Greater Kuala Lumpar/Klang Valley Land Public Transport Master Plan

Urban Rail Development Plan

SURUHANJAYA PENGANGKUTAN AWAM DARAT
SPAD
LAND PUBLIC TRANSPORT COMMISSION

Contents

List of Abbreviations

AM Hour	For the Greater KL/Klang Valley area defined as the average morning peak hour between 0700 and 0900
ANPR	Automatic number plate recognition
BET	Bus Express Transit
BRT	Bus Rapid Transit
BTP	Bus Transformation Plan
CBD	Central Business District
CCTV	Closed Circuit Television
CDL	Competent Driver Licence
CPA	Central Planning Area
DBKL	Dewan Bandaraya Kuala Lumpur
DVLA	Driver and Vehicle Licensing Agency (UK)
EPP	Entry Point Project
ETP	Economic Transformation Programme
EPU	Economic Planning Unit
ERP	Electronic Road Pricing
GDP	Gross Domestic Product
GIS	Geographic Information System
GKL/KV	Greater Kuala Lumpur/Klang Valley
GPS	Global Position System
GTP	Government Transformation Programme
HOV	High Occupancy Vehicle
IIP	Interchange & Integration Plan
ISF	Improvement Service Fund
ITS	Intelligent Transport System
JICA	Japan International Co-operation Agency
JPJ	Jabatan Pengangkutan Jalan
KL	Kuala Lumpur

KLIA	Kuala Lumpur International Airport
KLCP	Kuala Lumpur City Plan
KLIFD	Kuala Lumpur International Finance District
KPI	Key Performance Index
KTM	Keretapi Tanah Melayu
KTMB	Keretapi Tanah Melayu Berhad
LA	Local Authority
LCCT	Low Cost Commercial Terminal
LDP	Lebuhraya Damansar-Puchong
LPKP	Lembaga Perlesenan Kenderaan Perniagaan (also known as CVLB)
LPT	Public Transport
LPTMP	Land Public Transport Master Plan
LTABL	Lapangan Terbang Antarabangsa Bayan Lepas
LPSI	Lapangan Terbang Sultan Ismail
LRT	Light Rail (or Rapid) Transit
LUP	Land Use Plan
MOF	Ministry of Finance
MOW	Ministry of Works
MRR	Middle Ring Road
MRT	Mass Rail (or Rapid) Transit
NGV	Natural Gas Vehicle
NKEA	National Key Economic Areas
NKRA	National Key Results Area
NPP	National Physical Plan
PMR	Performace Monitoring Regime
PPHPD	Peak Passengers per Hour per Direction
PSL	Parking Space Levy
PSV	Public Service Vehicle
PTP	Public Transport Plan
PWD	People With Disability

RTPI	Real Time Information
RUC	Road User Changing
SMS	Short Messaging Service
SPAD	Suruhanjaya Pengangkutan Awam Darat
SPNB	Syarikat Prasarana National Berhad
TDM	Travel demand management
TDMP	Travel Demand Management Plan
TfL	Transport for London
TLC	Taxi Licensing Commission of New York
TOD	Transit Oriented Developments
TPZ	Transit Planning Zone
TRS	Traffic Restraint System
TTP	Taxi Transformation Plan
UPEN	Unit Perancangan Ekonomi Negeri
URDP	Urban Rail Development Plan
WPP	Work place parking

Background

1

1. Background

SPAD (Suruhanjaya Pengangkutan Awam Darat) has developed the National Land Public Transport Framework (National LPT Framework) to set out the vision and direction for Land Public Transport (LPT) in Malaysia. The purpose is to develop a long term programme to address the current deterioration in LPT with plans to execute high impact and effective delivery initiatives for a 20-year sustainable National LPT service. The goal of LPT is to drive forward the ambition of Vision 2020 and 1Malaysia. These national initiatives seek to transform Malaysia into a fully developed and industrialised nation by sustaining growth of 7% per annum. 1Malaysia is the foundation of the national vision where its goal is to preserve and enhance unity in diversity. As part of this, SPAD aspires to transform public transport to be the peoples mode of choice, thus enabling unity and a national drive for sustainable economic growth.

Within the Government Transformation Programme (GTP) (Source: Pemandu, 2010), the National Key Result Area (NKRA) for Urban Public Transport set a number of goals up to 2012:

- Raise modal share
- Improve reliability and journey times
- Enhance comfort and convenience
- Improve accessibility and connectivity

SPAD owns part of the Urban Public Transport NKRA and was set up to consolidate selected LPT related portfolios from other agencies and develop the National LPT Framework. SPAD's Mission for LPT in Malaysia can be summarised as:

> 'To achieve a safe, reliable, efficient, responsive, accessible, planned, integrated, affordable and sustainable land public transport system to enhance socio-economic development and quality of life.'

The National LPT Framework defines the National LPT Policy, which provides guidance towards developing the National Land Public Transport Master Plan (LPTMP). Included in the National LPT Framework is also a Planning Toolkit which provides the guidance on the methodology for setting objectives, plan development, identification of policy measures and assessments of solutions. The Planning Toolkit facilitates the development of Regional LPTMPs and enables interfacing with State-specific plans and land use policies.

The first Regional LPTMP developed by SPAD is for the Greater KL/ Klang Valley (GKL/KV) region. This document provides one of the Subsidiary Plans relating to urban rail development, which forms part of the GKL/KV LPTMP. The other Subsidiary Plans include:

- Taxi Transformation Plan (TTP)
- Bus Transformation Plan (BTP)
- Interchange and Integration Plan (IIP)
- Land Use Plan (LUP)
- Travel Demand Management Plan (TDMP)

Together these provide an integrated LPT plan for the GKL/KV region.

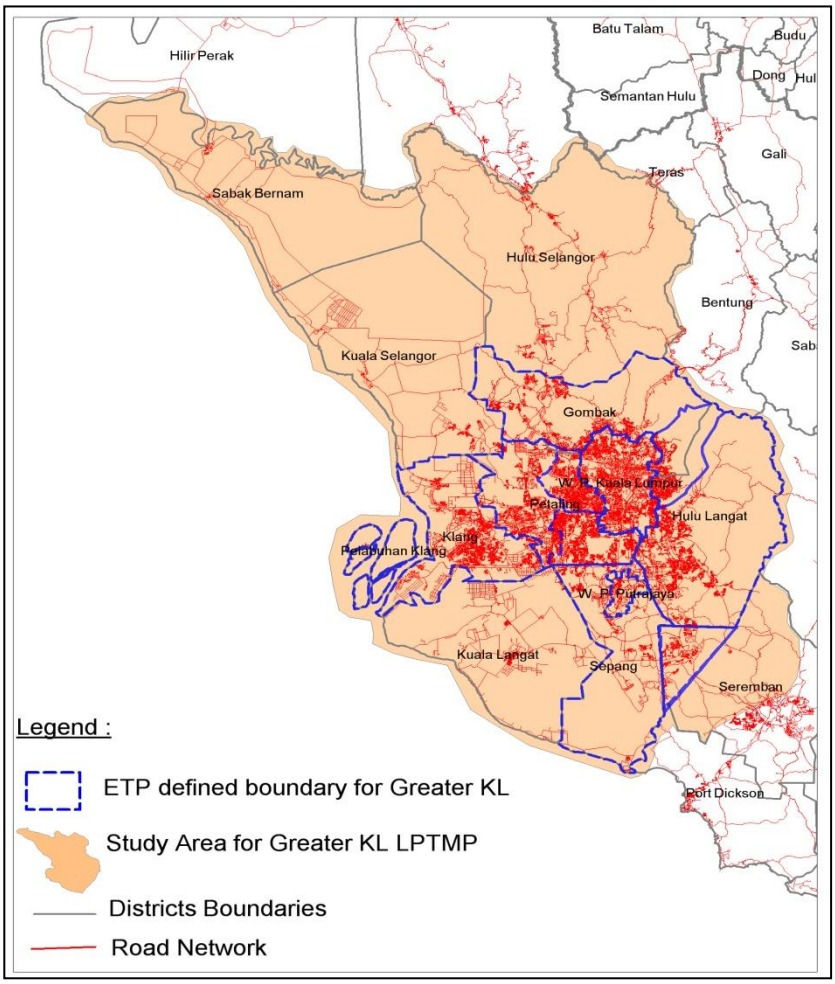
1.1) Greater KL/Klang Valley Region

The definition of the GKL/KV region is taken from the Economic Transformation Programme (ETP) (Source: Pemandu, 2010). The region comprises Kuala Lumpur, Putrajaya and all districts in Selangor with the exception of Kuala Langat, Kuala Selangor, Sabak Bernam and Ulu Selangor (See Figure 1.1). The region is defined as being of key economic importance for Malaysia as a whole. Over 37% of the nation's Gross Domestic Product (GDP) is identified as being related to Kuala Lumpur and Selangor (Source: National Statistics 2009). Within the ETP, the National Key Economic Area (NKEA) for the GKL/KV region has specified the following objectives:

'To achieve a top-20 ranking in city economic growth while being among the global top-20 most liveable cities by 2020 via 9 Entry Point Projects (EPP)'.

One element of the EPP is the GKL/KV Connect which is about public transport within the urban city. In defining the region for the GKL/KV LPTMP, analysis of travel demand data indicates that areas such as Nilai and Seremban, whilst being outside the defined region, do contribute significant demands to Kuala Lumpur and should therefore be considered in developing the LPT strategy.

Figure 1.1: Greater KL/ Klang Valley Region



1.2) Objectives

The objectives of the GKL/KV LPTMP are:

- To identify a single, consolidated and supported LPT strategy for the GKL/KV region
- To integrate all LPT modes (i.e. bus, rail and taxi), providing users with a high quality seamless journey
- Be guided by logical, pragmatic and sustainable principles in its planning to address current needs, which support future expectations

1.3) Guiding Principles

In order to aid the development of the GKL/KV LPTMP, a series of Guiding Principles have been developed as follows:

- Consider the planning, integration and co-ordination of all LPT modes
- Define modal share targets
- Define complementary policies to allow the LPT modal share to achieve the targets
- Allow LPT to be socially inclusive, encouraging it to be the travel mode of choice
- Provide for increased accessibility and connectivity
- Take account of the hierarchy of centres, with emphasis on primary centres being served by rail where possible to encourage modal transfer
- Provide capacity to meet future demands efficiently and reliably to allow the region to grow economically;\
- Provide additional capacity to serve central KL given its economic importance to the country
- Be based on a process of engagement with Stakeholders
- Take account of previous studies and plans where appropriate
- Promote the use of new technology to provide environmental benefits
- Corridors should be served according to the appropriate mode to meet travel demands

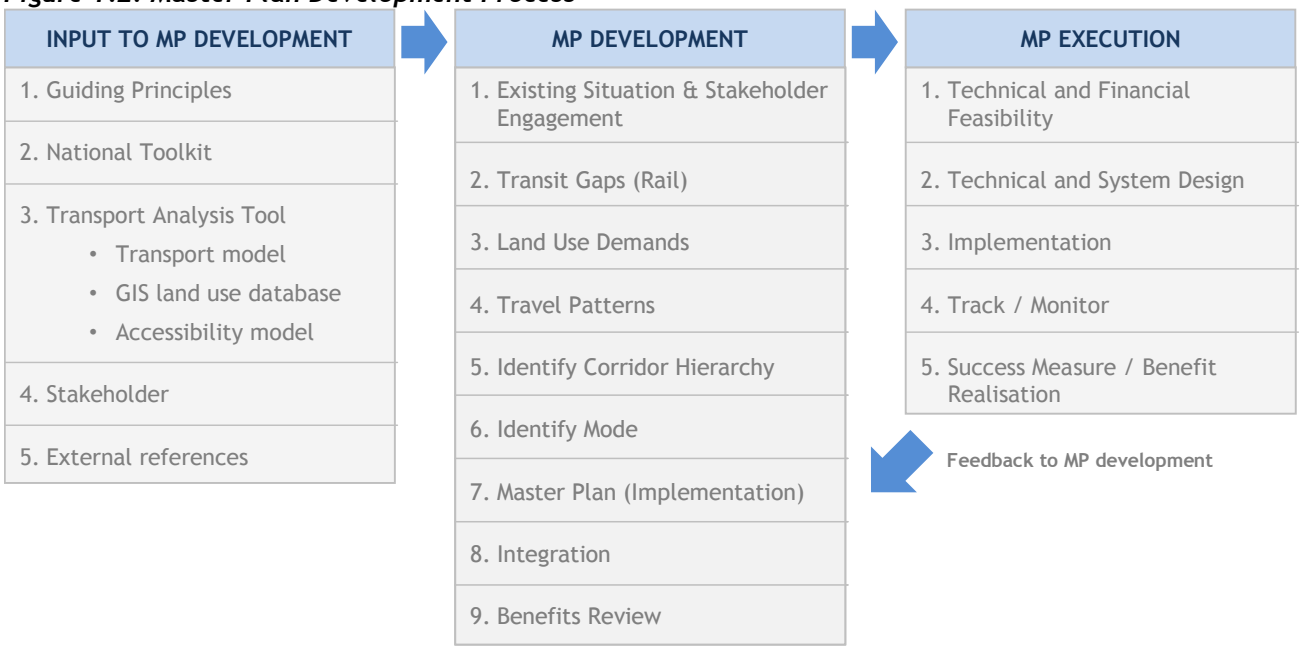
1.4) Master Plan Development

Using the Guiding Principles of the NLPTP and the LPT Toolkit, the process of developing the Regional LPTMP follows a series of stages which seek to understand the existing situation through the collation of existing data sources, the collection of new travel data and stakeholder engagement (see Figure 1.2). A suite of transport analysis tools is established which includes a transport model, GIS land use database and an accessibility model. These are used to forecast future transport conditions given known land use proposals and committed transport schemes. From this basis the concepts in the National Toolkit can be adopted including:

- Definition of the target mode share for the region;
- Definition of transport corridors based on a hierarchy including primary, secondary, local and feeder corridors; and

- Assessment of the travel demands in the corridors using the PPHPD and select the appropriate modes for future provision in those corridors.

Figure 1.2: Master Plan Development Process



From this basis the policies and measures can be selected based on the criteria of:

- Fix - identify current operational issues and seek to address these (such as regulation, fares structure, monitoring integration):
- Improve - upgrade operations and infrastructure to appropriate standards;
- Attract - provide investment in the corridors through new capacity (for example new rail lines) and infrastructure; and
- Push - define complementary policy measures through land use and travel demand management allow the PT modal share to achieve the targets

The Regional LPTMP is then an assembly of the policy instruments, proposals and transformation plans for public transport in a region. Key to the success of the LPTMP is the dire need for integration of public transport modes and the assessment of benefits. Often LPT is only one part of the passenger journey. Integration with other modes (public transport, private transport, walking and cycling) is important to maximise the potential usage of LPT. This can be referred to as the 'first and last mile'.

The URDP is to set the basis for the development of regional rail in the GKL/KV region. Its purpose is to identify the broad corridors (within a 2.5 km radius) along which any new lines might be developed and to specify measures to enhance the existing rail network. At this stage of the process, it is not for the GKL/KV LPTMP to set the detailed alignments and station locations. Issues related to these follow this GKL/KV LPTMP in the LPTMP Execution Phase during examination of the Technical and Financial Feasibility (post September 2011) to be undertaken by SPAD. Similarly the Technical and System Design phase will examine the detailed operational aspects of the plan including the locations of depots. Where appropriate, the development of the URDP has taken

account of technical work that has been already undertaken. These elements will be developed further in the master plan execution phases.

The consideration of Inter-City Rail, and the role of High Speed Rail will be considered in separate studies undertaken by SPAD.

1.5) Structure of the Urban Rail Development Plan

This chapter provides a summary of the URDP for the GKL/KV region. The next chapter outlines the existing situation in the region, particularly with respect to rail. Chapter 3 looks at future conditions including the identification of gaps, assessment of the future land use and travel demands and development of the corridor hierarchy for the region. Chapter 4 identifies the rail proposals while chapter 5 provides the phasing of measures, the consideration of integration and the review of the benefits of the URDP. Chapter 6 provides an overall summary of the URDP.

This summary document is supported by a technical analysis which will also be available at the publication of the GKL/KV LPTMP.

Key Conclusions

SPAD had developed the National LPT Framework to set out the vision and guiding principles for public transport in Malaysia.

The objective of the National LPT Framework is to drive the development of the National LPTMP, which comprises of Regional LPTMPs and Sectoral Plans.

The National LPT Framework provides a Planning Toolkit to guide the development of Regional LPTMPs.

The first Regional LPTMP developed by SPAD is for the GKL/KV region, the GKL/KV LPTMP.

The URDP is one of six subsidiary plans of the GKL/KV LPTMP.

The URDP establishes the basis for the development of regional rail in the GKL/KV region. Its purpose is to identify the broad corridors (within a 2.5 km radius) along which any new lines might be developed and to specify measures to enhance the existing rail network.

Assessment of Current Conditions

2

2. Assessment of Current Conditions

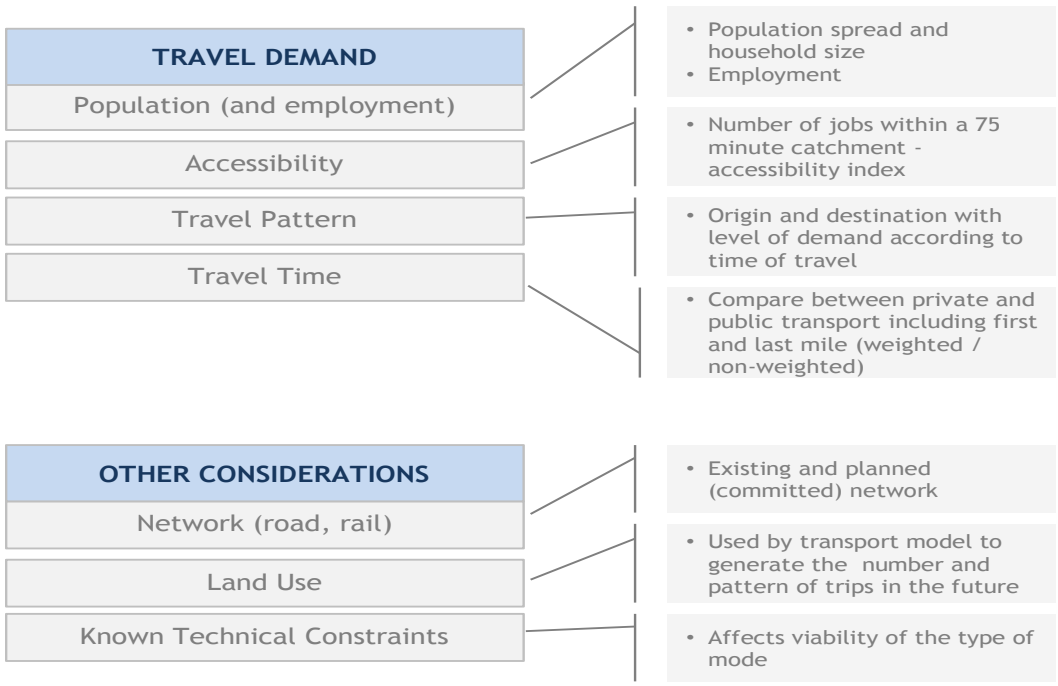
2.1) Introduction

Chapter 2 provides an outline of the key considerations in the development of the GKL/KV LPTMP. The starting point is the understanding of the existing conditions in the GKL/KV region in relation to urban rail. This is based on engagement with stakeholders to collate data and identify key problems and issues.

2.2) Key Considerations in Master Plan Development

In developing the Regional LPTMPs, a process of 9 stages are undertaken as outlined in figure 2.1. Having identified the existing situation through analysis of data and stakeholder engagement, a review of the forecast travel situation in the region is indentified. The key factors in the assessment are travel demands, including population (and employment), accessibility, travel pattern and travel time. Additionally, other considerations such as network, land use and known technical constraints are assessed (see Figure 2.1). Land use data is assembled from local authorities to reflect future population and employment changes identified in Structural Plans and Local Plans. The Regional LPTMP ensures alignment of state-level public transport plans and the National LPT Policy, whilst placing importance on inclusion of state-specific requirements. This is achieved through a consultive process and collaboration between State authorities and SPAD in developing the Regional LPTMPs. Additionally, the Regional LPTMPs recognise the need for consistency between state plan directives and the necessity for public transport. Therefore the Regional LPTMP takes account of the location of major development areas which need to be served by public transport.

