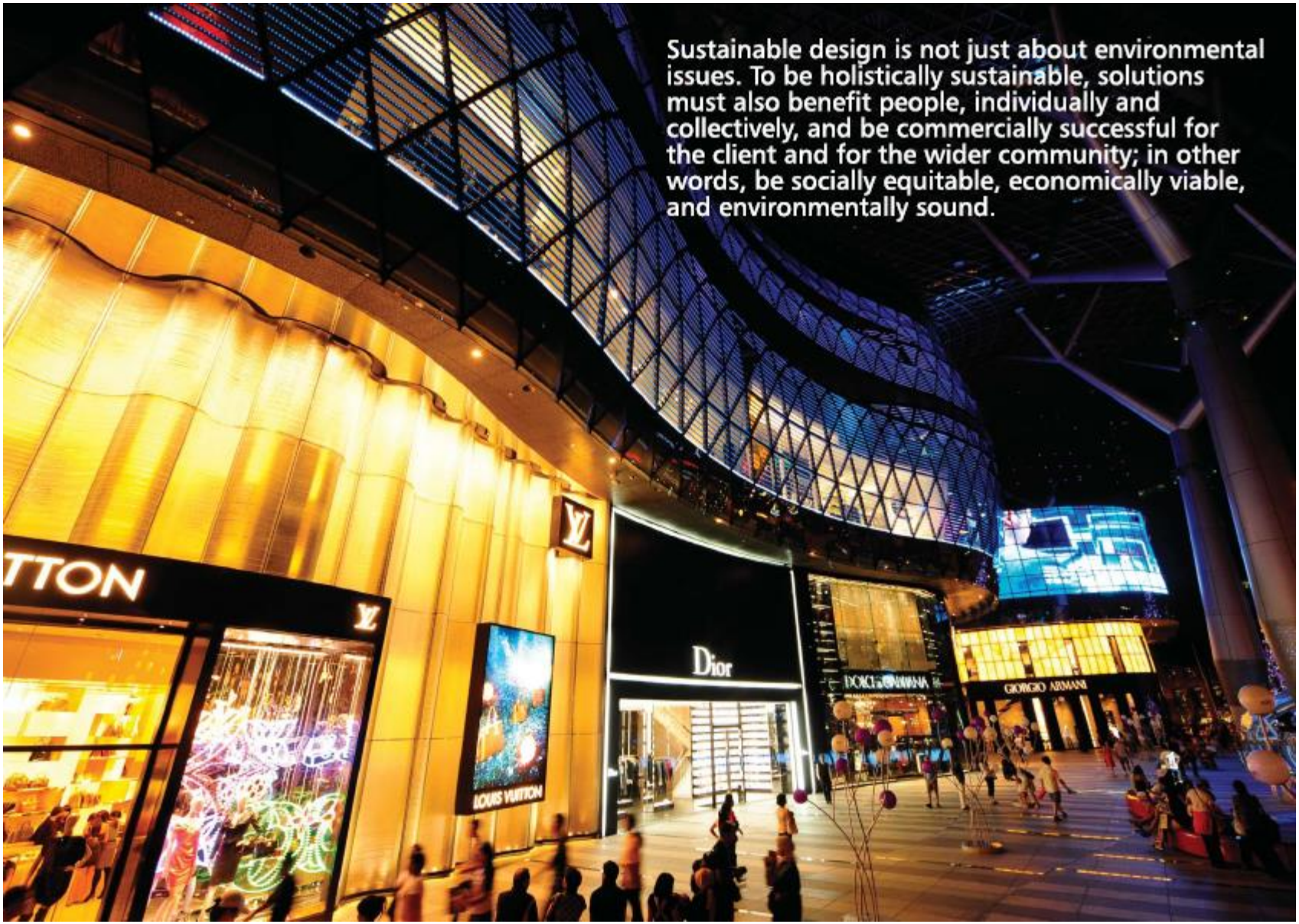
Source: Chua (2013)

Integrating a multitude of functions

Source: Chua (2013)

Source: Chua (2013)

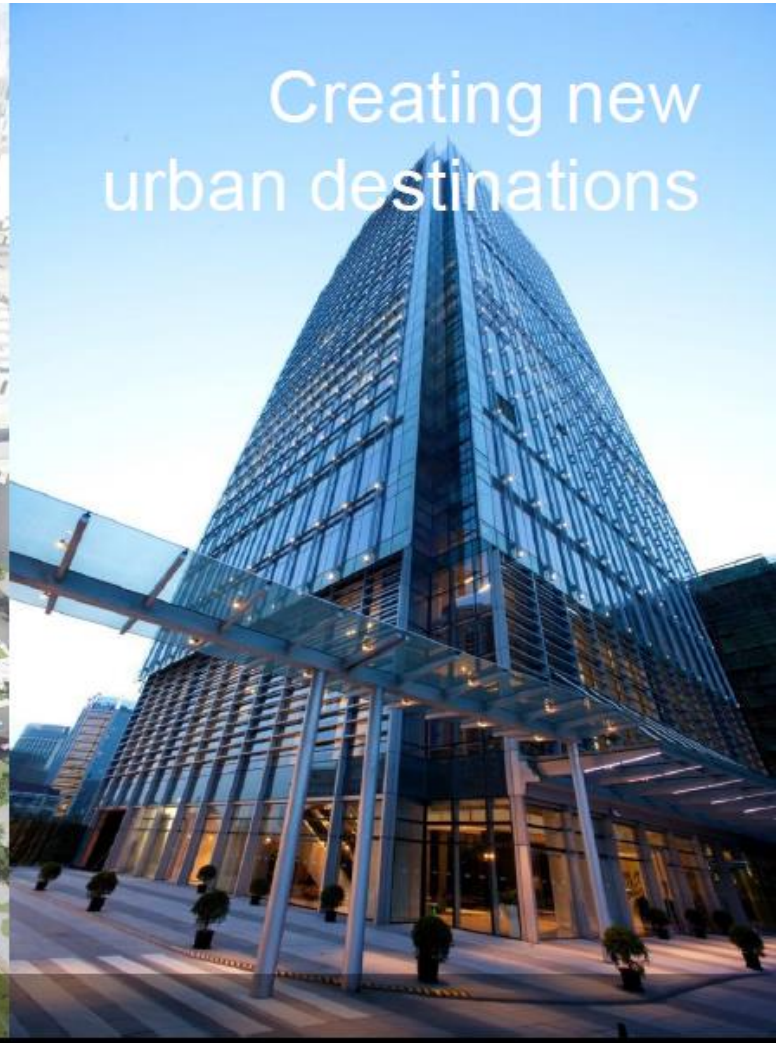
Source: Chua (2013)



