2.3.1.1 Kuala Lumpur MRT, Malaysia

Key information*	
Network length	103.2 km (two lines)
Planned lines	3
Planned stations	68 (two lines)
Expected ridership	400,000 passengers per day on Line 1; 529,000 passengers per day on Line 2
Fare system	AFC
Track and Power	Standard gauge (1,435 mm), third rail, 750 V DC
Technology	CBTC, driverless
Commencement of operations (expected)	December 2016 (Phase I of Line 1)

Notes: *Project is under construction (not yet operational); AFC – automatic fare collection; CBTC – communications-based train control

Background: Kuala Lumpur is the capital city of Malaysia and is ranked as the second most competitive global city in Southeast Asia by the Economist Intelligence Unit. The city isa centre for the finance, insurance, real estate and media industries.

It is the country's most populous city, with a population of 1.7 million (2014) residing in an area of 243 square km. The population is estimated to increase to 2.2 million by 2020.

Greater Kuala Lumpur (also known as the Klang Valley) contributes 30 per cent of the national gross domestic product (GDP). It spans 2,793 square km and has a population of 7.2 million, which is expected to increase to 10 million by 2020.

Currently, the city's rail-based transit system comprises two light rail transit (LRT) lines, one monorail line, commuter rail KTM Komuter and an airport rail link.

Theupcoming metrorail/mass rapid transit (MRT) system, also called the Klang Valley MRT project, is planned to be integrated with the existing rail systems.

The metrorail project is a crucial component of the Greater Kuala Lumpur/Klang ValleyNational Key Economic Area and the largest infrastructure project in thecountry. It aims to increase the modal share of public transport in the regionto 40 per cent by 2020, up from 17 per cent currently.

Key players: Land Public Transport Commission/ Suruhanjaya Pengangkutan Awam Darat(SPAD) plans, regulates and enforces all matters related to land public transport in PeninsularMalaysia. It is the supervising agency for the MRT project.

MASS Rapid Transit Corporation Sdn Bhd (MRT Corp) was set up in 2011 to develop and own the assets of the MRT system. It is fully owned by the Minister of Finance Incorporated.

MRT Corp is responsible for the procurement process, awarding of contracts, monitoring construction, dispute resolution, scheduling adherence and compliance with health, safety, security and environment requirements. MRT Corp directly manages the work package contractors for the underground works.

MMC-Gamuda KVMRT (PDP) Sdn Bhd, a joint venture of MMC Corporation Berhad and Gamuda Berhad,is the project delivery partner (PDP) for two MRT lines. It became the PDP for MRT-2 Line in July 2015. It is responsible for procurement management (except for underground works), quality and performance supervision, and local authority approval.

In July 2015, Arup was appointed as reference design consultant for the underground section of MRT-2 Line.

In March 2016, Turner & Townsend secured a consultancy contract to provide quantitative risk assessment during construction of the MRT-2 Line. The scope of work includes quantitative risk assessment every six months for the first three years of construction.

The contract includes an option to extend the term up to the completion of the project in 2022.

Planned network: The upcoming metrorail transit (MRT) system comprises three lines.

Table 2.3.8.1.1 provides details of the upcoming lines.

Table 2.3.1.1.1: Planned network

Line	Length	No. of stations	Route	Estimated investment (MYR billion)	Current status	Expected start of operations
MRT-1 Line	51 km (9.5 km underground, 41.5 km elevated)	31 (7 underground, 24 elevated)	Sungai Buloh–Kajang Phase I: Sungai Buloh–Semantan Phase II: Semantan–Kajang	23	The line was approved by the government in 2010 and construction began in July 2011 As of February 2016, 84 work packages have been awarded for MYR22 billion. As of February 2016, the project was 78 per cent completed.	December 2016 (Phase I), July 2017 (phase II)

Line	Length	No. of stations	Route	Estimated investment (MYR billion)	Current status	Expected start of operations