Figure 2.1: Key Considerations in the GKL/KV LPTMP Assessment

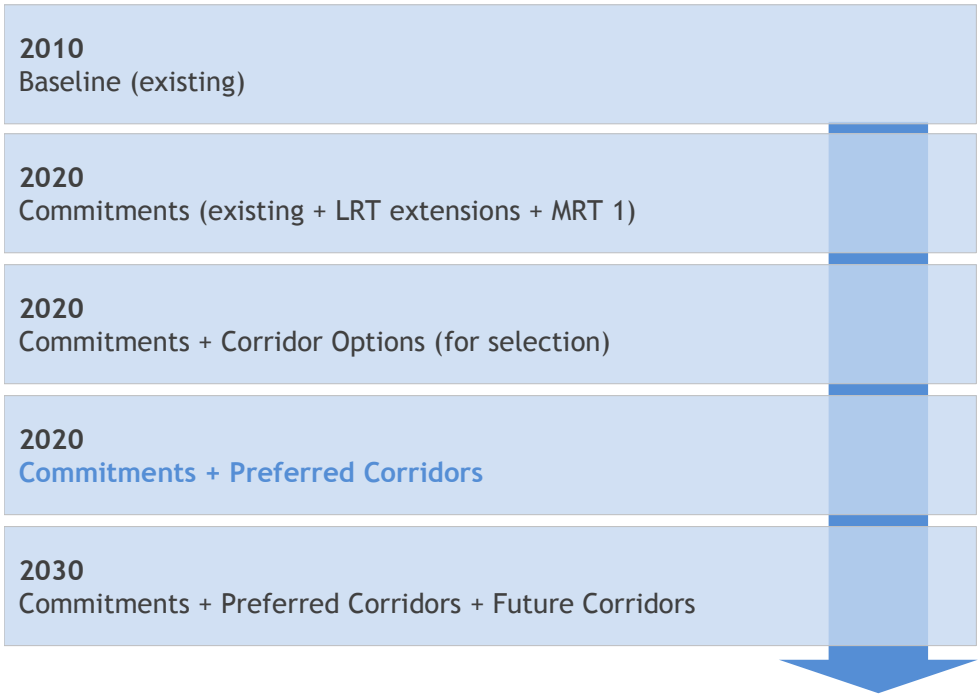


A transport model has been used to assess future travel patterns resulting from the land uses and assuming different network scenarios. The resulting travel time and accessibility patterns have been mapped against the existing situation of urban rail.

A range of time horizons and scenarios have been modelled (Figure 2.2). These include 2020 and 2030 time horizons and take into account those schemes which are funded and committed, including:

- Ampang Line - extension from Sri Petaling to Putra Heights (completion 2013).
- Kelana Jaya Line - extension from Kelana Jaya to Putra Heights (completion 2013).
- NKRA initiatives for Keretapi Tanah Melayu (KTMB) - upgrade to 15 minute service per branch.

Figure 2.2: Scenarios Considered



In addition, MRT1 is being proposed to be constructed between Sungai Buloh and Kajang providing additional capacity in the City Centre with linkages to areas poorly served by public transport such as Damansara and Cheras. This has been assumed in a reference case against which comparisons are made in identifying the further corridor options and the preferred corridors for enhancement.

2.3) Stakeholder Engagement

The initial phase in developing the GKL/KV LPTMP is to understand current conditions and issues in the GKL/KV region. As part of the ongoing study, stakeholder engagement with key agencies was used to inform the development of the GKL/KV LPTMP. The initial engagement included federal agencies, Dewan Bandaraya Kuala Lumpur (DBKL), Selangor State Unit Perancang Ekonomi Negeri (UPEN), Perbadanan Putrajaya, other district local authorities, and transport operators.

From this process SPAD:

- Identified key concerns and issues
- Identified stakeholder's plans and proposals for the future
- Collated a range of data (land use information, rail patronage, bus network data, traffic counts and journey time data

The key view points on rail highlighted by stakeholders in relation to the capacity and quality of the existing system, integration between modes particularly the feeder services and gaps in network coverage are presented in Table 2.1. The integration of land use planning and the GKL/KV LPTMP was raised by DBKL and UPEN with the need to ensure consistency between the plans as a means of matching LPT proposals with Transit Oriented Developments (TODs). Therefore, the strategy development process needs to ensure consistency between the GKL/KV LPTMP and City and Structure Plans.

Table 2.1: Key Viewpoints on Rail from Stakeholders

Stakeholder	Key View Point on Rail: Key Issues and Plans
KTMB *Provided ridership data*	• Conflicts with freight movements • Track capacity constraints at junctions • Quality of existing track and signalling • Poor integration of bus feeder services • Reduce headways through acquisition of new car sets
SPNB *Provided ridership data*	• Capacity of existing lines • Extend existing LRT lines • Possible extension of LRT to Matrade to serve new convention centre • Upgrade and propose extension of monorail • Propose BRT link at Sunway Lagoon
DBKL *Provided land use and traffic data*	• Ensure KL 2020 City Plan consistent with SPAD's GKL/KV LPTMP • Alignment of MRT1 and match to city plan • Linking transit oriented development (TOD) to future proposed transit corridors • Land use proposals- city plan to be gazetted later in 2011 • Review city plan with reference to SPAD's GKL/KV LPTMP
Selangor State EPU *Provided land use data*	• Review of Selangor State Structure Plan as current plan is based on research in 2003. This will allow local authorities to update their Local Plans • Alignment of MRT1 and match to local and structure plans • Link TODs to future proposed corridors • Review Structure Plan

2.4) Demographics

The 2010 census identified a regional population of 6.3 million compared with 4.6 million in 2000 and 3.0 million in 1990 (see Table 2.2). Although the percentage change at 37% from 2000 to 2010 is lower than in the previous decade, the magnitude of change is similar with an additional 1.7 million people in the region during the decade. The largest percentage growth is to the south and west of Kuala Lumpur in districts such as Sepang, Petaling Jaya and Putrajaya. The magnitude of growth in Kuala Lumpur between 2000 and 2010 was also higher than the previous decade (320,000 compared to 160,000).

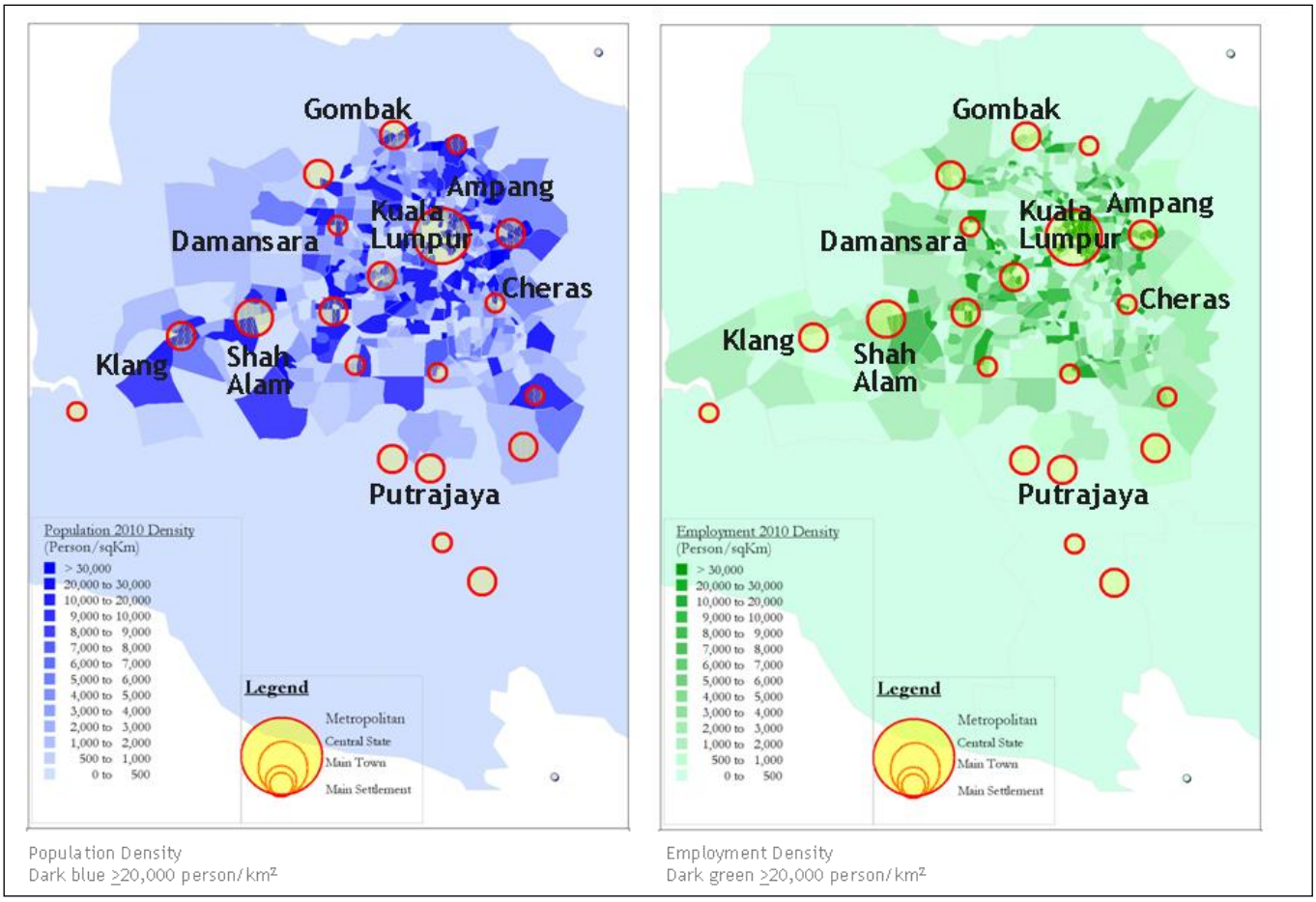
The number of households has grown by 59% in the last decade with the total number of households in the region being 1.66 million households. The net result of these changes is that the average household size has fallen from 4.81 persons per household in 1991 to 4.46 in 2000 and 3.83 in 2010. These changes are seen in all districts across the study area and has contributed to the increase of travel demands.

Table 2.2: Population and Household Trends (Source: Census 2010)

	Population					Households				
District	1991	2000	2010	Growth 1991 to 2000	Growth 2000 to 2010	1991	2000	2010	Growth 1991 to 2000	Growth 2000 to 2010
Selangor districts in study area										
Gombak	352,649	537,525	682,996	52%	27%	72,781	115,475	171,718	59%	49%
Klang	406,994	643,436	848,149	58%	32%	77,878	135,327	206,262	74%	52%
Petaling	633,165	1,184,180	1,782,375	87%	51%	132,230	268,287	481,954	103%	80%
Sepang	48,941	97,139	212,050	98%	118%	9,504	18,952	50,444	99%	166%
Ulu Langat	413,900	864,451	1,141,880	109%	32%	87,285	193,765	292,177	122%	51%
Selangor sub total	1,855,649	3,326,731	4,667,450	79%	40%	379,678	731,806	1,202,555	93%	64%
WP Kuala Lumpur	1,145,342	1,305,792	1,627,172	14%	25%	244,267	308,006	436,865	26%	42%
WP Putrajaya	5,730	11,501	67,964	101%	491%	1,022	2,152	19,692	111%	815%
GKL/KV	**3,006,721**	**4,644,024**	**6,362,586**	**54%**	**37%**	**624,967**	**1,041,964**	**1,659,112**	**67%**	**59%**
Selangor districts outside study area										
Kuala Langat	130,090	192,176	222,261	48%	16%	24,388	38,309	50,417	57%	32%
Kuala Selangor	123,052	161,168	210,406	31%	31%	23,618	32,455	49,419	37%	52%
Sabak Bernam	99,824	113,245	106,158	13%	-6%	20,122	24,258	25,443	21%	5%
Ulu Selangor	82,814	147,996	205,049	79%	39%	17,314	32,464	48,035	88%	48%
Selangor	2,291,429	3,941,316	5,411,324	72%	37%	465,120	859,292	1,375,869	85%	60%

The resulting population and employment densities have been mapped and show the higher population densities are in the main suburbs of KL and the regional centres such as Shah Alam, Klang and Petaling Jaya (see Figure 2.3). For employment the greatest concentrations of employment are in the city centre of Kuala Lumpur. Recent trends have highlighted the increasing concentration of employment in the major centres which has implications for the choice of appropriate modes to serve these centres. Where the concentrations of demands are highest are those locations where rail is most effective to provide the transport mode.

Figure 2.3: Population and Employment Densities 2010



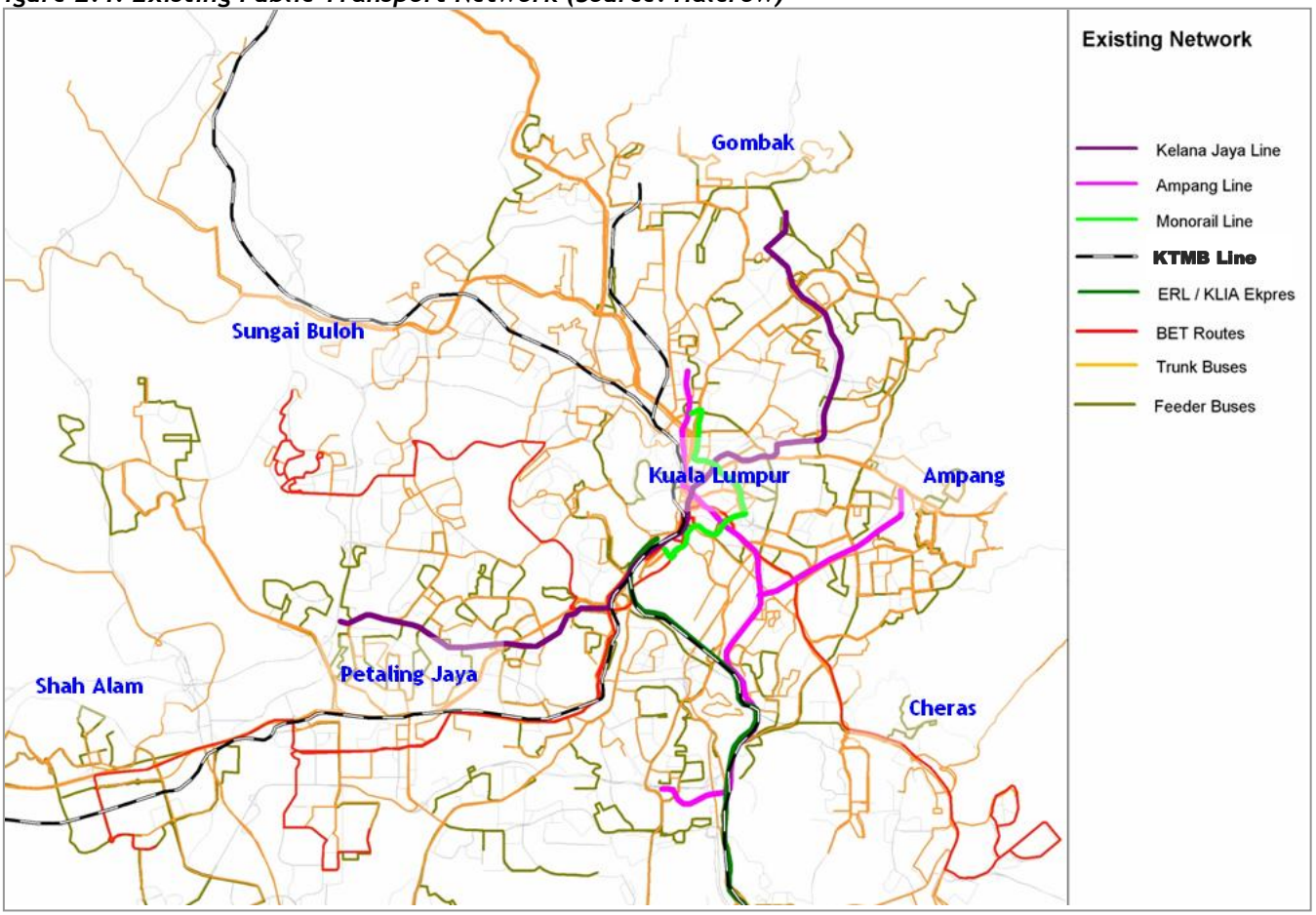
2.5) Network Provision

The current public transport network in the region covers 278km of rail with 115 stations (see Figure 2.4 and Table 2.3). In addition there is an extensive bus network operated by Rapid KL, Metrobus and a number of smaller operators.

Table 2.3: Existing Rail Network (Source: Prasarana, KTMB)

Rail Line	General Rail Category	Route length	No. of stations	Peak Hour Headway	Current Daily Ridership
KTMB Komuter	Suburban Rail	157 km	50 Stations	15 min	95,000
Kelana Jaya (Putra) LRT1	Urban Rail/ Metro	29 km	24 Stations	3 min	160,000
Ampang (Star) LRT2	Urban Rail/ Metro	27 km	25 Stations	3 - 6 min	141,000
Monorail	Urban Rail/ Metro	8.6 km	11 Stations	5 min	57,500
KLIA	Suburban Rail/ Airport Express	57 Km	5 stations	15 mins	11,000
Total		**278.6 km**	**115 stations**		**464,500**

Figure 2.4: Existing Public Transport Network (Source: Halcrow)



The KTMB Komuter runs on rail corridors that are the oldest in the country. In the early 1990s freight and passenger railway tracks between Port Klang, Sentul, Rawang and Seremban were upgraded and electrified. It was opened as the KTMB Komuter system in 1995. Since then there have been extensions to Tanjung Malim, Batu Caves and Seremban to Sungai Gadut. The current system is operated by Keretapi Tanah Melayu Berhad (KTMB). The Ampang Line (formerly STAR) was built of grade separated tracks using a combination of new alignments and the utilisation of disused freight rail lines from Pudu to Ampang. The first phase of the system opened in December 1995 and fully operational in December 1998. The system is currently operated by RapidKL. The Kelana Jaya line opened in 1998 as the Putra LRT using a completely new grade separated alignment. The KL monorail opened in 2003 and links areas within the centre of KL that were not served by the other urban rail systems.

The current daily ridership on the urban rail network is over 464,000 passengers per day with the Kelana Jaya and Ampang LRT services having the highest passenger loads. Data provided by the rail operating companies shows that the busiest stations include the main interchanges such as Masjid Jamek and KL Sentral. Typically KTMB is being used for longer distance movements including locations outside the GKL/KV region such as Seremban. Of 50 KTMB Komuter stations in the region, 12 have less than 250 passengers per day. This reflects the inaccessibility from the surrounding areas as well as the low frequency and slow journey times on KTMB. This highlights a need to provide improvements to the KTMB services.

2.6) Travel Demands

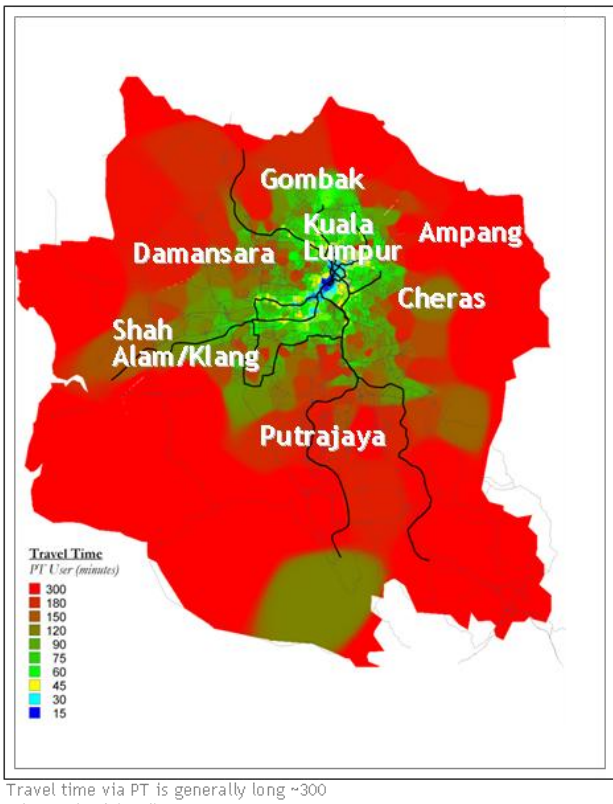
Feedback from stakeholders indicates that the mode share of car has been increasing in recent decades. The morning peak modal share for LPT has fallen from 34% in the 1980's to 10-12% in 2008 (Source: NKRA). This share is relatively low compared to other international cities such as Hong Kong (90% by LPT), Singapore (63%), and London (55% by LPT). This reduction in LPT reflects the:

- Increase of the highway network supply
- Changes in household characteristics such as reducing household sizes
- Rise in household incomes
- Affordability of cars
- Poor quality of public transport (specifically the unreliability of buses).

The net result of increased car use has been a rise in congestion across the region. However travel times for private vehicles remain competitive against the use of public transport. Buses are also subject to the congestion given the lack of bus priority measures. Figure 2.5 compares the perceived travel times to KLCC by car and public transport from all other areas in the region. Those areas shown in blue have the lowest travel times while those in red have the longer travel times. These perceived times are based on door to door times and for a LPT journey include elements of walking times at both the origin and destination, waiting time, in-vehicle time, and interchange time. In the perceived time calculation a weighting is applied reflecting the passengers valuation of the different elements such that walking and waiting has a weight of 2.0 compared to in-vehicle time (weight =1. Travel times are typically much higher by public transport resulting in poorer accessibility to jobs and facilities. The figures show that travel times by car are typically shorter than by LPT for many journeys in the region. The exception is those corridors currently well served by rail such as the LRT corridors.