Source: Chua (2013)

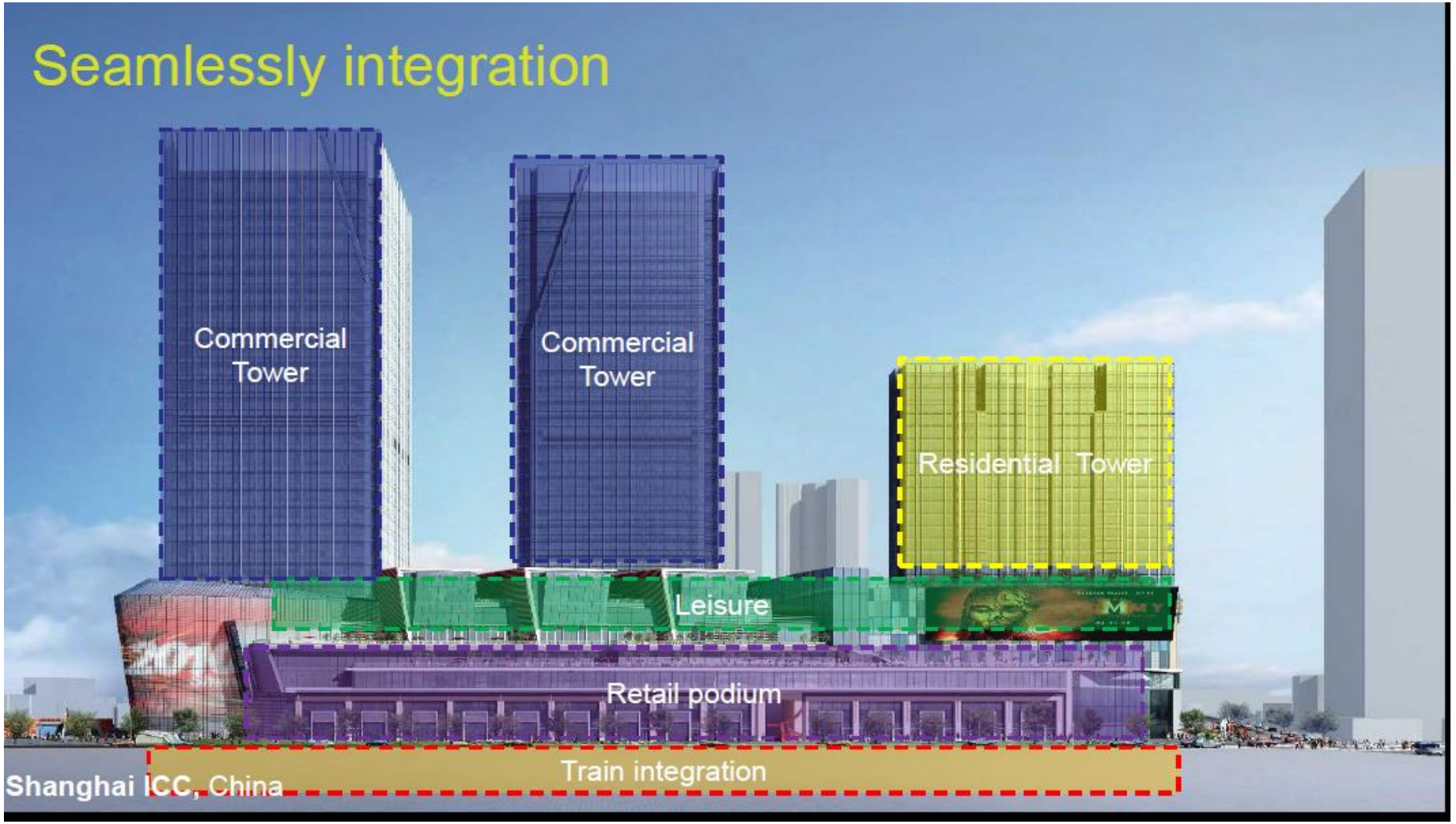
Transport Destinations

INTERNATIONAL COMMERCE CENTR (ICC) SHANGHAI



Source: Chua (2013)

Source: Chua (2013)



Source: Chua (2013)