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MRT-2 Line	52.2 km (13.5 km underground, 38.7km elevated)	37 stations (11 underground, 25 elevated and 1 at-grade)	Sungai Buloh–Serdang–Putrajaya(Underground between Jalan Ipoh and Kuchai Lama) Phase I: Sungai Buloh-Kampung Batu Phase II: Kampung Batu-Putrahaya Sentral	28	Construction is expected to begin in the second quarter (April-June) of 2016. Tenders for other civil works are yet to be launched. There will be 66 work packages.	July 2021 (Phase I), July 2022 (Phase II)
MRT-3 Line	NA	NA	Circular line	NA	The project is currently at the planning stage.	NA
Total	**103.2 km (23 km underground, 80.2 km elevated)**	**68 (18 underground, 49 elevated, 1 at-grade)**	-	**51**	-	-

Source: MRT Corp

Note: The integrated rail map for Greater Kuala Lumpur is available here: http://www.mymrt.com.my/en/sbk/klang-valley-integrated-rail-map

Table 2.3.8.1.2 indicates key civil contracts awarded for MRT-1 Line.

Table 2.3.1.1.2: Key civil contractors for MRT-1 Line

Company	Date of contract	Description
Underground works		
MMC Gamuda KVMRT (T) Sdn Bhd	March 2012	For the section from Semantan north portal to Maluri south portal
Guideway (Viaduct) works		
IJM Construction Sdn Bhd	February 2012	For the section from Maluri portal to Plaza Phoenix station
Ahmad Zaki Sdn Bhd	February 2012	For the section from Plaza Phoenix station to Bandar Tun Hussein Onn station
Syarikat Muhibah & Perniagaan & Pembinaan Sdn Bhd	May 2012	For the section from Sungai Buloh to Kota Damansara station
Sunway Construction Sdn Bhd	May 2012	For the section from Section 17 to Semantan Portal

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Company	Date of contract	Description
MTD Construction Sdn Bhd	May 2012	For the section from Bandar Tun Hussein Onn to Taman Mesra
Gadang Engineering (M) Sdn Bhd	July 2012	For the section from Kota Damansara to Dataran Sunway station
Mudajaya Corporation Berhad	July 2012	For the section from Dataran Sunway to Section 17
UEM Construction Sdn Bhd	September 2012	For the section from Taman Mesra to Kajang station
Elevated stations		
IJM Construction Sdn Bhd	July 2012	Taman Bukit Ria, Taman Bukit Mewah, Leisure Mall and Plaza Phoenixstations
Trans Resources Corporation Sdn Bhd	August 2012	Sungai Buloh, Kg. Baru Sungai Buloh and Kota Damansara stations
Ahmad Zaki Sdn Bhd	August 2012	Taman Suntex, Taman Cuepacs and Bandar Tun Hussein Onnstations
Apex Communication Sdn Bhd	August/October 2012	Balakong, Taman Koperasi, Saujana Impian, Bandar Kajang and Kajangstations
Naim Engineering Sdn Bhd	October 2012	Taman Industrial Sungai Buloh, PJU 5, Dataran Sunway, Section 16, Bandar Damansara and Semantan stations
UEM Construction Sdn Bhd	October 2012	Curve, One Utama and Tamn Tun Dr Ismail stations
Depots		
Trans Resources Corporation Sdn Bhd	May 2012	Sungai Buloh maintenance depot
TSR Bina Sdn Bhd	July 2012	Kajang Maintenance depot
Multi-storey car parks		
TSR Bina Sdn Bhd	July 2012	Sungai Buloh station
SMPP-Ibwani JV	March 2013	Kajang Station
Perkasa Sutera Sdn Bhd	June 2014	Taman Bukit Mewah Station
RD Resources Sdn Bhd	June 2014	Saujana Impian Station
Innoseven Sdn Bhd	June 2014	Taman Koperasi Station
Budaya Restu Sdn Bhd	June 2014	Section 16 Station

Notes: JV – joint venture
Source: MRT Corp

MMC Gamuda KVMRT (T) Sdn Bhd secured the MYR8.2-billion tunneling contract for MRT-1 Line following a Swiss Challenge method of procurement. The underground stations will be at Muzium Negara, Pasar Seni, Merdeka, Bukit Bintang, Tun Razak Exchange, Cochrane and Maluri. MMC-Gamuda procured 10 tunnel boring machines (TBMs) – two Earth Pressure Balance (EPB) machines from China-based CREG, and two EPB TBMs and six Variable Density Slurry TBMs from Germany-based Herrenknecht. The company is also the main contractor for the MRT-2 Line project.