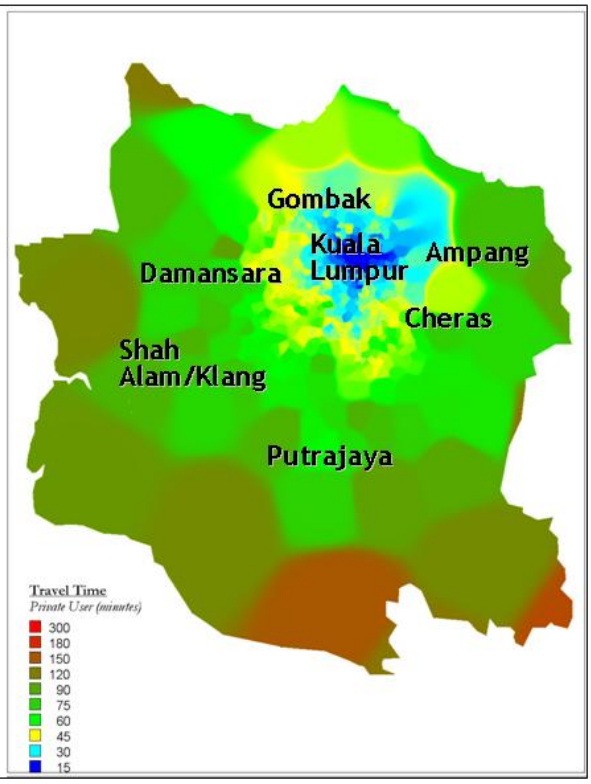
Figure 2.5: Modelled Perceived Travel times to KLCC (Source: Greater KL Transport Model)

Travel time to KLCC by LPT



Travel time via PT is generally long ~300 minutes (weighted)

Travel time to KLCC by car

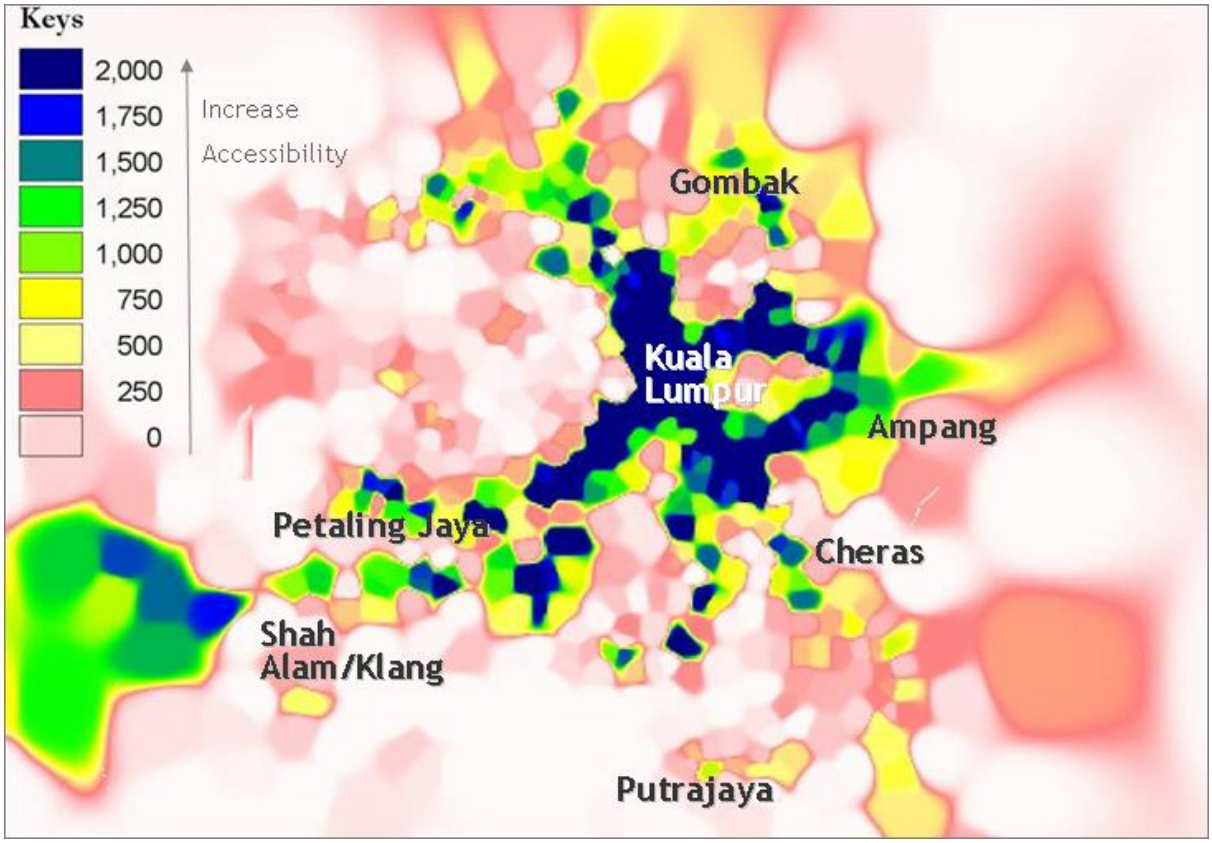


Travel time via private transport is generally quick ~60 minutes (weighted)

Accessibility by public transport is an important factor of the GKL/KV LPTMP. Accessibility has been mapped from both the perspectives of employers and residents across the region. Figure 2.6 shows the Accessibility Indicator from the employer's perspective and indicates for any location, the number of employees within 75 minutes of those jobs by using LPT. The blue areas on the maps are those areas with the greatest accessibility and where employers have a much larger pool of labour to attract within 75 minutes. The pink areas are those with much lower attractiveness as they have lower numbers of workers available within their catchment. The diagram has screened out those in white which do not have significant employment in them.

Typically the more accessible areas by LPT reflect the rail corridors within Kuala Lumpur. Within the central area of KL there is a strong focus on the LRT corridors. The map does show that areas to the north and west of the region generally have less accessibility than to the south. Therefore for LPT, only those employers close to a rail or LRT line have good access to the workforce and similarly those residents living close to such lines have greater access to employment by LPT.

Figure 2.6: Accessibility- Number of Employees within a 75 minute catchment-2010



2.7) Service Reliability and Efficiency

Maximising the reliability of existing systems can help enhance both their attractiveness and increase capacity. Each train cancelled or delayed will undermine the attraction of the service and reduce capacity. Indeed often it is the uncertainty of unreliable services that deters users more than the actual frequency or journey time.

Similarly, poor efficiency will be likely to result in poorer overall service quality (and potentially volume), the need for higher fares than necessary as well as worse financial results.

It has not been possible to establish clear benchmarks of existing performance of the rail operators, but one focus of the rail plan must be to ensure that all operators are providing as efficient and reliable services as reasonably practicable.

In the absence of monitoring and benchmarking information it is impossible to judge whether the operators are providing the best possible services at the best value. The lack of robust monitoring also makes it difficult to put complaints into context.

The conclusion is that a system of robust monitoring, benchmarking and reporting needs to be put into place for all rail operations. Should this identify weaknesses (including the use of reasonable comparator systems) then action plans need to be developed to address these weaknesses and to ensure that they are not replicated in the design and planned operation of system enhancements, extensions and new lines.

Key Conclusions

The region has seen steady population growth in recent decades which has led to increasing demand for travel.

LPT Mode share in GKL/KV is relatively low compared to other major cities.

There are many areas where LPT journey times to key destinations are unattractive.

Journey times by private vehicle tend to be faster than the equivalent journey by LPT.

Accessibility to jobs by private transport is currently much greater than by LPT.

The poorer accessibility by LPT leads to increased mode share for cars.

Robust performance monitoring, benchmarking and reporting should be introduced urgently for all rail operators with action plans developed to address and weaknesses identified.

Looking to the Future of Rail

3

3. Looking to the Future of Rail

3.1) Introduction

This chapter outlines the process for collating future information regarding the situation in GKL/KV. The scenarios considered have taken account of the transit gaps and the future land use patterns identified by the local authorities. The impact of land use is considered in terms of population and employment and how this impacts upon travel demands. The transport analysis tools assess the future travel patterns and demands particularly along the corridors in the GKL/KV region. These are compared against a corridor hierarchy based on peak passengers per hour per direction (pphpd). The tools provide methodologies to assess the impacts of alternative options within and between corridors. From this basis, preferred corridors were identified and the proposals for the URDP assembled.

3.2) Identifying the Rail Gaps

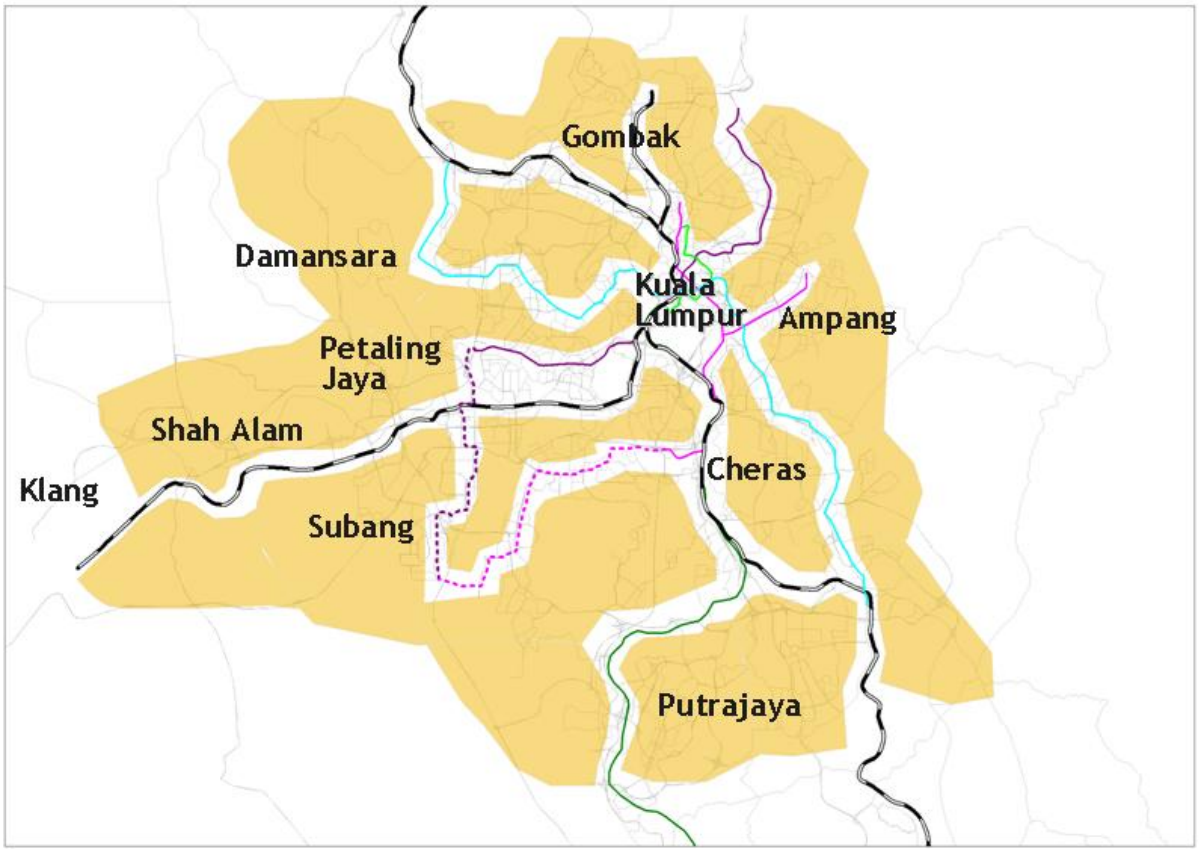
The committed future rail network was plotted to identify those gaps which are potentially poorly served by LPT (see Figure 3.1) whilst having significant population or employment centres that might justify rail access. The gaps are defined as being beyond 2.5km from the rail lines. The network used for this assessment assumes the LRT extensions to Putra Heights as well as the completion of MRT1 between Sungai Buloh and Kajang.

The green sectors depict the rail transit gaps (or white areas where rail is not easily accessible to the commuters) based on the proposed future rail network including MRT1 and the LRT extensions. Within KL these include a number of suburbs such as Pandan, Mont Kiara, and Serdang which fall within rail gaps. In Selangor the rail network gaps include Cyberjaya, areas to the north and south of Klang and Shah Alam, and Selayang. Most of Putrajaya currently lies within a rail gap as the services operate to Putrajaya Sentral which is to the west of the city.

The next stages in the GKL/KV LPTMP development assessed the changes in future land use in these areas and the resulting travel demands and travel patterns created to assess future transport needs and whether these should be filled by rail or other modes.

The analysis of the rail transit gaps highlight weaknesses that need to be reviewed through the GKL/KV LPTMP. Given the importance of the region to the national economy there is a need to increase accessibility to the primary centres and key employment areas. These include the centre of Kuala Lumpur where employment intensification is a key feature of the DBKL City Plan. Other centres such as Shah Alam and Putrajaya are also higher density employment locations. These will rely on the provision of enhanced LPT to serve these centres, both from radial and orbital perspectives. While there is an extensive bus network in place, there are still gaps without high quality reliable public transport links and from which journey times are slow.

Figure 3.1: Rail Network Gaps- 2020



The gaps highlight the need to provide better LPT services to serve key future developments identified by the local authorities. Generating the intensity of demand within these gaps to justify rail investment would be greatly helped through TODs. These developments will provide a greater incentive for public transport use by their co-location to transit nodes. The gaps indicate those existing populated areas and future developments that are not served by rail and therefore provide the pre-requisite consideration for rail services subject to other considerations such as demand. The gaps also indicate the need to improve modal integration for passengers to be able to use bus and rail services to access key centres.

Key Conclusions

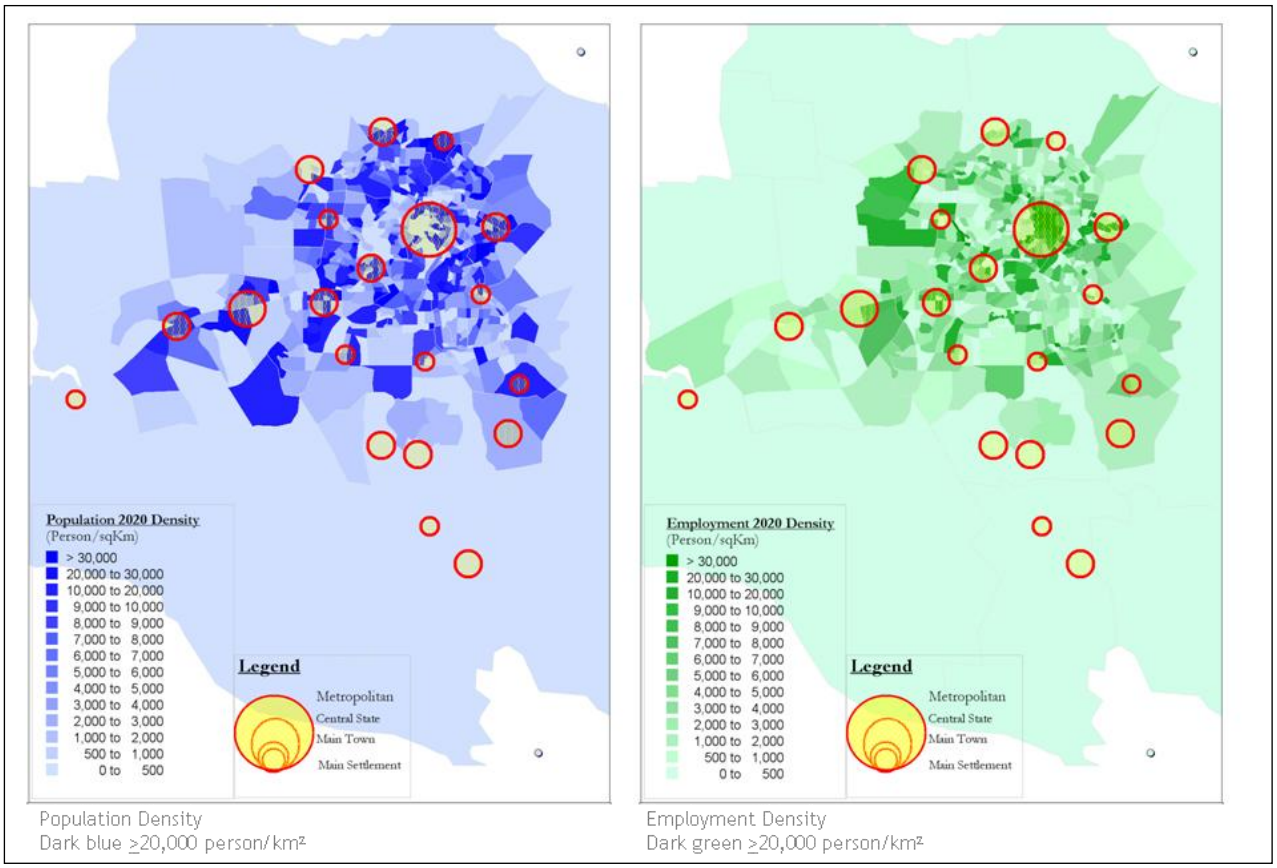
The LPT network coverage has rail gaps even allowing for the committed schemes. These are assessed in terms of land use, travel demand and travel pattern to inform the need for improvements in susequent development stages of the GKL/KV LPTMP.

3.3) Future Land Use Demands

Data have been collated from the local authorities in relation to the KL City Plan, the Selangor State Structure Plan, Putrajaya Master Plan and district local plans. The latest versions of the plans have been reviewed to identify their data, land use policies and development proposals. From this basis, the transport recommendations of the GKL/KV LPTMP are developed using an independent systematic and methodological approach as outlined in this chapter. This allows consistency and integration of the LPT elements of the GKL/KV LPTMP with the development aspirations of the land use plans.

The population forecasts assume a capacity of 10 million people in the region with the largest growth forecast in Klang, Sepang and Putrajaya. This is a 59% increase in population compared to 2010. The population density map for 2020 (see Figure 3.2) is similar to that shown earlier for 2010 with higher densities in the main suburbs of KL and the regional centres such as Shah Alam. There are a number of major residential developments proposed within the land use plans which need to be incorporated into the GKL/KV LPTMP. The household size projections within the plans are forecast to drop further to 3.93 persons per household in 2020. This growth will maintain the pressure on the transport networks with increased demand for movement across the region.

Figure 3.2: Population and Employment Densities 2020



The draft DBKL City Plan forecasts the growth in jobs from 729,000 in 2005 to 1.2 million in 2010 and 1.4 million in 2020. The City Plan shows greater intensification particularly in the city centre. There are a number of major commercial developments within the land use plans which need to be integrated into the LPT Master Plan (such as Kuala Lumpur International Financial District KLIFD and Matrade). The growth in these locations will intensify the need for high capacity public transport for their own success and to maintain the economic status of the region. In particular, enhanced rail systems need to provide access to the centre of Kuala Lumpur.

Key Conclusions

Population will continue to grow in the region increasing the demand to travel.

Employment intensification is proposed in key centres, particularly the centre of KL.

The concentration of employment will be more and more difficult to serve without major increases in LPT mode share.

Employment areas will need good accessibility to maintain the economic status of the region.

3.4) Future Travel Demands

The Transport Analysis Tools have been developed for use by SPAD in assessing the key considerations of land use and transport schemes on future travel demands, travel times and accessibility. The tools include:

- A Land Use database which utilises the data provided by DBKL, Selangor UPEN and Perbadanan Putrajaya
- A trip generation model which uses the land use information to derive the forecast travel demands in the region
- A multi-modal transport model which derives the future travel patterns on the network in terms of flows, and travel times
- An accessibility model which shows the impact of travel times on access to locations within the study area for catchment area analysis

Forecasts have been produced for the morning peak 2020 situation with those committed schemes and the MRT1. The forecast morning peak hour travel demands by all modes (private and public transport) in the region show large radial movements towards the Central area of Kuala Lumpur (see Figure 3.3). Demand for all modes crossing the MMR1 as forecast for 2020 shows strong flows in all the corridors with the highest demands being from the Petaling Jaya/ Shah Alam/ Klang corridor.

Within the region there are also strong orbital demands in the suburban areas (see Figure 3.4), particularly to areas such as Petaling Jaya and Shah Alam. The largest flows are in the Petaling Jaya area along corridors such as the North-South Expressway and the Damansara-Puchong Expressway (LDP) corridor. In addition to these flows between centres, there is a wide diversity of local movements within the suburban areas such as local movements within Shah Alam or Klang. Although lower than the radial demands into the centre of Kuala Lumpur, these demands require high quality LPT access.