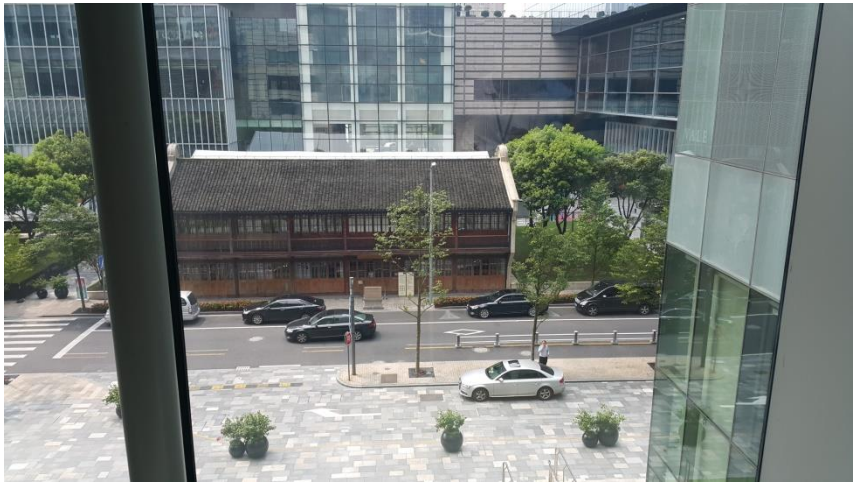
ICC Shanghai

Public Transport Integration

Narrow Side Road

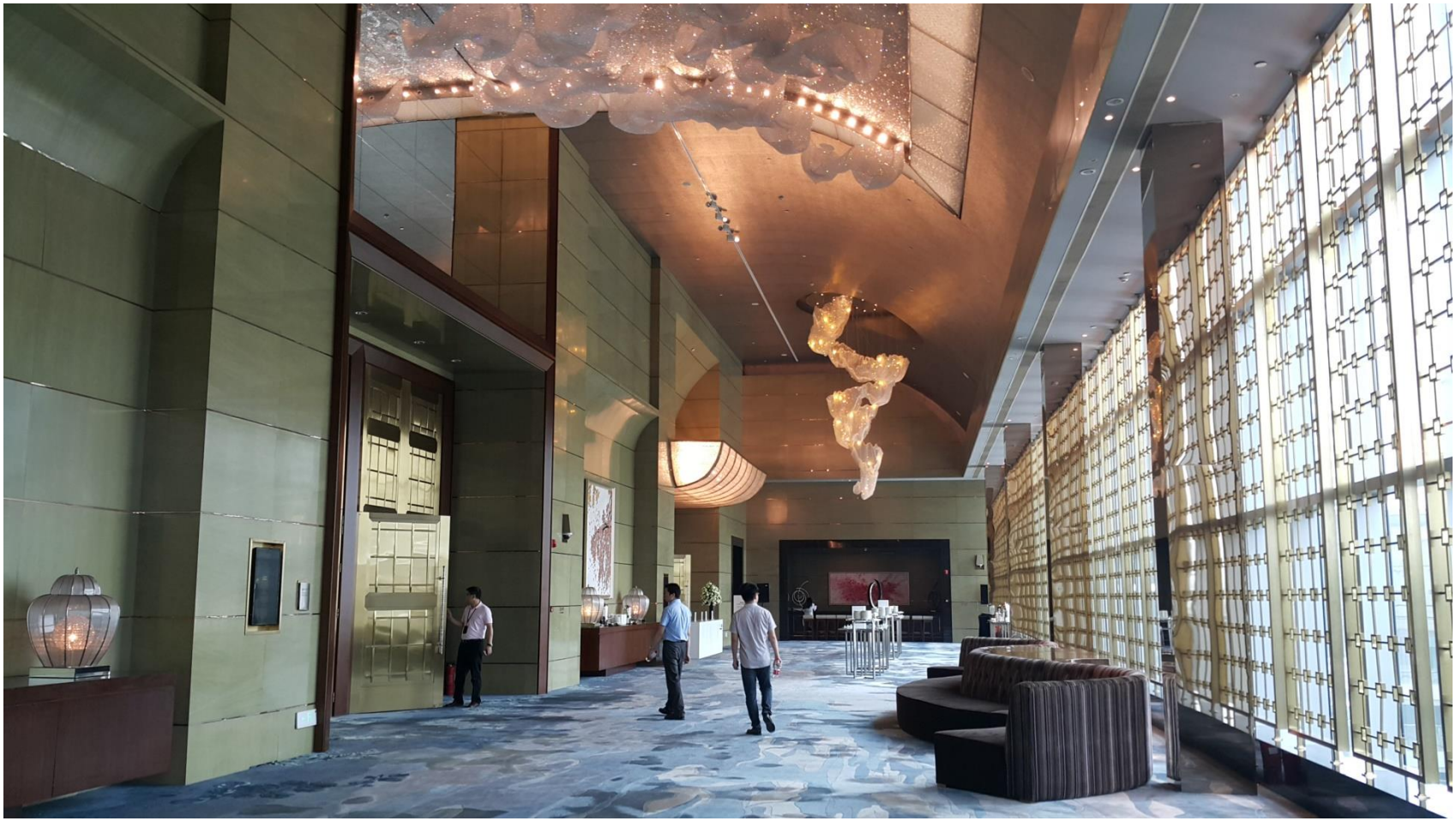
ICC Shanghai

Mao’s Place



Famous Tample

The Hotel Ballroom@ICC Shanghai



Shanghai MRT

Passenger Screed Door

Tongji University Station

Shanghai MRT