Out of the 31 stations on MRT-1 Line, 16 stations will be equipped with park-and-ride facilities. These are Sungai Buloh, Kota Damansara, Taman Industri Sungai Buloh, Taman Tun Dr Ismail, Seksyen 16, Pusat Bandar Damansara, Maluri, Taman Bukit Mewah, Plaza Phoenix, Taman Suntex, Taman Cuepacs, Bandar Tun Hussein Onn, Taman Koperasi, Saujana Impian and Kajang.

Service on MRT-1 Line will be from 6 a.m. till midnight. The average travel time fromSungai Buloh or Kajang to KL Sentral is expected to be 30 minutes.

Construction contracts for MRT-2 Line are indicated in table 2.3.8.1.3.

Table 2.3.1.1.3: Construction contracts for MRT-2 Line

Company/consortium	Contract value (MYR million)	Contract details	Award month and year
IJM Construction	1,470	Construction of a 4.6-km viaduct from Jinjang to Jalan Ipoh North Portal	May 2016
Malaysian Resources Corporation	648	Construction of a 2.6-km viaduct from Persiaran APEC to Purajaya Sentral	May 2016
MMC Gamuda KVMRT (T) Sdn Bhd	15,470	Design and construction of tunnels, underground stations, and associated structures such as portals and escape shafts for the 13.5 km underground alignment from the Jalan Ipoh North Escape shaft to the Desa Waterpark South Portal	March 2016
Ahmad Zaki Sdn Bhd	1,440	Construction of the viaduct guideway and other associated works for a 4.5 km stretch from Persiaran Dagang to Jinjang	March 2016
Sunway Construction Sdn Bhd	1,210	Construction of the viaduct guideway and other associated works for a 4.9 km stretch from Sungai Buloh to Persiaran Dagang	March 2016
SPC Industries Sdn Bhd	199	Supply and delivery of segmented box girders for viaduct work packages V201 to V205	March 2016
Acre Works Sdn Bhd	170	Supply and delivery of segmented box girders for viaduct work packages V206 to V210	March 2016

Source: MRT Corp

Ridership: MRT Corp has estimated average daily ridership of around 400,000 passengers on MRT-1 Line and around 529,000 passengers on MRT-2 Line.

Rolling stock and technology: In September 2012, a consortium of Siemens Malaysia Sdn Bhd, Siemens AG and Malaysia-based SMH Rail Sdn Bhd secured a EUR450-million contract to supply 58 driverless Inspiro metro trains for MRT-1 Line and equipment for two new MRT depots. The trains will be assembled in a new plant in Rasa, Hulu Selangor.

In March 2014, Siemens delivered a full-size model of the driverless Inspiro metro train for the MRT-1 Line. As of November 2015, 19 trains had been delivered.

Table 2.3.8.1.4 provides key details of the rolling stock.

Table 2.3.1.1.4: Rolling stock details for MRT-1 Line

Parameter	Details
Manufacturer	Siemens AG
Designer	BMW Designworks USA

Parameter	Details
Capacity	300 passengers/car (four cars for each train)
Maximum speed	100 km/hour
Average speed	70 km/hour
Service frequency	3.5 minutesin peak hours (~17 trains per hour)

Source: MRT Corp

In September 2012, Bombardier (Malaysia) Sdn Bhd secured the EUR71-million contract for engineering, procurement, construction, testing and commissioning of Cityflo 650 communications-based train control (CBTC) solution for driverless operation on MRT-1 Line (including 31 stations and onboard equipment for 58 trains plus a further 16 maintenance vehicles).

Table 2.3.8.1.5 provides the list of key railway system vendors for MRT-1 Line.