Figure 3.3: Forecast Travel Demands towards Kuala Lumpur Central Area (AM Peak Hour)

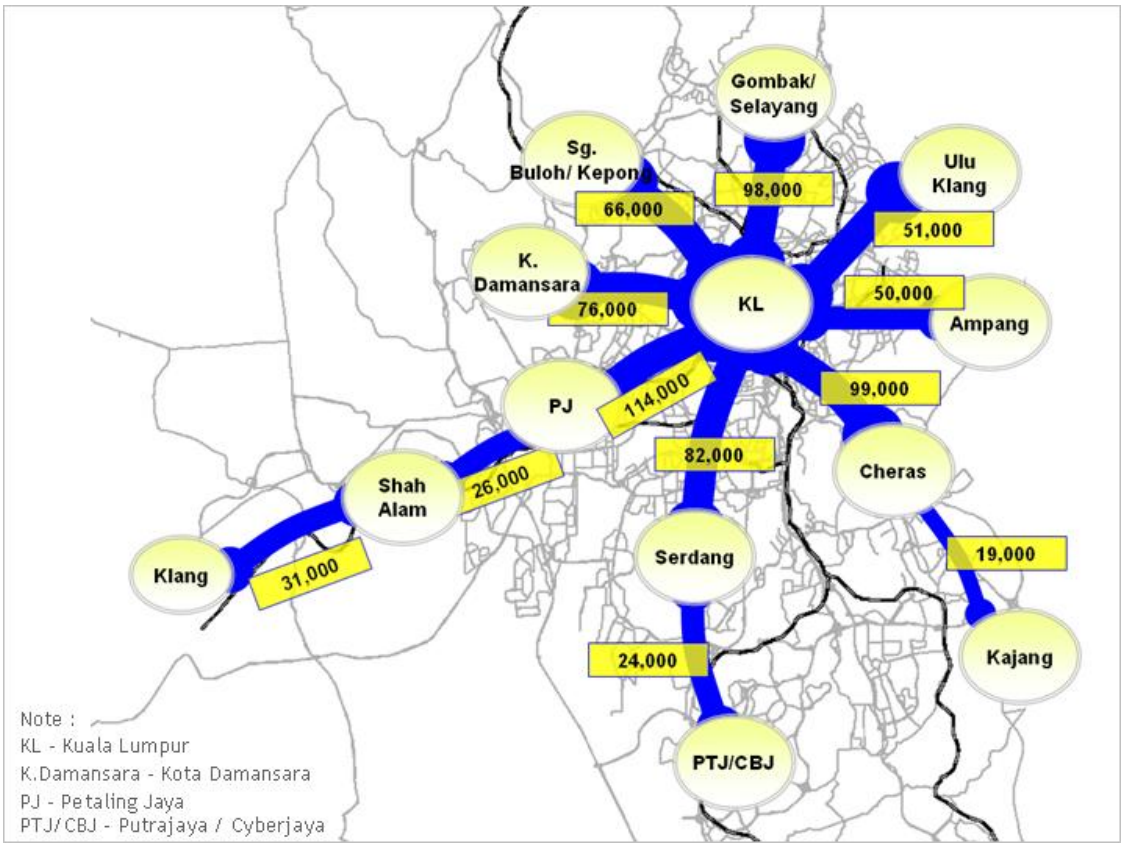
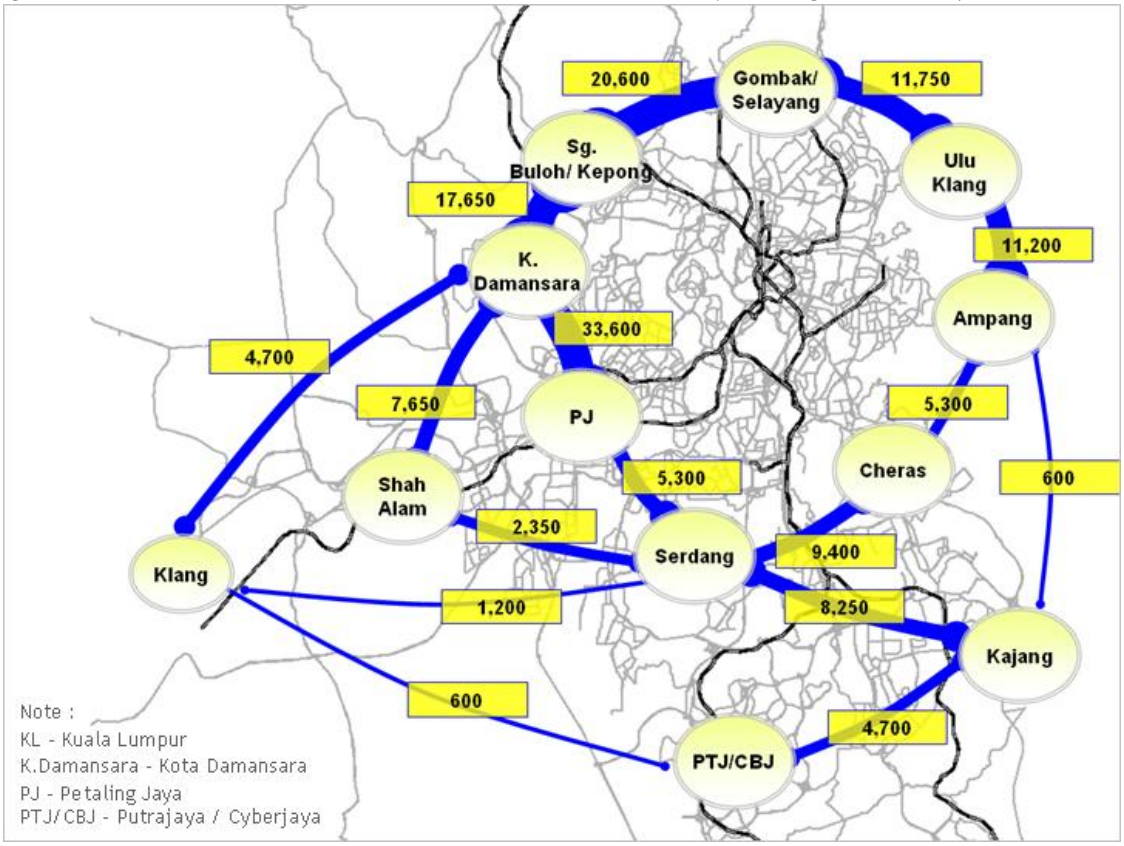
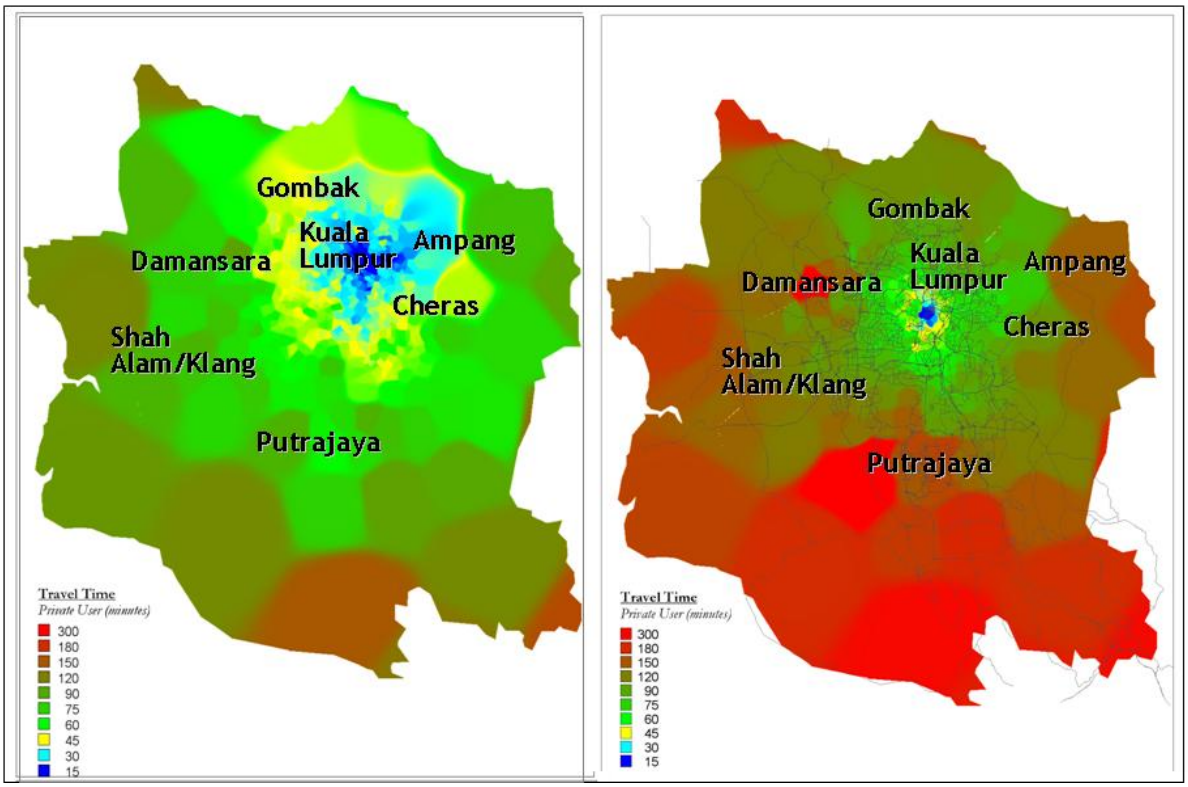


Figure 3.4: Forecast Travel Demands Orbital Movements (Morning Peak Hour)



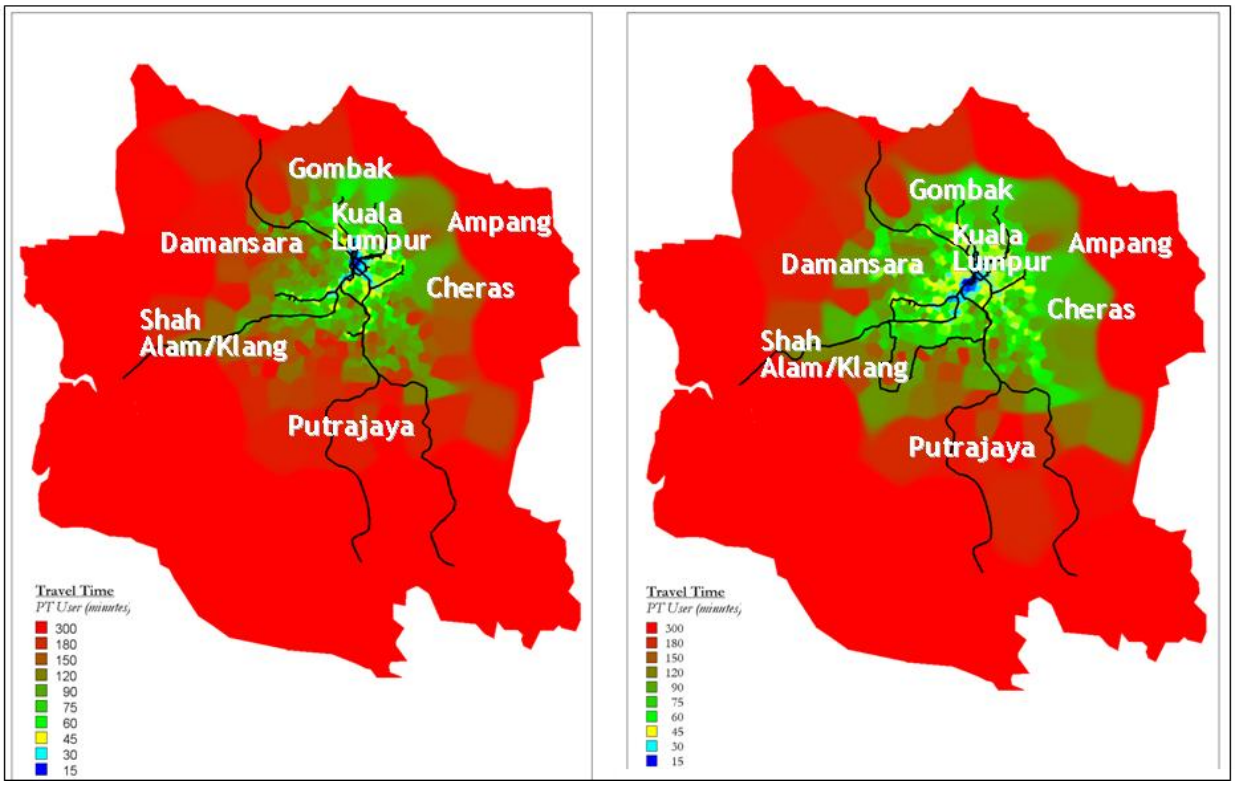
Without improved LPT and a mode shift to LPT, the net result of the growth in travel demands arising from the land use changes will further increase car usage. This will lead to longer travel times with a further significant rise in congestion for private vehicles, as well as buses leading to unreliable travel times. This will affect the commercial performance of the region. The forecast 2020 travel times to the centre of Kuala Lumpur clearly show the lengthening of private vehicle journey times with more areas in red (see Figure 3.5) and much fewer areas of blue.

Figure 3.5: Modelled Perceived Travel times by Private Vehicle to KLCC (Source: Greater KL Transport Model)



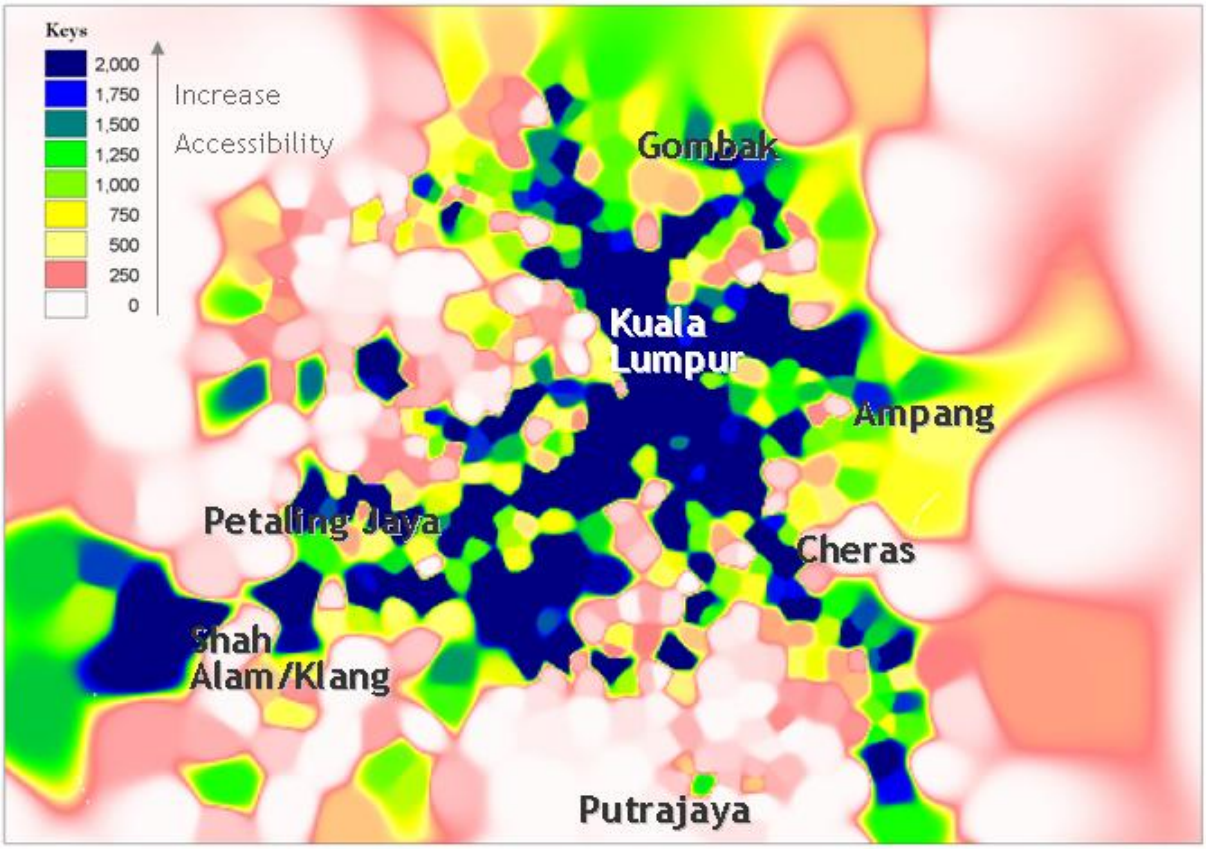
A similar comparison for public transport shows travel times will improve along those corridors with the Commitments (more green areas). These include the LRT extensions to Putra Heights (see Figure 3.6) as well as the MRT1 line through Damansara and Cheras.

Figure 3.6: Modelled Perceived Travel times by Public Transport to KLCC (Source: Greater KL Transport Model)



Mapping overall accessibility to employment shows a much wider area of blue with improved accessibility (see Figure 3.7). The areas of improvement follow the LRT extensions and the MRT1 line through areas such as Damansara, Cheras and Kajang. However the figure does confirm that significant gaps remain such as Mont Kiara and along the Klang corridor and that the committed schemes alone do not provide high quality LPT services to all parts of the region. The conclusion is that further LPT measures are needed.

Figure 3.7: Modelled Accessibility Index 2020 (Source Greater KL Transport Model)



Key Conclusion

The increase in population and employment will increase travel demands.

This will put further pressure on the highway network with resulting congestion and unreliable journey times.

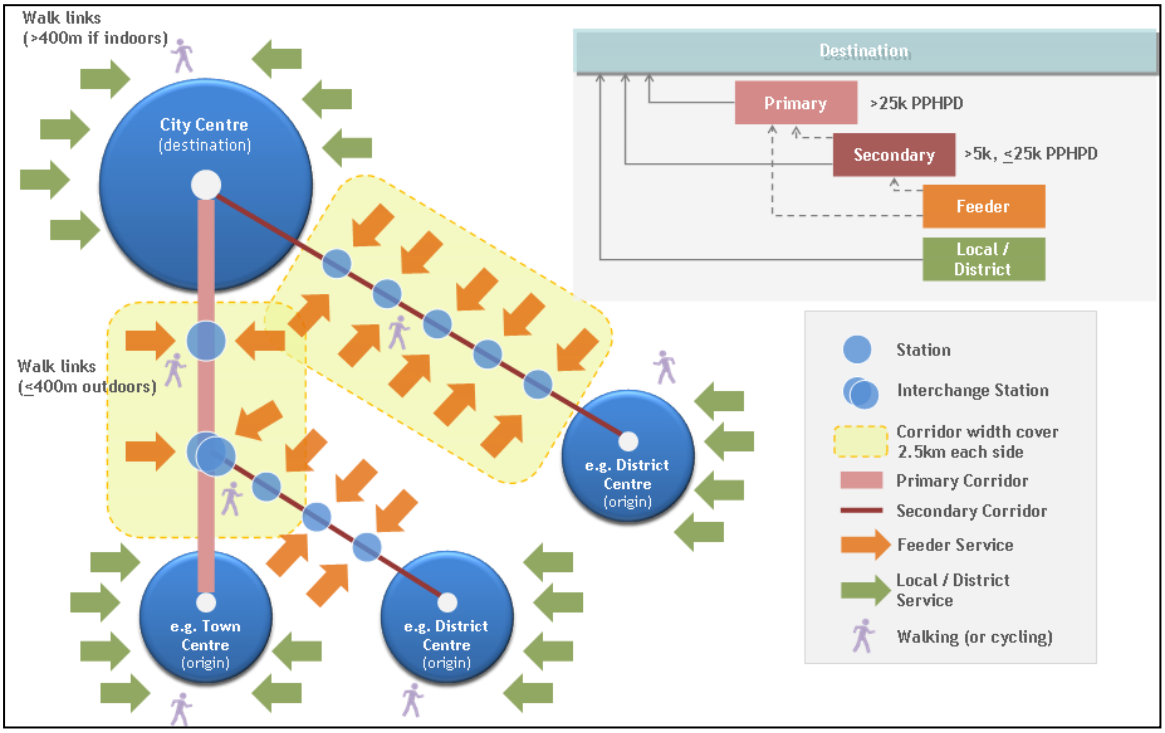
LPT Accessibility is improved along the LRT extension corridors and the MRT extension, but significant areas remain without good accessibility.

Overall Accessibility will worsen unless additional LPT supply is provided.

3.5) Corridor Hierarchy

The approach to the GKL/KV LPTMP development is to investigate the corridor hierarchy in a region and from this to select the appropriate modes where enhancement is needed. Four levels of corridor are identified according to the Toolkit including primary, secondary, feeder and local/ district corridors. In the context of GKL/KV, these are distinguished within a functional hierarchy and are based on pphpd (see Figure 3.8).

Figure 3.8: Conceptual Corridor Hierarchy



The conceptual diagram of how the corridors fit together shows that at the top level of the hierarchy are the primary corridors. These are identified as corridors with the highest demand (over 25,000 pphpd). These will typically be linkages to city centres potentially from other suburban town centres. At these levels of demand, high quality rail-based systems are likely to be justified. Transit stops along the primary corridors will be further apart than on other corridors reflecting the need to serve the city centre. Each transit stop would be served by a walking catchment (potentially up to 400 metres if outdoors and over 400 metres if indoors or under cover. Transit stops would also be supported by a feeder bus network.

Secondary corridors can serve a range of functions such as lower demand corridors to a city centre or as providing linkages to a primary corridor. They will have demands in the range 5,000 to 25,000 pphpd. In these corridors demand will, in some cases, be sufficient to justify rail-based systems while in others a high quality bus solution may be more appropriate. Transit stops might be closer together on the secondary corridors served and walking and bus catchments.

The feeder services are crucial to support the primary and secondary corridors as these provide access to the main services. Finally there are local corridors which access other local centres as these will generate demands in their own right. Feeder services and local corridors are likely to be bus based, with the maximum practicable priority to minimise journey times and unreliability. The role of bus in the GKL/KV Region is outlined in more detail in the Bus Transformation Plan document.