The Network

Bicycle for Last Mile Transport

Shanghai MRT

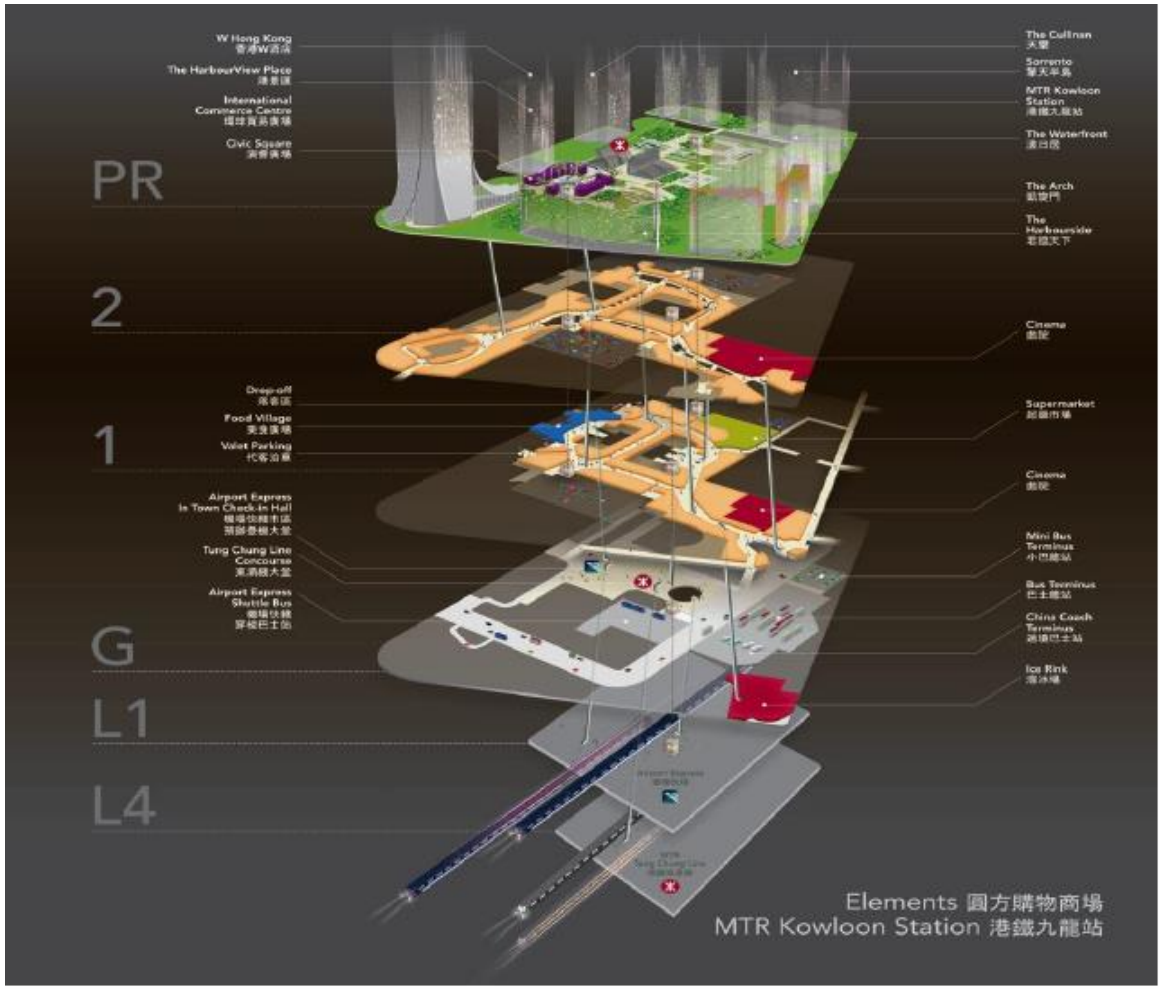
Bus as a feeder

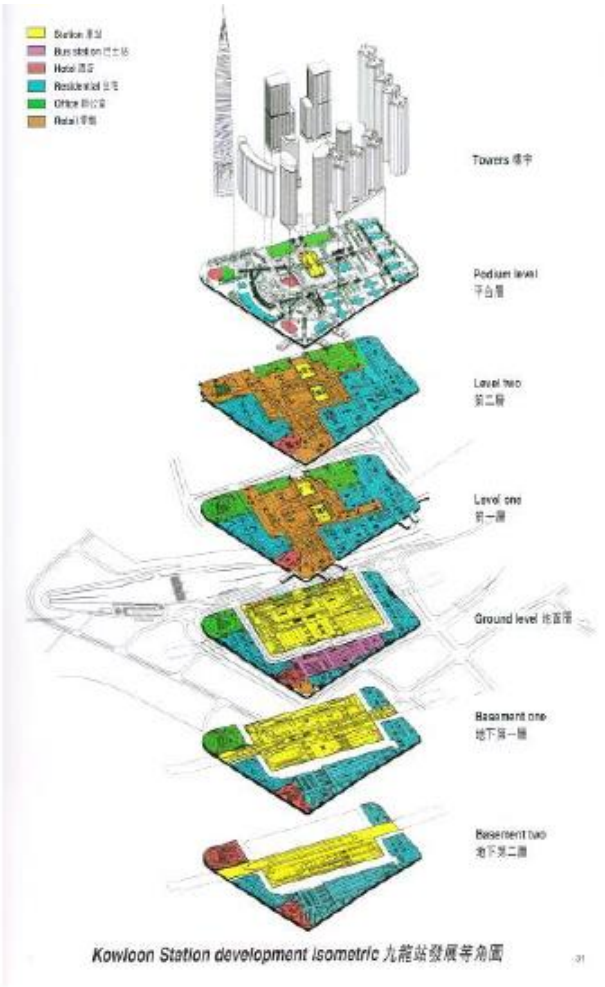
Connected with other mode

Transport, Commercial, Residential and Retail Mixed Use

ELEMENTS AND UNION SQUARE, HONG KONG

Source: Chua (2013)