Table 2.3.1.1.5: Key railway system vendors for MRT-1 Line

Company	Description
Meidensha Corporation	Engineering, procurement,construction, testing and commissioning of power supply and distribution system
Info-Matic Power Sdn Bhd	Supply, delivery and supervision of installation, testing and commissioning of power supply for all elevated stations.
PTIS Engineering Sdn Bhd	Supply, delivery and supervision of the installation, testing and commissioning of step down distribution transformer for all elevated packages, underground stations, Sungai Buloh depot and Kajang depot
Mitsubishi Heavy Industries, Limited	Engineering, procurement, construction, testing and commissioning of track works
Apex Communication Sdn Bhd - LG CNS Consortium	Engineering, procurement, construction, testing and commissioning of telecommunication system
Apex Communication Sdn Bhd - Johnson Controls (M) Sdn Bhd	Engineering, procurement, construction, testing and commissioning of electronic access control system
Singapore Technologies Electronics Limited	Engineering, procurement, construction, testing and commissioning of platform screen doors and automatic platform gates.

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Otis Elevator Company (M) Sdn Bhd	Supply, installation, testing and commissioning of the elevator system for all elevated packages, Sungai Buloh depot and multi-storey car parks.
MS Elevator (M) Sdn Bhd	Design, supply, installation, testing and commissioning of escalators and travelators for the elevated stations.
EITA Elevator (Malaysia) Sdn Bhd	Supply, procurement, installation, testing and commissioning of escalators, lifts and travelators for all underground stations and ancillary building

Source: Global Mass Transit Research

In May 2016, key contracts for MRT-2 Line were awarded as indicated in table 2.3.8.1.6.

Table 2.3.1.1.6: Rolling stock and signalling contracts for MRT-2 Line

Segment	Company/consortium	Contract value (MYR million)	Contract details
Rolling stock	HAP consortium of South Korea-based Hyundai Rotem, POSCO Engineering and Apex Communications	1,620	Supply 58 four-car driverless electric trainsets and depot equipment. The trains will operate at a maximum speed of 100 km/hr.
Signalling	Consortium of Bombardier and Global Rail	458	Supply signalling and train control systems

Source: MRT Corp

A new control centre is planned to integrate the MRT and KTM Komuter railway lines.

Tracks will be standard gauge (1,435 mm). Power will be sourced from third rail (750 V DC).

Fare system: France-based Affiliated Computer Services Solutions (ACS) France SAS secured the MYR120-million engineering, procurement, construction, testing and commissioning of the automatic fare collection (AFC) system contract for MRT-1 Line in March 2013.

By 2017, the AFC system is planned to be integrated with LRT and monorail systems under a USD20-million contract awarded to Australian company Vix Technology to design, install, operate and maintain a unified multi-modal ticketing system in Greater Kuala Lumpur. The system will allow payments through contactless smartcards, bank cards (debit and credit cards) and near field communication (NFC)-enabled mobile phones.

Recent developments: In May 2016, MRT Corp awarded contracts for civil works, supply of rolling stock and installation of signaling and train control systems for MRT-2 Line.

In March 2016, Turner & Townsend secured a consultancy contract to provide quantitative risk assessment during construction of the MRT-2 Line.

Also in March 2016, five construction contracts were awarded for MRT-2 Line.

As of February 2016, the following developments were recorded for MRT-1 Line:

- Construction was 78 per cent completed.
- A total of 84 work packages had been awarded for MYR22 billion.
- In January 2016, MRT Corp launched the tender for the construction of MRT-2 Line Serdang Depot and another tender for the construction of MRT-2 Line bus depot platform.
- In December 2015, MRT Corp invited bids for associated works for the construction and completion of underground works, civil and infrastructure works for MRT-2 Line and the proposed MRT feeder bus depot and related supporting buildings and facilities for MRT-1 Line.
- As of November 2015, 19 trains had been delivered for MRT-1 Line.

- In October 2015, MRT Corp secured the national government approval for MRT-2 Line and launched tenders for the line's system works package (tracks, maintenance vehicles and AFC).
- In August 2015, Vix Technology secured the USD20-million contract to design, install, operate and maintain a unified multi-modal ticketing system for Greater Kuala Lumpur.

(1 MYR [Malaysian Ringgit] = 0.25 USD; 1 EUR [Euro] = 1.1 USD)

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