Key Conclusion

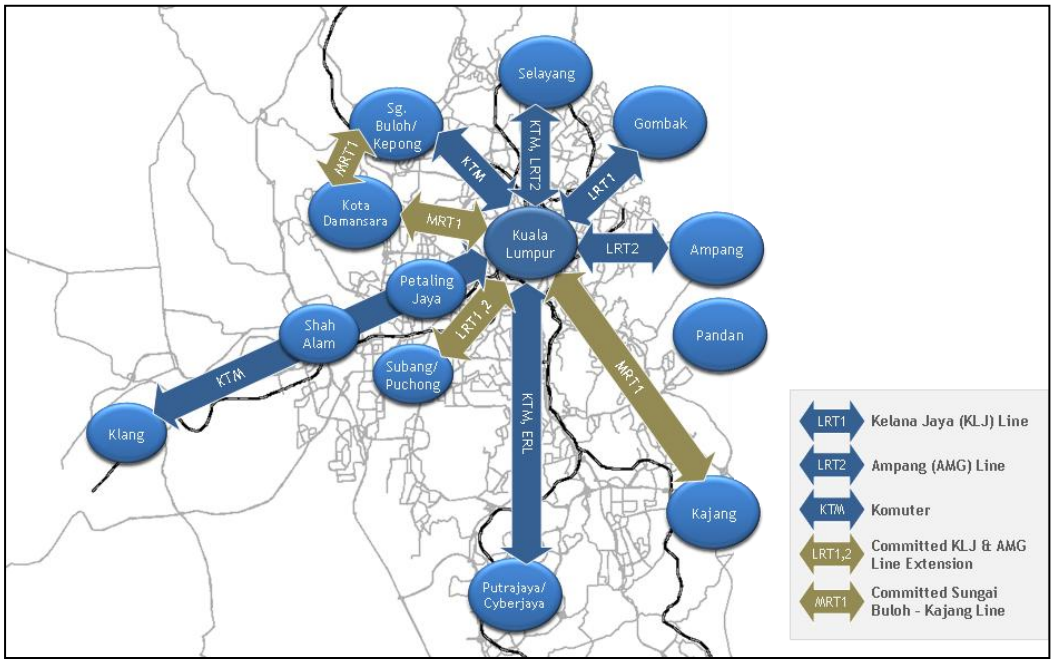
The GKL/KV LPTMP has set out definitions for developing the hierarchies of transport corridors based on Primary, Secondary, Feeder and local/ district corridors.

3.6) The Greater KL/ Klang Valley Corridor Hierarchy

The corridors in the GKL/KV have been identified in terms of their roles in the hierarchy. The forecast demands identified in Section 3.4 were based on all modes (private and public transport) for each corridor. The morning peak demands were converted to a LPT pphpd which assumes a 50:50 split between public transport and private transport reflecting longer term aspirations for modal share in the region. It is noted that for some corridors a higher modal share will be achievable.

The primary corridors cover each of the main entries into the city centre of Kuala Lumpur (see Figure 3.9). Rail provides the main mode in the majority of these corridors. The KTMB network provides services from the Klang, Sungai Buloh/ Rawang corridors and for part of the Selayang corridor from Batu Caves. LRT1 provides the main mode in the Gombak corridor while LRT2 serves the Selayang and Ampang corridors. Both LRT lines serve the Subang/ Puchong corridor through their extensions to Putra Heights. This fills one of the current rail gaps. The southern corridor towards Putrajaya is served by KTMB and ERL. The new MRT1 line will provide the main mode in the corridor from the CPA to Kota Damansara and Kajang (via Cheras) as well as linking Kota Damansara to Sungai Buloh. The MRT1 line therefore closes some of the key gaps in the rail network.

Figure 3.9: Primary Corridors- Greater KL/ Klang Valley

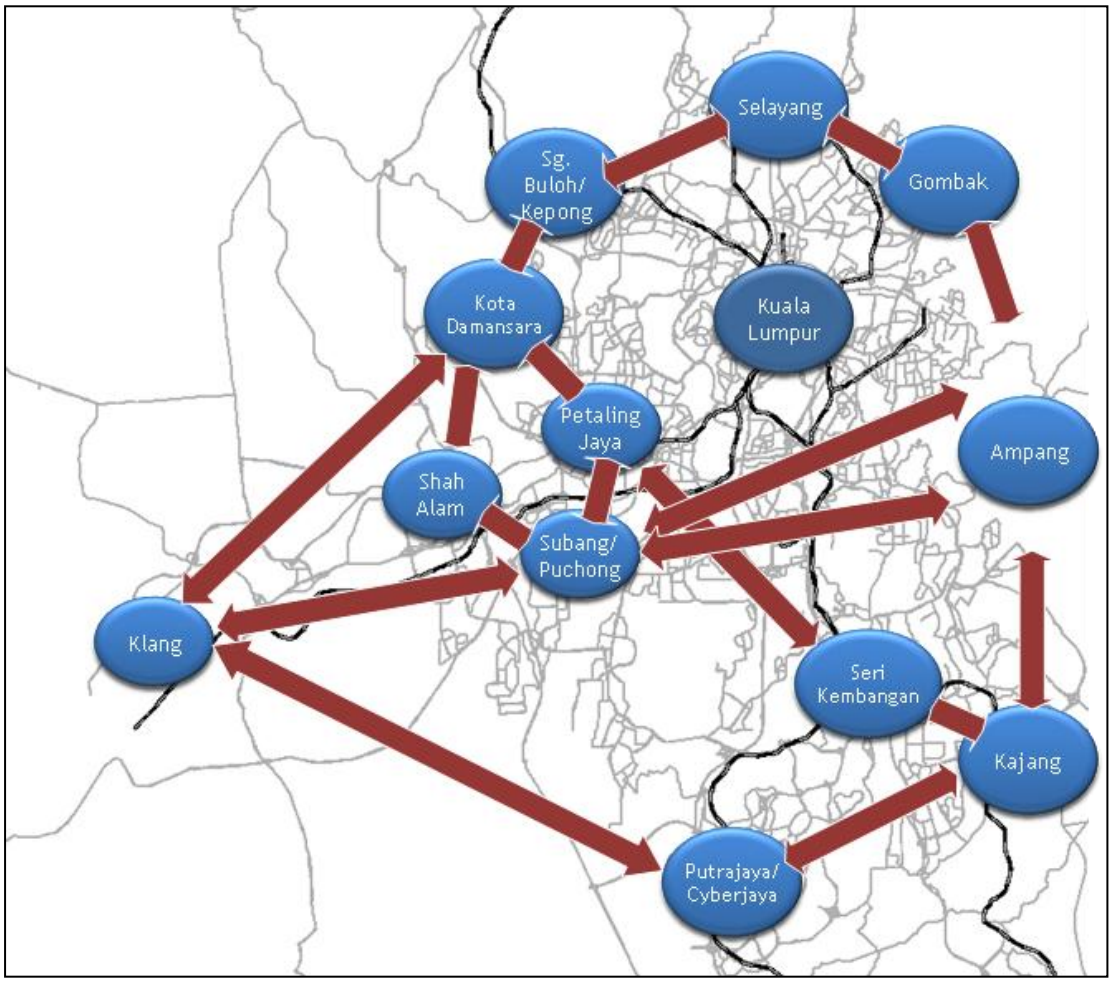


The secondary corridors comprise the linkages to other key centres such as Klang, Shah Alam, Petaling Jaya and Putrajaya. Additionally the secondary corridors include a number of orbital movements around KL. There is an inner orbital corridor around the city linking locations such as Mont Kiara, Mid Valley Megamall and Sentul. An outer corridor can be identified linking Gombak, Selayang, Kota Damansara and Pandan. The demands in these corridors often reflect the road system with the LDP corridor and North-South (N-S) Expressway corridors having high demands. Looking at the future LPT network these corridors would be served by modes appropriate to the local circumstances. In some cases these will require rail systems while for others monorail, tram or bus would be appropriate.

In addition to the primary and secondary corridors there are extensive feeder and local/ district corridors which are shorter in length and provide local access to centres and the other corridors. These are served by the bus network.

In the case of KL, the assessment process showed that meeting the growing travel demand can be best achieved through a combination of solutions most appropriate to the needs of the individual corridors and areas served.

Figure 3.10: Secondary Corridors- Greater KL/ Klang Valley



Key Conclusion

The range of primary and secondary corridors have been defined for the GKL/KV region.

Primary corridors focus on the access to the city centre of KL.

Secondary corridors focus on orbital movements and the other centres.

The assessment process needs to consider the role of each mode such that the growing travel demand can be met by the appropriate mode.

Appraising Rail Corridors

4

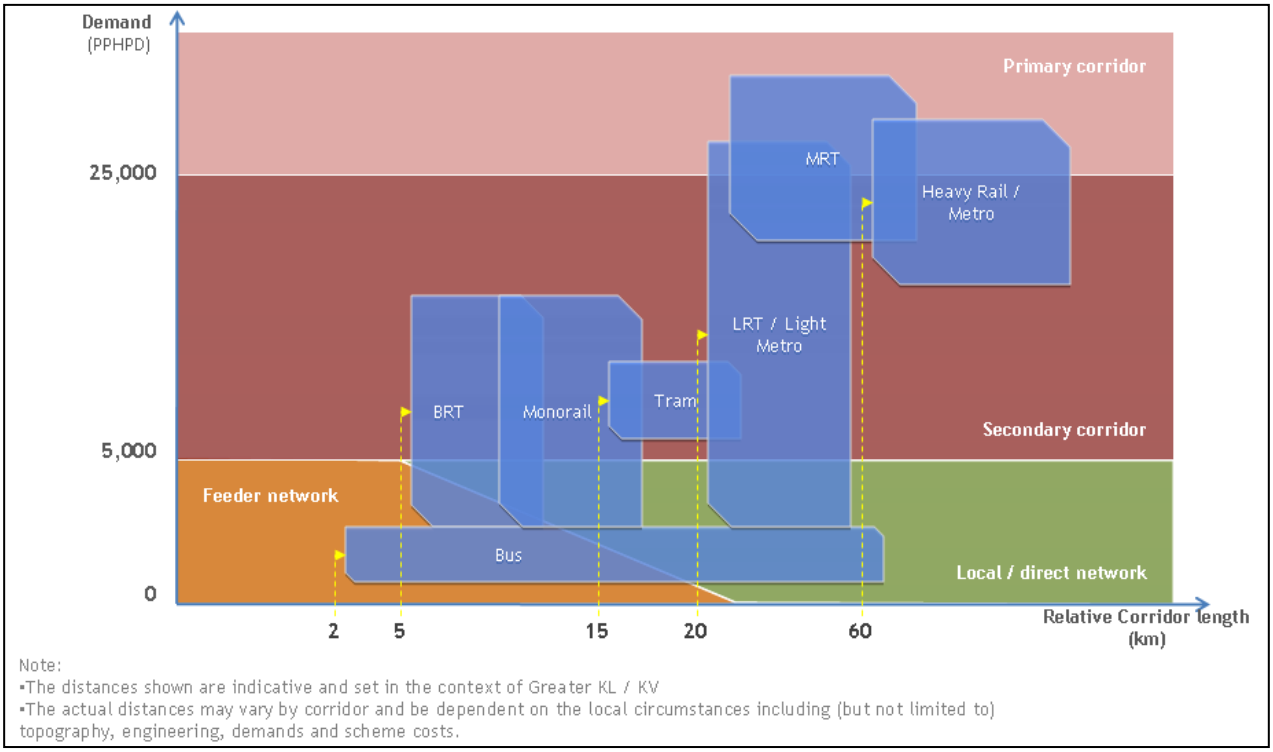
4. Appraising Rail Corridors

4.1) Introduction

The previous chapter highlighted the future land use changes in terms of population and employment and how these would influence travel patterns in the region. The travel patterns show a strong indicator of movement to the primary centres, particularly to the central area of Kuala Lumpur. This intensifies the need to provide greater capacity on these corridors to cope with the demands. In addition, good station access in the central area is important in order to disperse demands across a number of access points to avoid overloading the system at a small number of key terminals or interchanges. This chapter outlines the rail proposals within the URDP. Although there is a need to maximise reliability and efficiency of the existing operations, the scale of the need for additional capacity and the gaps in the current networks mean that this should be one part of the plan, albeit an important one.

4.2) Modes

Figure 4.1: Relating the Modes to Conceptual Corridor Hierarchy



Note:
•The distances shown are indicative and set in the context of Greater KL / KV
•The actual distances may vary by corridor and be dependent on the local circumstances including (but not limited to) topography, engineering, demands and scheme costs.

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LPT covers a wide range of modes from different types of bus and rail system. Each has different key characteristics in terms of pphpd, average speed, technology and operating considerations. Buses typically operate at lower speeds and are more likely to be subject to congestion thus impacting on their reliability and ability to operate to timetable. There is often the potential to implement priority measures and buses provide the greatest flexibility to respond to changes in demand and network characteristics. They provide a much lower capacity compared to rail systems but do operate with lower costs where lower capacity is required. As such buses are more suited to feeder corridors and local/ district network.

BRT systems can operate with a range of vehicle types from single deck buses carrying 70 passengers up to articulated vehicles carrying 300 of which the majority will be standing. These rely more on segregated sections of carriageway in order to provide relief from congestion. They can play a role in local corridors and also on secondary corridors. The capacity provided is a function of the headway and vehicle types. This will determine the amount of carriageway required for BRT services. High frequency services, such as in Latin America, typically require more running lanes so that with transit stations, they can require the equivalent of a 5 lane highway and are thus very demanding of infrastructure needs.

Street trams by comparison can operate within traffic lanes or segregated from traffic and are extensively used in Western Europe. Where they operate with traffic and pedestrians, the speed is lower and can be subject to delay. In developing a network, as the system is at grade, there may be significant disruption to utilities during construction to avoid operational disruption. The capacity of tram systems is not as large as for a monorail due to operational characteristics but the infrastructure costs are lower.

Monorail also provides an overlap between local feeder and secondary corridors. These systems can provide similar levels of capacity to BRT and are segregated from traffic using elevated sections. They require sophisticated signal and control systems to operate at high frequency. Monorail systems have limited interoperability and it is not easy to switch tracks as with conventional rail systems.

Rail systems can be envisaged as providing linkages to the city centre, particularly through primary and secondary corridors in GKL/KV. They offer advantages in that they are the main mode most likely to encourage modal transfer from private vehicles. They also allow local authorities to encourage TODs in the corridor. Therefore primary corridors are characterised as being most appropriate for heavy rail, MRT and LRT systems. MRT will operate with a higher capacity than LRT systems but will be the most expensive to implement. LRT can provide lower capacity and cost services including providing access to secondary centres. Where elevated sections are provided these can have a relatively high visual impact. In many major cities rail is seen as the primary mode for high capacity corridors, particularly for city centres.

In developing a GKL/KV LPTMP, the role of each mode needs careful consideration according to the local requirements.

Key Conclusion

The assessment process needs to consider the role of each mode such that the growing travel demand can be met by the appropriate mode.

In the case of KL, the assessment process showed that meeting the growing travel demand can be best achieved through a combination of solutions most appropriate to the needs of the individual corridors and areas served.

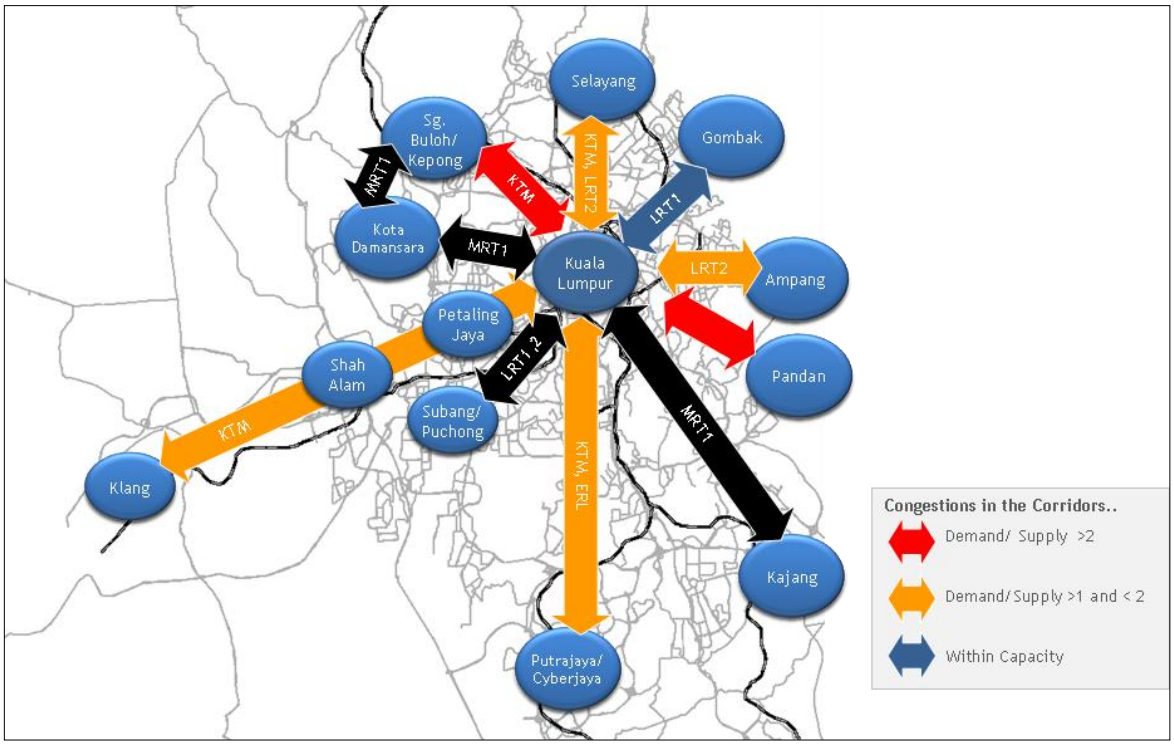
4.3) Developing the Corridors in the Future - Assessing the Demands

An assessment has been undertaken to review whether the proposed supply can accommodate the forecast 2020 travel demands and meet the aspirations of higher LPT modal share. The initial analysis examined a scenario with no additional improvements over the committed LRT extensions and the MRT1 line. This showed that the MRT1 corridor and the LRT1 corridors are forecast to operate in the morning peak within capacity (see Figure 4.2). The corridors to the city centre from Selayang, Klang, Ampang and Putrajaya are forecast to have demands in excess of supply while those from Sungai Buloh and Pandan are forecast to have demands significantly over supply. In the case of Pandan there is no direct rail link from this area to the city centre so the bus network is overloaded.

The analysis concluded that currently funded rail projects will not be sufficient to meet the forecast growth in travel demand given the intensification of employment in the CPA. The introduction of the MRT1 and the LRT extensions will improve conditions in key corridors but further measures are required to enhance LPT modal shares and provide greater comfort and reliable journeys. The impact of a congested GKL/KV region is likely to have economic consequences given the importance to the national economy.

Therefore the challenge is to provide an enhanced public transport system which can encourage modal transfer and reduce overcrowding by providing more capacity particularly in the peak periods. This will need greater emphasis on the role of both bus and rail. The implication for rail is that it will not only require additional infrastructure but will also need greater station capacity, rolling stock, maintenance depots and power supply.

Figure 4.2: Forecast Over-crowding on the Primary Corridors



4.4) Summary of the Rail Proposals

This section summarises the rail proposals included in the URDP. A more detailed explanation is given in Section 4.5 for each element. The purpose of the URDP is to define broad corridors where new and enhanced lines are needed in addition to existing commitments. In line with the guiding principles the rationale behind these are to:

- Maximise the potential use of the current assets and the quality of service
- Provide an expansion of capacity to cope with demands through extensions
- Construct new lines to meet demand and future developments

Pertaining to implementation of rail proposals included in the URDP, a more detailed technical assessment will be required of the engineering and operational feasibility. That stage will examine the exact alignment that should be adopted for new lines and the location of stations.

In order to identify these proposals an initial technical analysis was undertaken using the transport analysis tools to assess ridership and accessibility which sought to compare alternative options for individual corridors, or between providing new lines in alternative corridors.

As part of the GKL/KV LPTMP the proposed rail enhancements to the primary corridors include:

- Upgrade of the KTMB service between Klang and KL Sentral to provide a 'metro' style service
- Upgrade of the KTMB service between Seremban and Rawang/ Batu Caves to provide a 'metro' style service;\
- Provision of a new MRT Circle line around KL
- Provision of a new north west-south east MRT line to serve the city centre
- Development of an LRT line to operate between Kelana Jaya LRT, Shah Alam and Klang

The proposed rail enhancements to the secondary corridors include:

- Extension of the KL Monorail
- Completion of the Putrajaya Monorail
- Development of an outer orbital route linking suburban centres

Figure 4.3 shows the development of the primary corridors up to 2020. Given the intensification of employment in the city centre, the emphasis is to develop the linkages to the Central area of Kuala Lumpur by providing additional capacity on the radial routes through the upgrade of KTMB, and to the eastern half of the city centre passing major new development areas such as Kampung Baru by the provision of a new MRT line. In addition, the provision of a Circle Line will link major development areas in accordance with the DBKL City Plan.