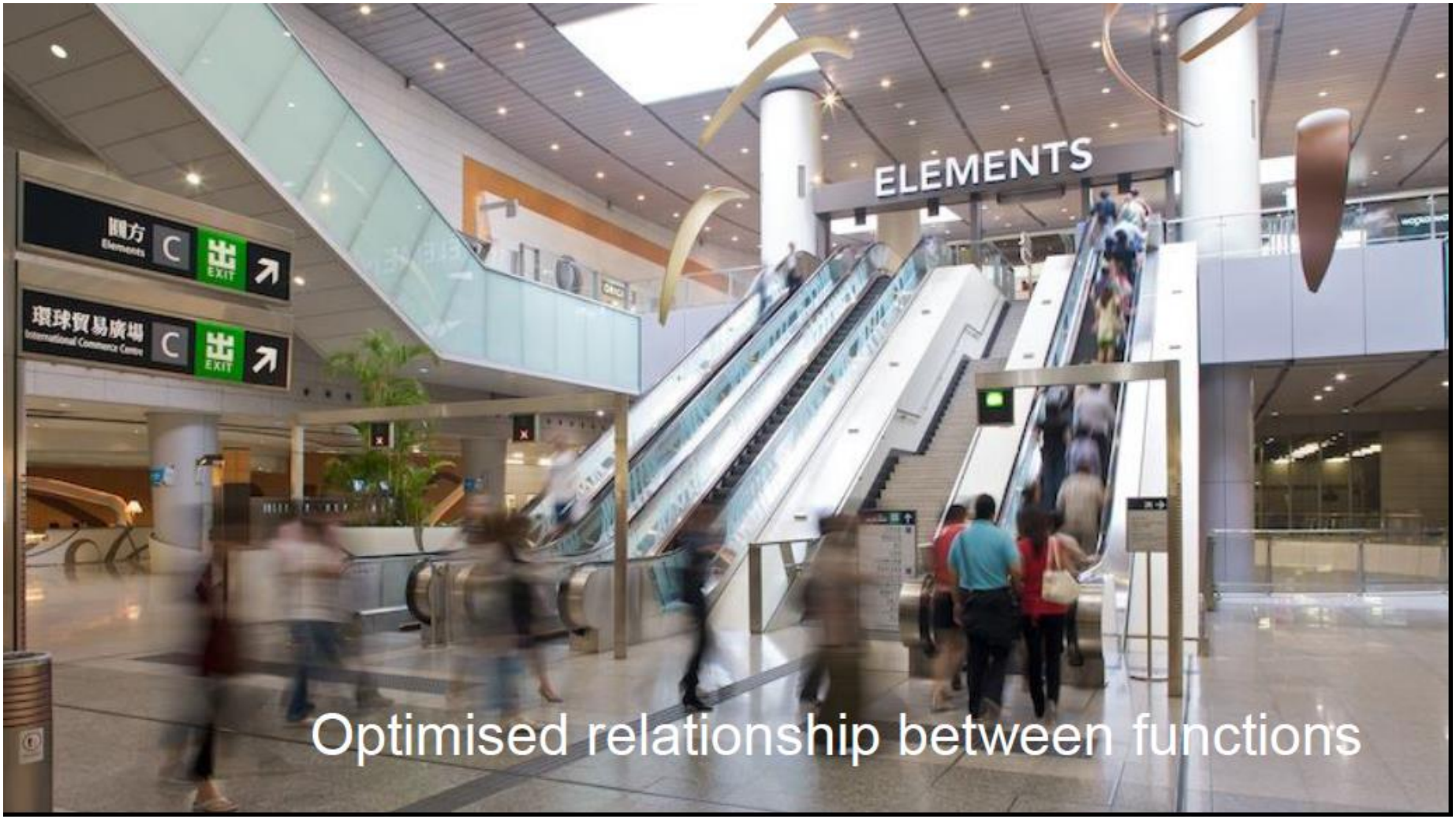




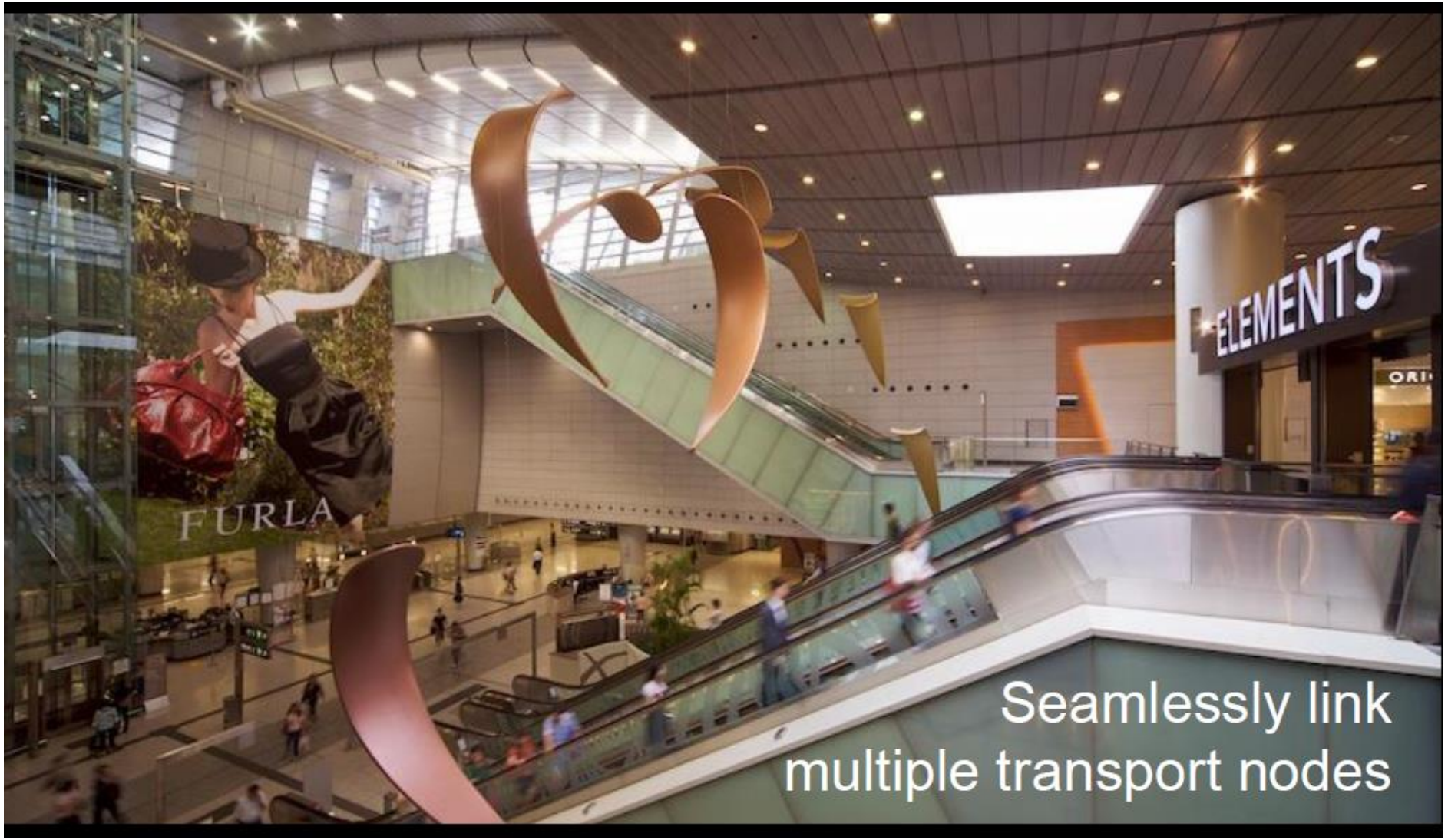
Source: Chua (2013)

Source: Chua (2013)

Source: Chua (2013)



Source: Chua (2013)



Source: Chua (2013)

Source: Chua (2013)

The Master Planning
Railway Master Plan - 2013

Indicative Output

1. 12,300 km of Total Railway Network
2. **3,800 km of Urban Railway Network (DKI, SMG, BDG, SBY, JOG)**
3. Passenger : High Speed Train Jakarta - Surabaya
4. Passenger : 2,805 unit of Locomotive
5. Passenger : 27,960 unit passenger car
6. Freight : 1,995 Locomotive
7. Freight : 39,655 wagon

Required Budget : 67 BUSD where 30% - 50% from Private

Source: Poernomo (2013)

Law No. 23 / 2007 on Railway

multiple railway operators or executors will be able to operate: the trains, operate the infrastructures, as well as facilities/equipment and maintain the railway system

Government Regulation No. 56 / 2009 on Railway Implementation
Government Regulation No.72 / 2009 on Railway Traffic
Presidential Decree No. 67/2005, No.13/2010, and No. 56/2011 on PPP

Min Reg. No. 91 /2011 on Implementation of Special Purpose Railway
Min Reg. No. 43/2011 on National Railway Master Plan 2030