Figure 4.3: 2020 Development of the Primary Corridors

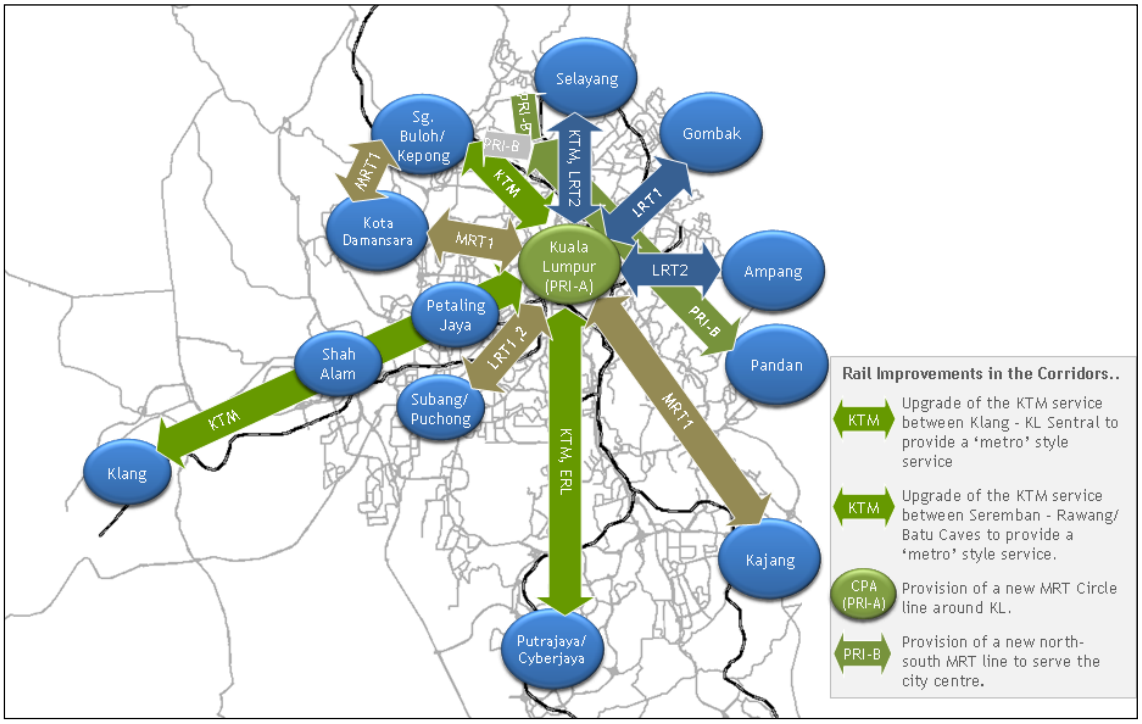
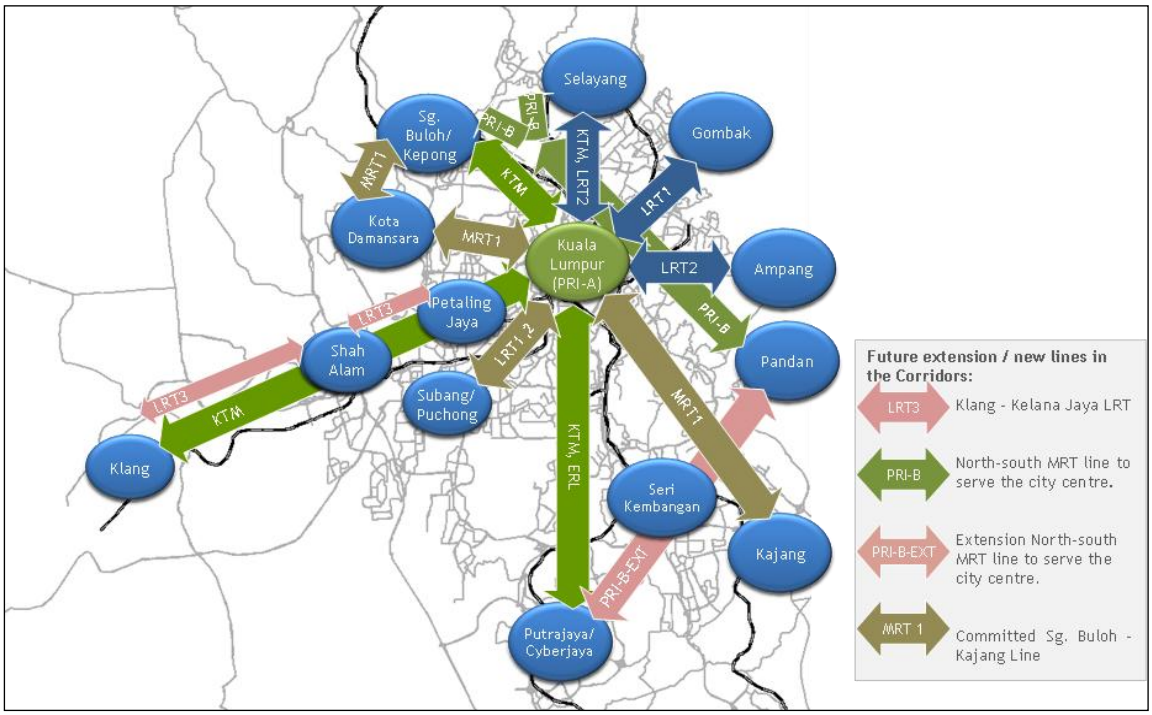


Figure 4.4 shows the 2030 development of the primary corridors with the extension of the North-South MRT line towards Putrajaya and the provision of a local LRT spur line between Kelana Jaya and Klang via Shah Alam. This would operate in parallel with the KTMB service to Klang but as far as practicable with a separate complementary catchment area.

Figure 4.4: 2030 Development of the Primary Corridors



Rail Improvements to the secondary corridors are shown in Figure 4.5. These include the extension of the KL Monorail and completion of the Putrajaya Monorail. In the longer term there is a need to provide some form of orbital relief along the LDP corridor. The sections through Petaling Jaya have particularly heavy private vehicle demands resulting in significant congestion. Initially consideration should be given to the bus network coverage in this area but in the longer term additional capacity will be needed to link areas such as Gombak and Damansara to Petaling Jaya. An outer orbital LRT line should be considered by 2030.

Improvements in the remaining secondary corridors will be provided by using bus and BRT. These corridors will be outlined in the BTP.

Figure 4.5: Development of the Secondary Corridors-Rail

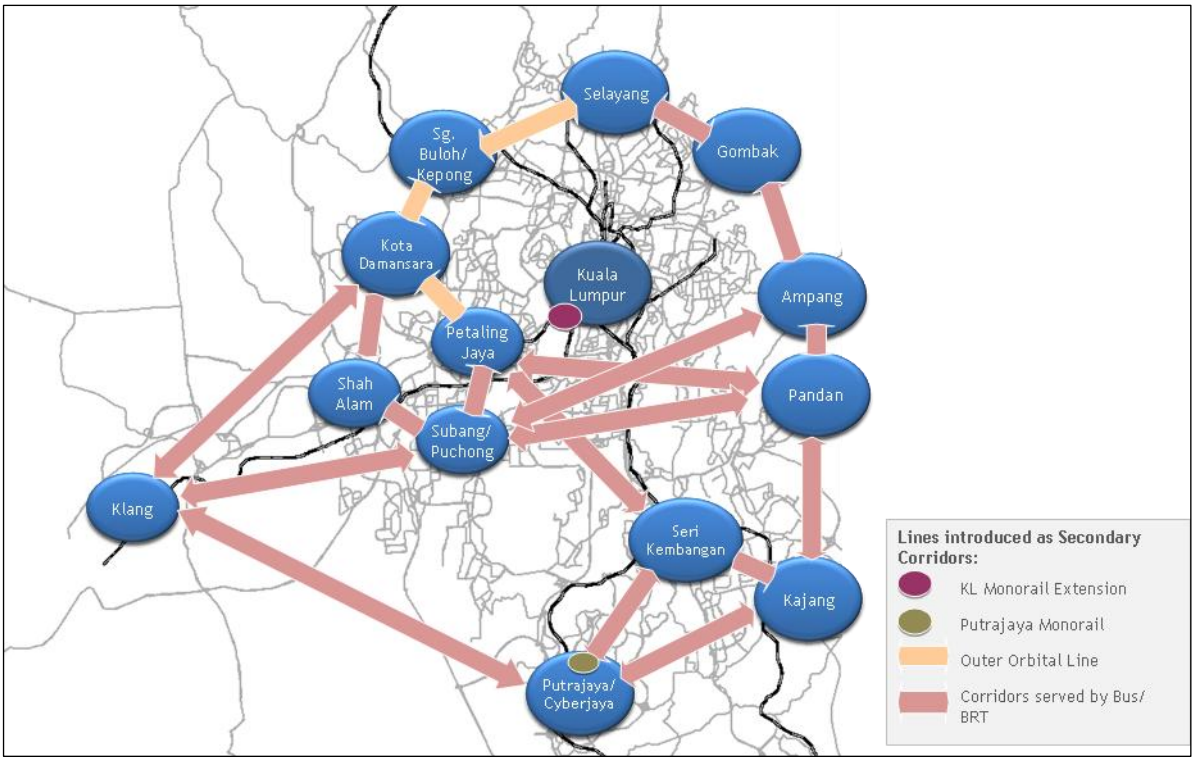


Table 4.1 provides a summary of the rationale for each element. These are outlined in more detail in the next section.

Table 4.1: Rationale for the Rail Proposals

Scheme	Rationale
Klang- KL Sentral KTMB line	Upgrade of KTMB services to enhance service quality, frequency and journey time. The proposal seeks to make optimum use of KTMB to provide greater capacity on radial corridors
Seremban- KL Sentral KTMB line	
Rawang- KL Sentral KTMB line	
Batu Caves- KL Sentral KTMB line	
Freight Relief line	In order to assist the commuter service upgrade to KTMB, a freight relief line is proposed to link Klang with the N-S line The aim is to allow greater capacity to be provided for passenger train movements in the city.
MRT2 – Circle Line	To cater for orbital movements around KL. To provide linkages to key major developments identified in the DBKL City Plan such as Matrade The line would also serve existing areas that are currently poorly served
MRT 3- North-south Line	To cater for NW corridor which is forecast to be overloaded in the future. To serve key developments such as Kampung Baru
LRT3- Kelana Jaya- Klang	To provide improved linkages to Shah Alam and cater for local demands
Putrajaya Monorail	Improve linkages to centre of Putrajaya from Putrajaya Sentral
KL Monorail	To cater for development areas in the south of KL
Outer Orbital Line	To cater in the longer term for orbital movements, particularly in the LDP and N-S Expressway corridors. These are also corridors with land use developments in the longer terms associated with the Structure Plan

4.5) The Primary Corridor Rail Proposals

4.5.1) KTMB Passenger Services

As an initial consideration in the GKL/KV LPTMP, the KTMB services should be enhanced and re-branded as 'metro' services to play a greater role in the public transport system of GKL/KV. As a provider of a heavy rail network, the KTMB is currently under utilised with low passenger numbers at a number of station due to poor accessibility of the stations, lower service frequency and long journey times. Therefore the KTMB upgrade is aimed at addressing all of these issues and to allow the network to maximise the use of the network capacity.

On the Klang- KL branch a targeted headway of 5 minutes in the peak period is proposed. This is subject to confirmation of signalling headways and verification of the level of other freight traffic on the route. Research for the GKL/KV LPTMP indicates that a significantly enhanced peak service could be offered along this line. With modern, high acceleration,

rolling stock, it is estimated that the current end-to-end run time could be brought down to below an hour, thus offering an attractive service on the line.

The pattern of services should be examined. This should include the potential for mixing faster and slow services on the Klang line with some services operating as express services stopping only at key stations. Consideration should also be given to operating services between Klang and KL but not running through to Batu Caves.

The selection of the KTMB upgrade from Klang is in preference to the construction of a new MRT line from KL to Shah Alam and Klang. The impact of the latter was tested within the transport model and found to have less benefit than other proposals that have been included in the GKL/KV LPTMP. The KTMB upgrade provides similar benefits at a much lower cost.

Similarly on the Seremban to KL branch a targeted headway of 5 minutes is proposed. This is subject to integration with any longer distance inter-city services that might operate to the south of KL. The journey time from Seremban to the centre of KL could be provided at just over the hour. This service will cater for longer distance commuting patterns from Seremban. As with the Klang branch, the pattern of services should be examined. Consideration should also be given to operating services between Seremban and KL rather than running through to the north of the city.

To the north of the city centre there are operational constraints that restrict the ability to provide a 5 minute service on both the Rawang and Batu Caves branches. The at-grade crossing where the two branches meet is a significant constraint and given the proximity of neighbouring elevated roads, it is not feasible to provide a grade-separated solution without excessive expenditure. Therefore it is proposed that the Batu Caves branch operates at a similar frequency to the current situation with a higher frequency of 7.5 minutes on the Rawang Branch. The Rawang service will provide linkages to the MRT1 at Sungai Buloh.

These improvements on the KTMB branches will need to take account of any signalling and track constraints where the two lines meet just south of KL Sentral. In addition, any requirements to upgrade the power supply will need to be considered.

In order to assist the development of the KTMB services, it is proposed that additional enhancements are made to the station facilities. An initial audit should be undertaken of all KTMB stations to assess current facilities, feeder services and local access by all modes. A comprehensive travel plan should be developed for each station to encourage greater use. Over time it is envisaged that the greater use of KTMB stations will encourage TODs to be developed along the corridor thus enhancing the local areas around stations. This will also increase the potential ridership in these corridors.

The service enhancement will need to be supported by a maintenance regime to maintain the quality of the asset and encourage ridership.

4.5.2) Freight Relief Line

To assist the enhancement of passenger service, there is a requirement in the URDP to develop a freight relief line to divert freight trains to Port Klang away from Kuala Lumpur and the Klang Branch. Currently freight trains are taking a number of passenger train paths during the day. They operate at slow speeds and are reducing passenger train capacity. The Freight Relief Line will allow passenger services the maximum opportunity to improve

headways. In addition, the freight relief line would reduce the security hazards of freight trains passing through the city centre of KL.

The alignment for the relief line should be considered in a more detailed study. The route could follow an outer route linking Klang to Seremban and Serandah thus allowing freight services to be diverted from all of the Klang Branch. An alternative route that could be considered is to make use of the branch line that passes through Subang Airport. This would require a new link to be developed from Subang to Sungai Buloh to connect with the main line.

The provision of a freight relief line will also allow for the growth in rail freight services through increased demand through Port Klang. The route may also be available for passenger services and this should be investigated further.

4.5.3) MRT 2 Circle Line

Orbital movements in KL will be addressed by the provision of a Circle Line as MRT2. This would link existing areas such as Mid Valley, Mont Kiara, Sentul Timur and Ampang, as well as proposed developments such as Matrade. The Circle Line would encourage modal transfers in corridors that are currently poorly served by public transport as well as providing relief to the radial lines for those direct orbital journeys which have to travel via the city centre.

It is proposed that the Circle Line makes use of the Ampang Branch of the Ampang Line. This will allow a higher frequency service to be provided on the main Star line towards Sri Petaling. Figures 4.6 and 4.7 show the future networks in 2020 and 2030 respectively with the potential corridor recommended for further examination following the publication of the GKL/KV LPTMP. The width of the corridor identified on the plan has a 2.5 km radius.

The Circle Line would be developed in at least two phases. The first would be the western and southern sections linking Ampang with Mid Valley, Matrade and Sentul. The second phase would line Ampang with Sentul Timur completing the north eastern sector of the Circle Line. Given the terrain to the west of the city, and the amount of existing development it is expected that a large proportion of the Circle Line is likely to be underground.

In the technical analysis to date it has been assumed that a station will be provided every 1.5 km. Subject to technical feasibility an initial estimate suggests a length of 29 km for phase 1 with 22 stations. The second phase would be 12 km with 8 stations. The operational study would need to examine the location for depot facilities.

4.5.4) MRT3 New N-S Line

In the northern corridor, even allowing for the upgrade to KTMB the future travel demands indicate that there will be a need to provide enhanced capacity. The land use maps in Chapter 3 indicated the additional intensification in the north western corridor from KL. The KTMB service is forecast still to be overloaded so additional capacity is required. For this reason a new N-S line is proposed to link developing areas such as Sungai Buloh, Kepong and Selayang with the eastern half of the city centre (including Kampung Baru and KLIFD). This will reduce overcrowding on the other city centre lines and allow KTMB to focus on longer distance commuter trains and inter-city services to the north of the country.

It is proposed that two northern branches are provided (see Figure 4.6). The first would be to serve Selayang while the second would serve Sungai Buloh. The latter would potentially have the advantage of making use of possible depot facilities at this location as well as providing interchange with KTMB and MRT1. The N-S line is also proposed to provide a link to Pandan to improve connections to this area that was identified as a transit gap.

In total this would give a line of the order of 36 km served by 24 stations assuming a spacing of 1.5km per station. Where the line operates in the city centre it is proposed that this should be underground. Where the line crosses existing rail lines it is proposed that interchange stations are provided. This will encourage interchange between lines.

In the longer term up to 2030, the line could be extended southwards towards Serdang and Putrajaya depending on the developments in that area.

4.5.5) LRT3 - LRT Line- Kelana Jaya- Klang

A spur of the LRT line should be built linking Klang to Shah Alam and the existing LRT at Kelana Jaya. The aim is to cater for local movements in these areas with services operating between Klang and Kelana Jaya. This will allow local demands to transfer from KTMB to LRT allowing KTMB to provide a longer distance suburban service. The exact alignment of the LRT is to be determined through engineering feasibility but the aim would be to complement the KTMB route along a parallel alignment rather than serve the same catchment areas. Therefore the LRT3 would provide a linkage to Shah Alam from both Klang and Kelana Jaya.

4.5.6) KL Monorail

The KL monorail should be extended from Tun Sambathan to Taman Gembira to provide improved accessibility to Bangsar, Mid Valley and Taman Gembira. This will provide congestion relief on the LRT lines approaching KL Sentral from the south. The timing of this enhancement should be in accordance with local development pressures in the area.

4.5.7) Putrajaya Monorail

The Putrajaya Monorail should be completed to provide improved local access within the city. This will provide a link to Putrajaya Sentral and encourage modal transfer to the ERL. The timing of this facility should be in response to development needs in Putrajaya.

4.5.8) LRT 4- Outer Orbital Line

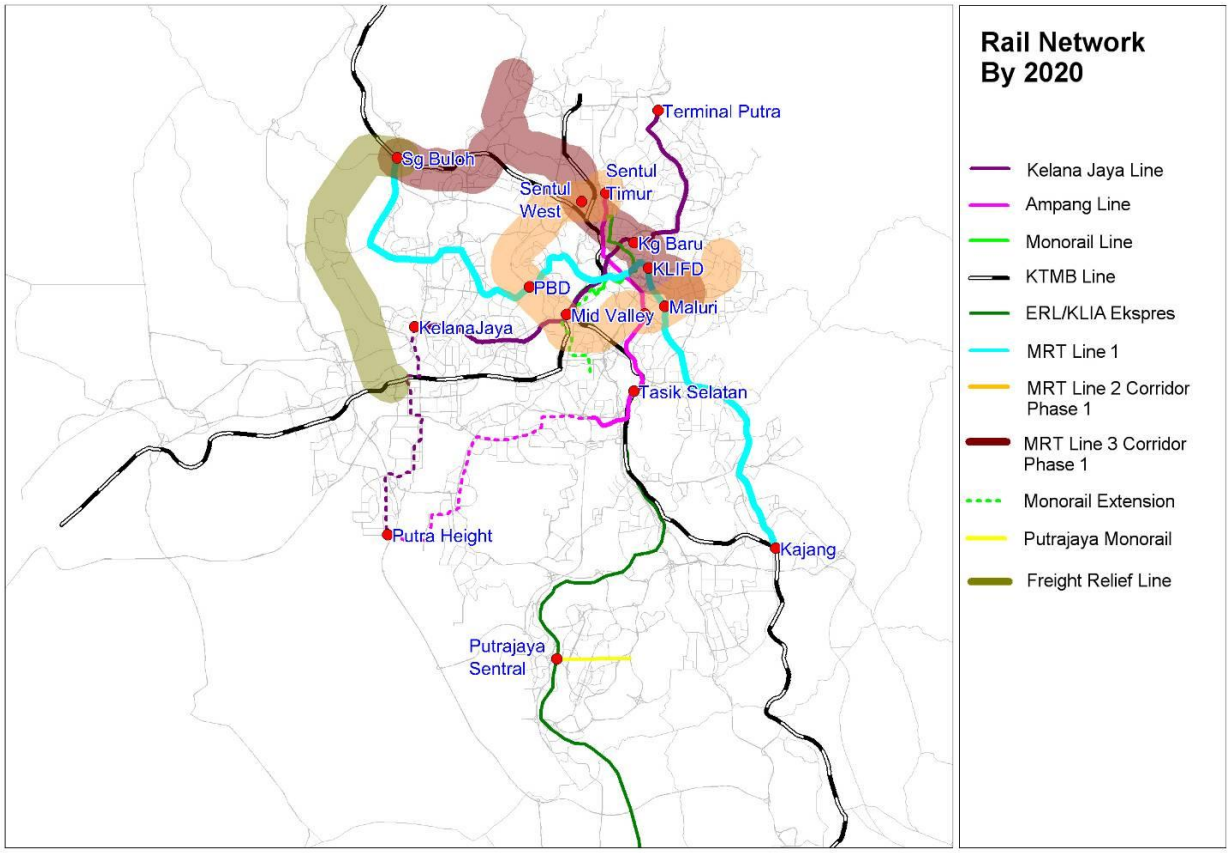
In the longer term there is a need to provide some form of orbital relief along the LDP corridor. The sections through Petaling Jaya have particularly heavy private vehicle demands resulting in significant congestion. Initially consideration should be given to the bus network coverage in this area (see Bus Transformation Plan) but in the longer term additional capacity will be needed to link areas such as Gombak and Damansara to Petaling Jaya. An outer orbital LRT line should be considered for post 2020. The corridor for this LRT has not been defined at this stage and would be subject to later investigation.

4.5.9) Other Modes

The rail enhancements will be supported by enhancements to bus services in the region. These are set out in the Bus Transformation Plan of the GKL/KV LPTMP. Improvements in the remaining secondary corridors would be using bus and BRT. The Bus Plan identifies how bus can support the rail system through feeder services as well as outlining the role of bus in non-rail corridors.

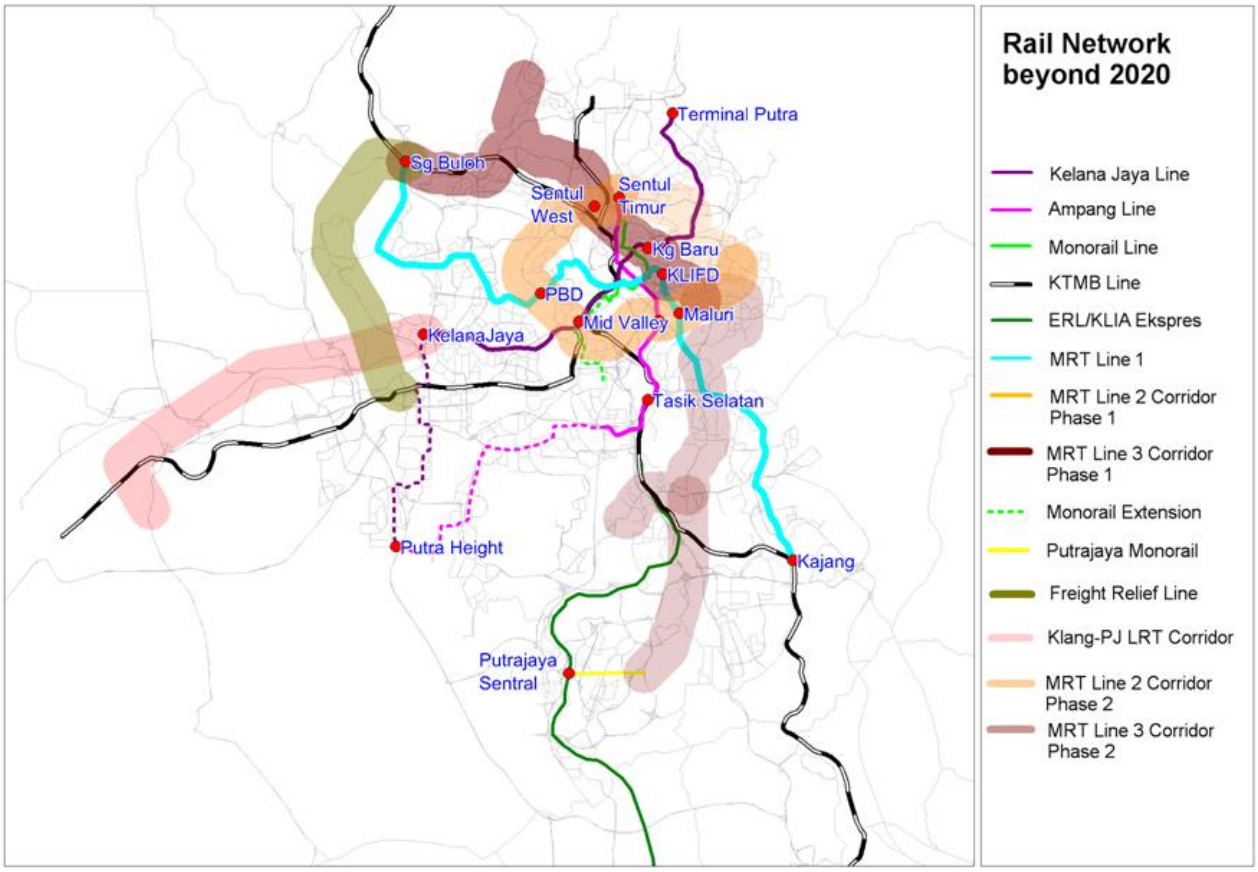
The implementation of these rail schemes will also complement the other elements of the GKL/KV LPTMP in order to develop an integrated public transport system. This will include improvements to the bus network (see Bus Transformation Plan), transformation of the taxi system (see Taxi Transformation Plan), the provision of enhanced interchange facilities (see Terminals and Interchange Plan) and the use of complementary travel demand management policies (Demand Management Plan). The plan will also allow for integration with land use policies being developed by DBKL and Selangor State, WP Putrajaya and the local authorities (see Land Use Plan). Each of these elements is outlined in the other Subsidiary Plans.

Figure 4.6: Proposed 2020 Rail Network



(Note: for the newly proposed lines a 2.5km radius indicative corridor is identified within which an assessment should be undertaken of the appropriate alignment. The freight relief line shown here is assumed to use the Subang Spur line but further study might investigate an alternative route. The technical feasibility study should assess the requirement for MRT3 to serve Sungai Buloh, particularly if there is a need for depot at this location.)

Figure 4.7: Proposed 2030 Rail Network



(Note: for the newly proposed lines a 2.5km radius indicative corridor is identified within which an assessment should be undertaken of the appropriate alignment. The freight relief line shown here is assumed to use the Subang Spur line but further study might investigate an alternative route.)

Interchange and Integration

Important to maximizing the benefit of the new lines and extensions will be to ensure there is good interchange and integration with existing and other new lines. Where rail lines intersect the detailed design phase should consider whether good interchange can be provided. There should be a presumption that interchange will be provided unless it duplicates other facilities or is unlikely to provide benefits.

Rail interchange design should seek to ensure minimum interchange distances, that there is no need to leave the station, that ticketing is integrated and that information supports good interchange. Rail network design should be developed to provide well-planned rail to bus interchange with convenient stops with good information.

Key Conclusion

A rail strategy has been developed which seeks to maximise the use of the existing KTMB network while providing additional capacity in primary and secondary corridors as necessary.

Phasing and Delivery

5

5. Phasing and Delivery

5.1) Introduction

This chapter presents the proposed delivery timeline of the URDP.

5.2) Phasing

The proposed timeline for the implementation of the projects is shown in Figure 5.1 and Table 5.1. The exhibits also include the timeline for committed schemes including the LRT extensions and the MRT1 construction as well the establishment of bus feeder networks and BRT corridors. The rationale behind the timing and staging of the projects depends on achieving value for money, the expected levels of overcrowding on key corridors and how advanced the individual projects are.

In addition to enhancements, extensions and new lines, priority should be given to introducing monitoring, benchmarking and reporting systems that will enable identification of current operational and financial issues. Accordingly, the identified issues can be addressed to ensure that existing services operate to their maximum potential from an early date.

The KTMB upgrade project is proposed to be carried out until 2015. As part of the NKRA new rolling stock sets are due to be delivered in the next year which will allow a reduction in headway on the KTMB service. Investigations should be undertaken to confirm the potential of 5 minute headways and service patterns (timetabling) on the Klang, Seremban and Rawang operations. This will include a review of signalling, track operations, station access and facilities, power supply and the use of the central stations. This will be supported by the development of the bus feeder networks and the re-branding of the services to a 'metro' style service.

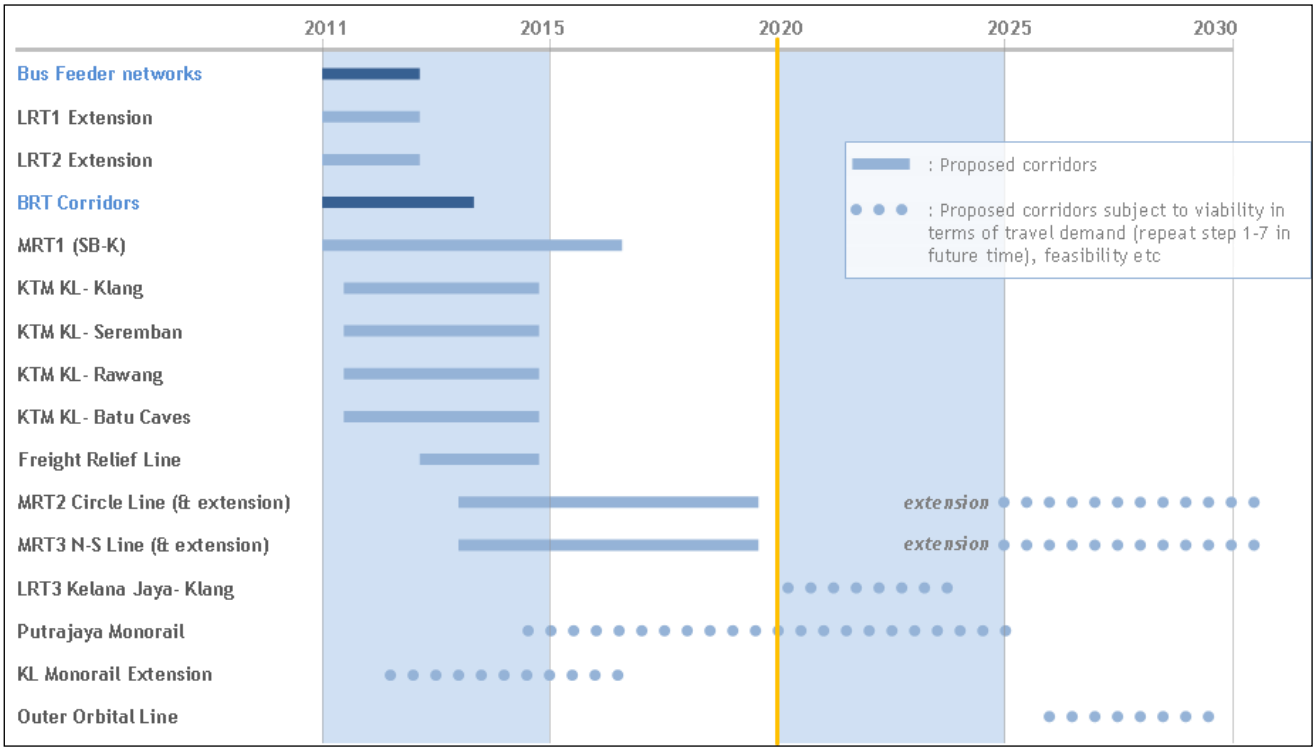
A crucial element for the delivery of the five minute passenger service headway will be the Freight Relief Line. The route should be confirmed as soon as possible to enable its construction to facilitate the re-routing of freight services away from the city centre of KL. The timing of the construction would be confirmed during those investigations.

The Circle Line MRT2 is planned to be built in two phases. The first phase which includes the section from Ampang to Sentul Timur via Mid Valley is targeted to be completed by 2020. Initial investigations would need to confirm the exact alignment, technical and engineering feasibility, station locations and depot locations. It is anticipated that much of the new construction sections would need to be in tunnel sections. The construction of this phase should tie in with the key developments in the corridor such as Matrade.

The proposal includes the use of the existing Ampang Line. Accordingly, there will be a period when that section is converted from LRT to MRT, and the line will not be operational. This will require alternative bus transport provision during the construction phase. The LRT line to Sri Petaling and Putra Heights can benefit from additional capacity once LRT services cease on the Ampang spur line.

The second phase of the MRT2 (North Eastern section) is proposed to be built at a later date prior to 2030. The completion of this corridor will be subject to viability in terms of travel demand and feasibility.

Figure 5.1: Rail Scheme Summary



The N-S line (MRT3) is planned to be built in two phases. The first phase, which includes the section from Selayang and Sungai Buloh to Pandan is targeted to be completed by 2020. Initial investigations would need to confirm the exact alignment, technical and engineering feasibility, station locations and depot locations. It is anticipated that the sections in the city centre would need to be in tunnel sections. The branches to Selayang and Sungai Buloh will be investigated in the technical study. A key consideration will be the location of the depot and this should be investigated at an early stage in order to identify the land requirements.

The second phase of the MRT3 (southern section) is proposed to be built at a later date prior to 2030. The completion of this corridor will be subject to viability in terms of travel demand and feasibility.

The KL monorail extension is to be considered by 2016 to enable it to tie in with development proposals along the corridor. The proposed corridor will be subject to viability in terms of travel demand and feasibility. Similarly the completion of the Putrajaya Monorail to provide greater connectivity between the city and the Putrajaya Sentral Station should be investigated for viability in relation to demands. The timing will be dependent on the local needs for the link to be constructed.

The Outer Orbital Line is a long term aspiration prior to 2030 and should be investigated when the local demands and modal share targets identify the need for the service.

Table 5.1: Rail Scheme Summary

Scheme	Completion	Activity
LRT1 extension	Pre 2013	Extension to Putra Heights
LRT2 extension	Pre 2013	Extension to Putra Heights
MRT1	Pre 2016	Provide a new MRT line between Sg Buloh and Kajang
Klang- KL Sentral KTMB line	Pre 2020	Provide a 5 minute headway on the KTMB service between Klang and KL Sentral
Seremban- KL Sentral KTMB line	Pre 2020	Provide a 5 minute headway on the KTMB service between Seremban and KL Sentral. Services continue to Rawang and Batu Caves
Rawang- KL Sentral KTMB line	Pre 2020	Provide a 7.5 minute headway on the KTMB service between Rawang and KL Sentral
Batu Caves- KL Sentral KTMB line	Pre 2020	Provide a 15 minute headway on the KTMB service between Batu Caves and KL Sentral
Freight Relief line	Pre 2020	To allow greater capacity to be provided for passenger train movements by removing freight trains from the city centre of KL and the Klang branch
KTMB Stations	Pre 2020	Initial station audit to be carried out of station facilities and interchange prior to upgrade Enhance walking and cycling access to the stations
City Centre Stations	Pre 2020	Assess the need for facilities in the central area making more use of Kuala Lumpur Station
KTMB Feeders	Pre 2020	Bus feeder services to key KTMB stations in order to develop the integrated system
MRT2 – Circle Line	Pre 2020	Provide new circle line from Sentul Timur to Ampang via Matrade, Mt Kiara, Bangsar and Mid Valley. Section from Ampang to Miharja to replace current Star Line
	Pre 2030	Complete Circle Line from Ampang to Sentul Timur
MRT 3- North-south Line	Pre 2020	Provide new N-S line from Sentul to Pandan Jaya
	Pre 2020	Provide extension to Selayang and or Sungai Buloh
	Pre 2030	Provide extension from Pandan Jaya to Serdang/ Putrajaya
Putrajaya Monorail	Pre 2020	Complete Putrajaya Monorail
KL Monorail	Pre 2020	Complete Monorail extension from Tun Sambathan to Taman Gembira
LRT- Kelana Jaya- Klang	Pre 2030	Provide LRT spur from Kelana Jaya to Shah Alam and Klang
Outer Orbital Line	Pre 2030	Provide orbital link from Gombak to Petaling Jaya via Damansara

Each of the above elements will be supported by other elements of the GKL/KV LPTMP which are reported in the other fives Subsidiary Plans.

Together these provide an integrated LPT plan for the GKL/KV region and are summarised in the overall GKL/KV LPTMP document. The GKL/KV LPTMP also identifies the role of each of these measures in terms of proposed modal share targets which will be contained within the GKL/KV LPTMP.

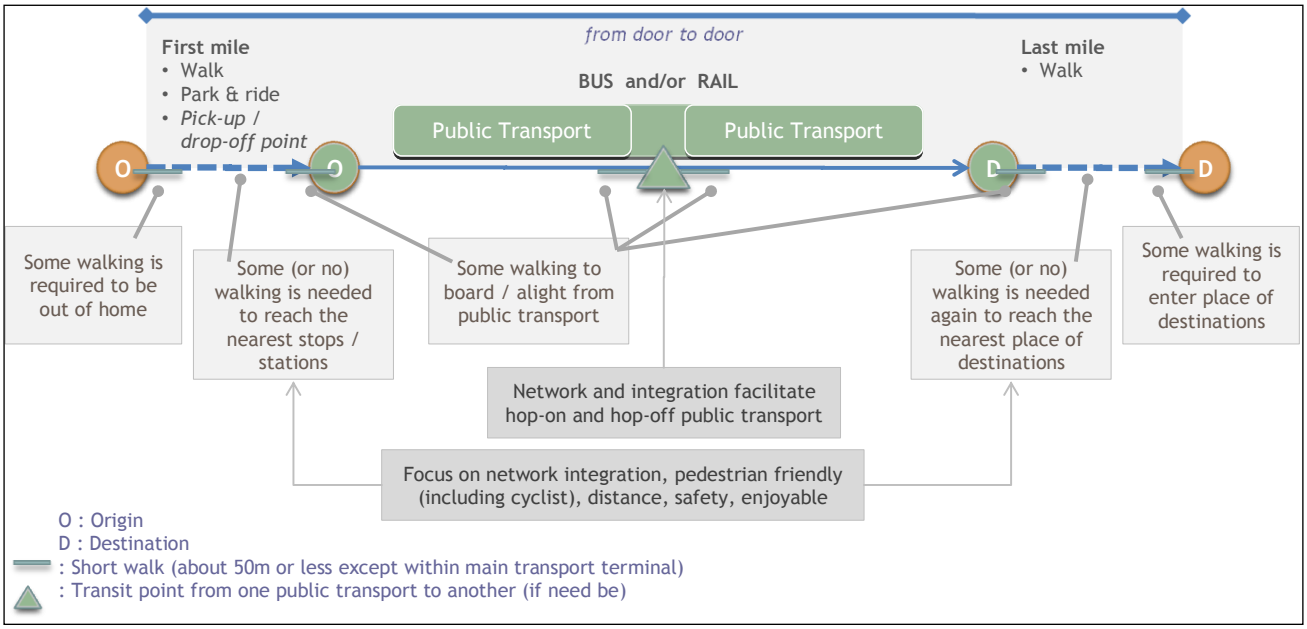
Key Conclusion

A phasing strategy has been derived which best serves the needs of the region.

5.3) The First and Last Mile

The rail element is only one part of the passenger journey. Integration with other modes (public transport, private transport, walking and cycling) is important to maximise the potential usage of rail. This can be referred to as the 'first and last mile'. The requirements for the 'first and last mile' will vary between the different access modes. The IIP will consider these requirements in more detail.

Figure 5,2: The First and Last Mile



The integration requires:

- A network of feeder bus services to provide linkages to stations
- Good interchange facilities between modes to reduce the 'barrier' of changing modes
- Information systems to provide real time passenger information on the availability of bus and rail services
- Local information (maps) at stations to show local facilities, and access routes
- Easy access routes, covered footways and road-crossing facilities either at-grade or above/ below ground
- Stations and their accesses should to be secure and safe (i.e. lighting and close circuit security systems)
- Stations to provide cycle and motorcycle parking facilities
- Introduction of multi-modal ticket systems to allow users to use one ticket/ smart-card which can be used on all modes
- Focus on transit oriented developments to allow housing and commercial developments close to the stations which will encourage use of public transport

Key Conclusion

The first and last miles of a LPT journey are crucial.

Measures must be introduced to maximise the benefits of rail by providing customers with integrated journeys that reduce the barrier of using LPT.

TODs should be encouraged to maximise access to and use of LPT.

5.4) Review of Benefit

The GKL/KV LPTMP rail elements seek to increase peak capacity to meet future demand, reduce crowding on the radial primary corridors, improve accessibility and 'join-up' these routes with improved orbital services. The network is summarised in Table 5.2. The final GKL/KV LPTMP includes a Multi-criteria assessment against the National Toolkit objectives and indicators. A summary of this is provided in Table 5.3.