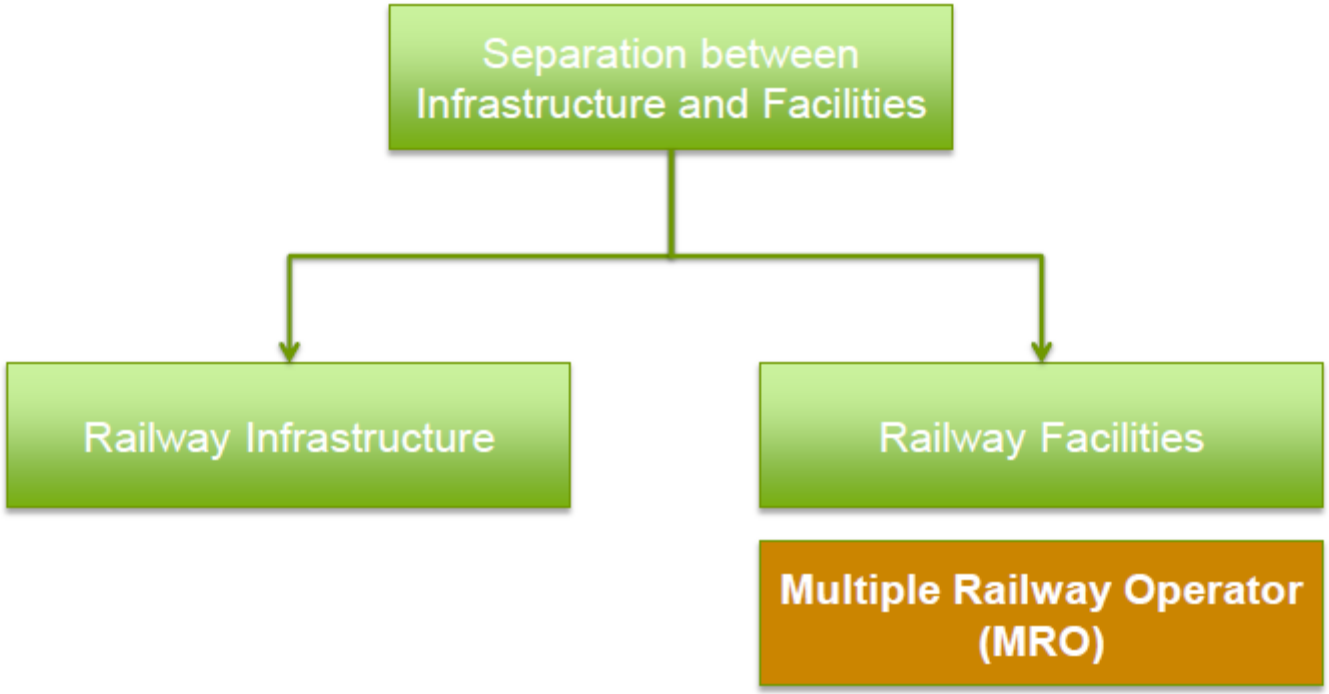
Source: Poernomo (2013)

Evolution to MRO is made possible in Indonesia by this Law 23/2007, which set the principles of:

- Railway infrastructure operated by a business entity or the government or regional government
- Railway rolling stock operated by a business entity or government or regional government

Source: Poernomo (2013)

Organizational Planning



When separation can be implemented?

Source: Poernomo (2013)

Why Multiple Railway Operator are needed?

- What is the aim? to improve the overall railway system.
- Improvement in term of what? Railway performance, including : cost efficiency, level of services, and safety
- Why so ? to stop monopoly

Source: Poernomo (2013)

The need to evolution towards MRO

Because the existing situation is showing severe concerns….

- The actual network is in bad condition. Out of 6,797 km of existing railway network, 2,122 km is not in operational (source: DGR, 2009), and only 666 km electrified
- Most of the components of the infrastructure are aging and are not properly maintained. This results in speed restrictions on many sections of the network and sometimes in safety hazards
- The maintenance budget appears to be insufficient to meet the needs of this aging network

Source: Poernomo (2013)

The need to evolution towards MRO

- Most of the rolling stock is also aging
- Many of the current workshops and depot are obsolete and have multiple safety hazards built into them
- Current railway operation is showing constant problems of train delays
- Time table appears to have remained unchanged for a number of years

Source: Poernomo (2013)

Opening the prospect for private sector participation in rail operations and services

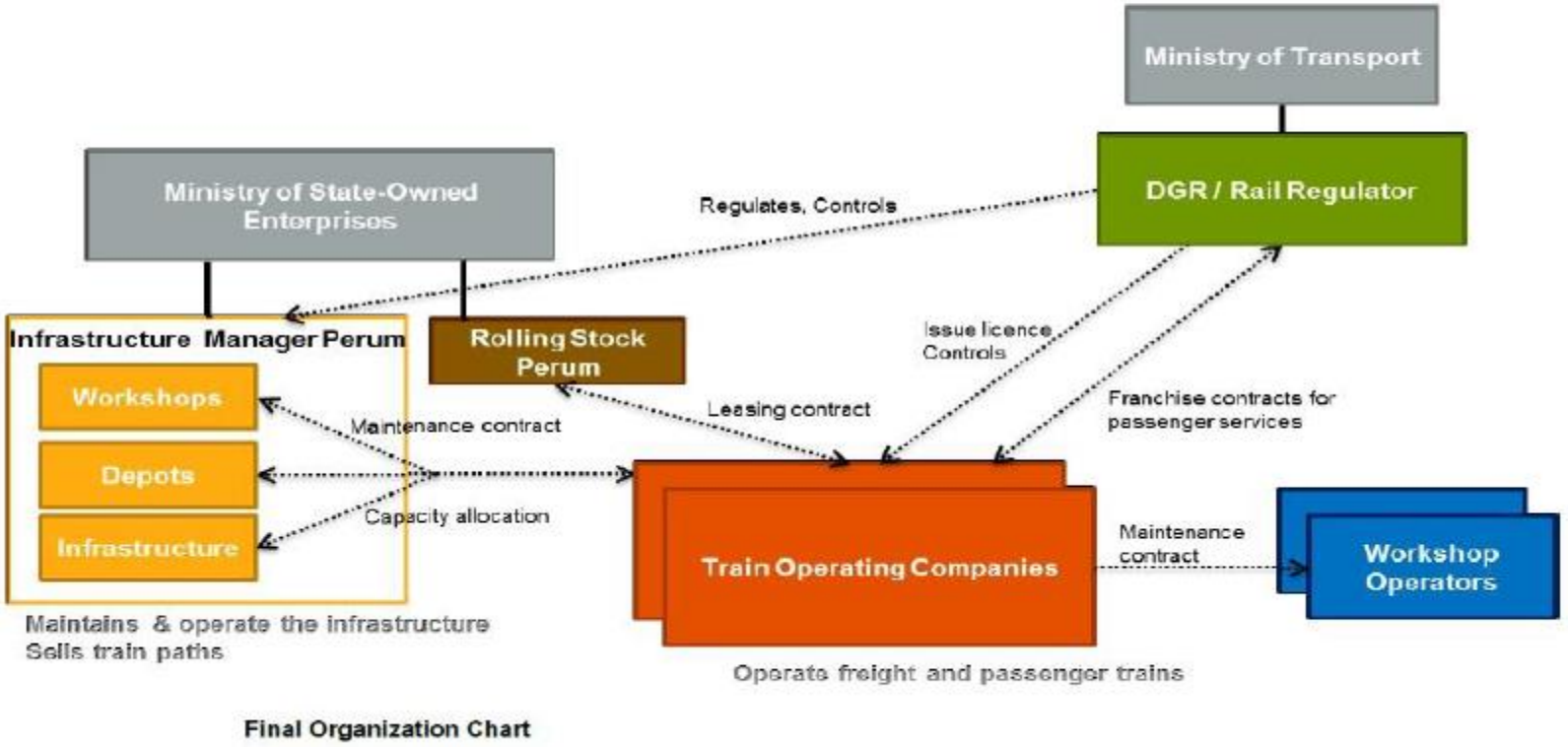
Institutional setup

- The Law No 23/2007 introduce the possibility of both vertical and horizontal separation

- The steps:
  - creating an organization sufficiently attractive, trustworthy and reliable for the private sector to invest and operate
  - Implementing and operating a new railway system from scratch
  - Need a clear Roll-Out - Plan

Source: Poernomo (2013)

Proposed MRO Organization for Indonesia



Final Organization Chart

Source: Poernomo (2013)

Color Code	Descriptions
	Government ■ Sets the rules. ■ Contracts franchises. ■ Defines long term network planning. ■ Provides a subsidy if needed.
	One or two regulatory bodies ■ A safety regulator: issues the train licenses (permits). ■ An economic regulator: enforces the rules.
	The Infrastructure Manager ■ Maintains the infrastructure. ■ Manages train operations (train diagram). ■ Allocates train paths and sells them to the train operators.
	Several train operators (railway rolling stock) ■ Operate trains. ■ Buy train paths from the Infrastructure Manager.

MRO Function Scheme

Source: Poernomo (2013)

DGR will be in charge of:

- Economic regulation: it will agree on the TAC proposed by the Infrastructure Manager, and control the behavior of the Infrastructure Manager and train operators.
- Safety regulation: it will define railway standards and operating rules, and it will issue operating licenses (permits) to train operators. It will also give its approval before operations start on any new section of the network.
- Contracting franchise: it will define the geographic zone of the franchise and the service requirement. It will set the tariff for economy class trains.
- Defining long-term network planning (master plan).
- Giving a subsidy to the Infrastructure Manager if needed

An Infrastructure Transformation company will be created as a Perum. It will be controlled by the Ministry of Transport (MOT DGR) and the Ministry of State Owned Enterprises (MSOE). Its role will be:

- To maintain the infrastructure.
- To manage train operations (train diagram).
- To set up the time table (in consultation with the train operators and DGR) and to sell the train paths to the train operators.

The Infrastructure Transformation Perum (ITP) will also hold the depots and the workshops. As the operation of a depot is closely linked with the operation of trains, the depots may be "given" to the train operators as part of the franchise agreement. The workshops will be operated by the ITP and may even evolve towards independent entities (another Perum). The idea is also to attract the private sector to build new workshops that would be privately operated.

Source: Poernomo (2013)

	A rolling stock company will also be created as a Perum. It will be controlled by the Ministry of Transport (MOT DGR) and the Ministry of State Owned Enterprises (MSOE). Its role will be: ■ To hold the rolling stock assets currently owned by DGR and used by PT. KAI. ■ To lease the rolling stock to any train operator that would need it, including PT. KAI. ■ To operate trains in case a line cannot be included easily in a franchise, or in case no operator is interested in a franchise.
	Several train operators (railway rolling stock). One of them will be PT. KAI that could remain as a state-owned enterprise (Persero). The train operators will: ■ Operate trains. ■ Buy train paths from the Infrastructure Manager. ■ Operate the depots, if they are part of their franchise, or contract the use of depots to other franchises from the Infrastructure Manager. ■ Maintain the rolling stock by contracting maintenance agreement with the workshops

Source: Poernomo (2013)

How these policies being implemented

- Presidential Decree 83/2011 : appointment to PT. KAI to implement railway infrastructure and facilities of Airport Urban Railway Train Connection; and railway circular line of Jakarta-Bogor-Depok- Tangerang-Bekasi

- Is it a fair competition?

- Competition on RAIL (MRO) or competition on TRACK (PPP)

Source: Poernomo (2013)

The Challenges?

- Involving multi stakeholder
- Policies gap between central-Local government
- Unclear policies related to PPP
- Knowledge on what is PPP
- No brake through on land acquisition

Source: Poernomo (2013)

Licensing Problems

Sector	Municipal	Provincial	National
1 Business permit (infra)	B/WK	Gvr	MOT
2 Construction permit (infra)	B/WK app MOT	Gvr app MOT	MOT
3 Operation permit (infra)	B/WK app MOT	Gvr app MOT	MOT
4 Business permit (rolling s)	MOT	MOT	MOT
5 Operation permit (rolling s)	B/WK app MOT	Gvr app MOT	MOT

Source: Poernomo (2013)