Table 5.2: Future Rail Network

Rail Line	Route length	No. of stations	Peak Hour Headway	Forecast Daily Ridership
KTMB Metro (upgrade from Komuter)	157 km	50	5 mins	237,000
Kelana Jaya (Putra) LRT1	46 km	37	2.5 mins	496,000
Ampang (Star) LRT2	44.7 km	38	2.5 mins	352,000
KL Monorail	16 km	20	3 mins	115,000
KLIA	57 Km	5	15 mins	16,500
MRT1	50.8km	36	3 mins	445,000
MRT2	Phase 1 = 29Km Phase 2= 11.6Km	Phase 1=22 Phase 2=30	3 mins	320,000 Increasing to 440,000
MRT3	Phase 1 = 38Km Phase 2= 23Km	Phase 1=26 Phase 2=41	3 mins	316,000 Increasing to 500,000
LRT3	23.5Km	16	5 mins	100,000
Total	**Phase 1- 462.0 km** **Phase 2- 496.6 km**	**250 stations** **273 stations**		**2,397,500**

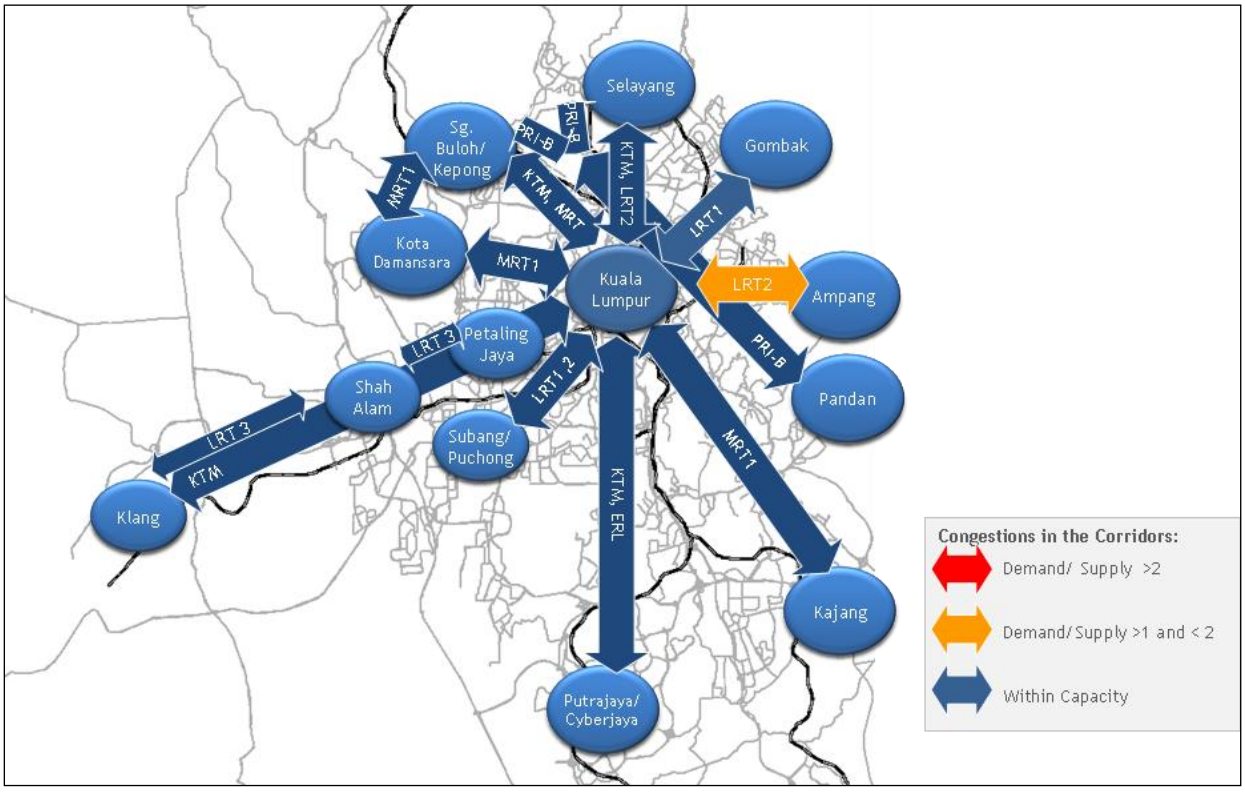
5.4.1) Ridership

The enhancement of KTM services provides greater radial capacity. The URDP is forecast to lead to 2.5X increased ridership on the KTMB services (through reduced waiting time, improved reliability, faster journeys). The URDP proposals are targeted to increase ridership by two fold on the LRT and Monorail services where they are expected to support more local demand with increase capacity and line extensions. Ridership levels on rail will increase five fold to increase LPT modal share, particularly to the centre of KL. The additional capacity provides is equivalent to 48,000 cars (or 12 lanes of traffic flow) during the peak hour by 2020 due to MRT1, MRT2 and MRT3 service.

5.4.2) Over-crowding

The new N-S MRT line provides additional capacity in the eastern half of the city centre providing relief on other lines (see Figure 5.3). While the Ampang branch is identified as being overloaded for rail, additional capacity will be provided by the Circle Line. In addition, it is proposed that an enhanced bus corridor is provided along Jalan Ampang and this is identified within the Bus Transformation Plan.

Figure 5.3: 2020 Over-crowding Levels with the GKL/KV LPTMP



5.4.3) Journey Times and Accessibility

The journey time maps to the centre of KL in Figure 5.4 show a much greater area of lower LPT travel times with the GKL/KV LPTMP compared to existing commitments. Accessibility has also been mapped with the GKL/KV LPTMP improvements and shown in Figure 5.5. This shows a greater area of improved accessibility including areas along the additional MRT lines and in the Klang Valley. This will assist the economic performance of the region.

Figure 5.4: 2020 Modelled Perceived Travel Time to KLCC with the GKL/KV LPTMP

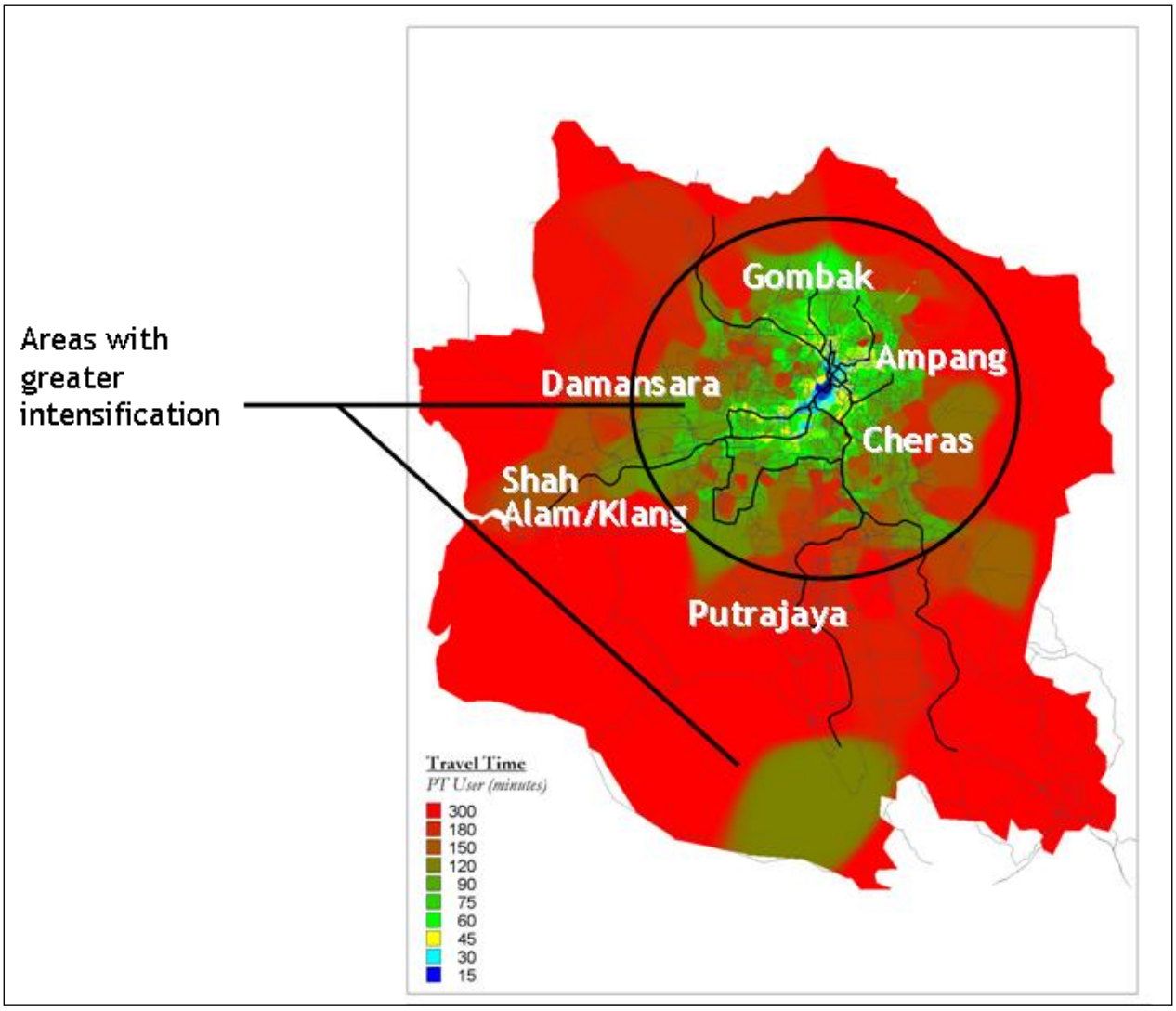
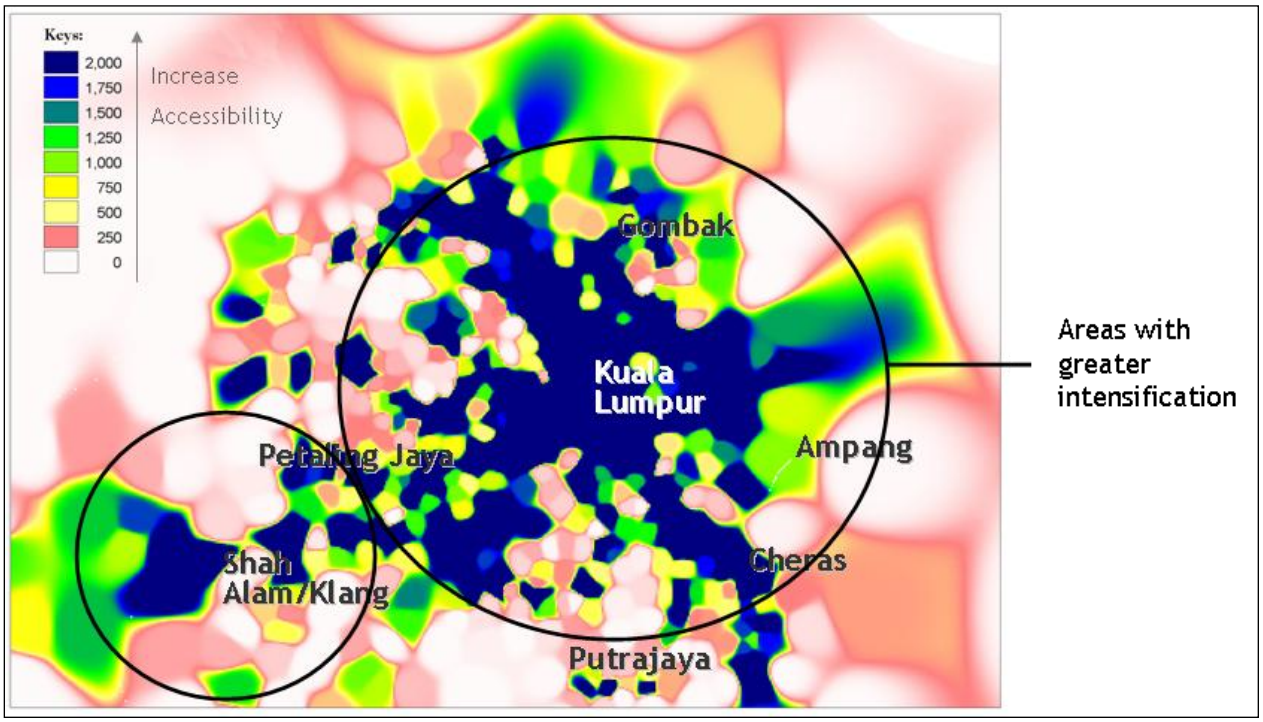


Figure 5.5: 2020 Accessibility Map- with GKL/KV LPTMP



5.4.4) Benefits Summary

The GKL/KV LPTMP will have a number of benefits (see Table 5.2). The increased LPT provision will significantly enhance accessibility in the region which will assist the economic performance. By 2030 the network provision will increase to 34 km/ million people which is comparable to a number of other major cities such as Beijing (29 km/ million people), Moscow (28 km/ million people), Seoul (28 km/ million people),Tokyo (37 km/ million people) and Hong Kong (41 km/ million people).

Access to the network will be increased through the greater coverage and travel times will be reduced both in terms of waiting time and in-vehicle time. The improved LPT supply will encourage modal transfer which will assist commercial operations on the highway network. A fuller appraisal of the GKL/KV LPTMP is included in the main GKL/KV LPTMP document.

5.5) Next Steps

Following publication of the URDP the next steps for the rail proposals are as follows:

- Completion of the remaining Subsidiary Plans and incorporation into the full GKL/KV LPTMP (publication September 2011)
- Consultation on the GKL/KV LPTMP proposals
- Technical and Financial Feasibility Study
- Technical and System Design
- Implementation
- Monitoring

The GKL/KV LPTMP proposals generally indicate the corridors that would be served by the new lines. Once the approach and the proposed schemes have been confirmed, it will be important to develop the detailed alignment and station locations as a priority. This will both allow early completion and enable other developments along the routes of the new lines to complement and support their implementation and help enhance their success.

Key Conclusion

The rail strategy provides significant benefits in terms of improved accessibility, reduced travel times and integration with land use policy. The enhanced rail network will encourage modal share.

Overall the GKL/KV LPTMP will assist the economic performance of the region.

Table 5.3: Summary of Benefits

Objectives	Indicator	Impact
Economic Competitiveness	Access to Jobs	The increased LPT provision will significantly enhance accessibility for workers to reach jobs
	Access to International Links	Improved links will be provided to KL Sentral to facilitate international access to KLIA
	Reduce Journey Times	Increased LPT supply will reduce public transport journey times and will encourage modal transfer which will reduce congestion for private and commercial vehicles
	Increase Reliability	Reduced congestion for private and commercial vehicles will aid reliability. LPT reliability improved through improved supply and measures to improve system reliability
Access, Connectivity and Integration	Improve accessibility	Increased LPT supply will close the transit gaps allowing more people access to the system
	Improved integration between modes	Interchanges between rail and other modes will reduce the 'barriers' of making a LPT journey. This will be enhanced by integrated ticketing
	Improved integration between Transport and Land Use Planning	The GKL/KV LPTMP seeks to address the DBKL City Plan, Selangor State Plan and local authority plans. The enhanced rail network will aid TODs including along the KTMB corridor
Efficiency	Journey Time Reliability	Improvements to the rail system such as track and signalling will assist the provision of a reliable service
	Mode Share	The provision of the rail improvements and new capacity will increase LPT mode share
	Deliverability	A deliverable plan will be established through detailed technical feasibility
Social Inclusion	Providing access for all through better connectivity	Increased LPT supply will close the transit gaps allowing more people access to the system.
Safety and Security	Providing improved safety and security through quality public transport	The design of the new lines will take into account the needs of all users
	Reduce road accidents through modal transfer	The encouragement of modal transfer will reduce the vehicle kilometres travelled in the region thus reducing accidents
Environment	Improve air quality through modal transfer	Modal transfer will reduce private vehicle kilometres and congestion thus improving air quality

Summary

6

6. Summary

SPAD has developed the National LPT Framework to set out the vision and direction for LPT in Malaysia. The purpose is to develop a long term programme to address the current deterioration in LPT with plans to execute high impact and effective delivery initiatives for a 20-year sustainable national LPT service.

The National LPT Framework outlines the National LPT Policy which provides guidance and direction towards developing the National LPTMP. Included in the National LPT Framework is also a Planning Toolkit which provides the guidance on the methodology for setting objectives, plan development, identification of policy measures and assessments of solutions. The Planning Toolkit facilitates the development of Regional LPTMPs and enables interfacing with State-specific plans and land use policies.

The first Regional LPTMP developed by SPAD is for the Greater KL/ Klang Valley region. The URDP is one of six Subsidiary Plans of the GKL/KV LPTMP, and relates to urban rail development in the region. Together these six plans provide an integrated LPT plan for the GKL/KV region.

In order to aid the development of the GKL/KV LPTMP, a series of Guiding Principles have been developed examining issues related to accessibility, capacity, social inclusion and the environment.

Currently LPT Mode share in GKL/KV is relatively low compared to other major cities and has fallen since the 1980s. This decline is in spite of increased population and households in the region. The fall in LPT share reflects the increase of the highway network supply, changes in household characteristics such as reducing household sizes, the rise in household incomes, the affordability of cars, the poor quality of public transport, and the unreliability of buses.

Analysis shows that journey times by private vehicle tend to be shorter than the equivalent journey by LPT. Therefore accessibility to jobs by private transport is currently much greater than by LPT.

It may be possible to improve existing services and performance significantly but in the absence of robust monitoring, benchmarking and reporting, this cannot be assessed with any certainty. An important element of the GKL/KV LPTMP will be to introduce such systems and develop action plans to tackle any weaknesses identified.

Looking to the future, the LPT network coverage has significant gaps in the rail network even allowing for the committed schemes. These are assessed in terms of land use, travel demand and travel pattern to inform the need for improvements in subsequent stages of the GKL/KV LPTMP development.

Population will continue to grow in the region increasing the demand to travel. Employment intensification is proposed in key centres, particularly the centre of KL. The employment areas will need good accessibility to maintain the economic status of the region.

The increase in population and employment will increase travel demands. This will put further pressure on the highway network with resulting congestion and unreliable journey times unless public transport capacity and performance improves so as to reduce traffic levels. LPT Accessibility will be improved along the LRT extension corridors and the MRT extension but overall accessibility will worsen unless additional LPT supply is provided.

The GKL/KV LPTMP has set out definitions for developing the hierarchies of transport corridors based on Primary, Secondary, Feeder and local/ district. The assessment process considers the role of each mode such that the growing travel demand can be met by the appropriate mode.

The range of primary and secondary corridors has been defined for the GKL/KV region. The primary corridors focus on the access to the city centre of KL while secondary corridors focus on orbital movements and the other centres. The volumes of demand in the primary corridors in GKL/KV justify the provision of high capacity rail services.

A rail strategy (see Table 6.1) has been developed which seeks to maximise the use of the existing KTMB network while providing additional capacity in primary and secondary corridors as necessary through the inclusion of new lines and extensions of existing facilities. A phasing strategy has been derived which best serves the needs of the region by identifying those elements for completion by 2020 and 2030. The proposed rail schemes and indicative planning is shown in the table.

The first and last miles of a LPT journey are crucial. Measures must be introduced to maximise the benefits of rail by providing customers with integrated journeys that reduce the barrier of using LPT.

The rail strategy provides significant benefits in terms of improved accessibility, reduced travel times and integration with land use policy. The enhanced rail network will encourage increased LPT modal share. Overall the GKL/KV LPTMP will assist the economic performance of the region.

The rail elements of the GKL/KV LPTMP meet the guiding principles through the provision of additional capacity to improve accessibility, capacity and reliability (see Table 6.2). This will allow the region to develop economically.

Table 6.1: Rail Scheme Summary

Scheme	Completion	Activity
LRT1 Extension	Pre 2013	Extension to Putra Heights
LRT2 Extension	Pre 2013	Extension to Putra Heights
MRT1	Pre 2016	Provide a new MRT line between Sg Buloh and Kajang
Klang- KL Sentral KTMB Line	Pre 2020	Provide a 5 minute headway on the KTMB service between Klang and KL Sentral
Seremban- KL Sentral KTMB Line	Pre 2020	Provide a 5 minute headway on the KTMB service between Seremban and KL Sentral. Services continue to Rawang and Batu Caves
Rawang- KL Sentral KTMB Line	Pre 2020	Provide a 7.5 minute headway on the KTMB service between Rawang and KL Sentral
Batu Caves- KL Sentral KTMB Line	Pre 2020	Provide a 15 minute headway on the KTMB service between Batu Caves and KL Sentral
Freight Relief Line	Pre 2020	To allow greater capacity to be provided for passenger train movements by removing freight trains from the city centre of KL and the Klang branch
KTMB Stations	Pre 2020	Initial station audit to be carried out of station facilities and interchange prior to upgrade Enhance walking and cycling access to the stations
City Centre Stations	Pre 2020	Assess the need for facilities in the central area making more use of Kuala Lumpur Station
KTMB Feeders	Pre 2020	Bus feeder services to key KTMB stations in order to develop the integrated system
MRT2 – Circle Line	Pre 2020	Provide new circle line from Sentul Timur to Ampang via Matrade, Mt Kiara, Bangsar and Mid Valley. Section from Ampang to Miharja to replace current Star Line
	Pre 2030	Complete Circle Line from Ampang to Sentul Timur
MRT 3- North-South Line	Pre 2020	Provide new N-S line from Sentul to Pandan Jaya
	Pre 2020	Provide extension to Selayang and/ or Sungai Buloh
	Pre 2030	Provide extension from Pandan Jaya to Serdang/ Putrajaya
Putrajaya Monorail	Pre 2020	Complete Putrajaya Monorail
KL Monorail	Pre 2020	Complete Monorail extension from Tun Sambathan to Taman Gembira
LRT- Kelana Jaya- Klang	Pre 2030	Provide LRT spur from Kelana Jaya to Shah Alam and Klang
Outer Orbital Line	Pre 2030	Provide orbital link from Gombak to Petaling Jaya via Damansara

Table 6.2: Summary of the GKL/KV LPTMP against the Guiding Principles

Guiding Principle	Review of GKL/KV LPTMP
Consider the planning, integration and co-ordination of all LPT modes	The approach adopted has developed a corridor based approach to integrating the LPT modes. These elements will be addressed further in the other Subsidiary Plans.
Define modal share targets	Mode Share targets to be addressed in the main GKL/KV LPTMP document. The provision of the rail improvements will form a key building block in achieving these.
Define complementary policies to allow the LPT modal share to achieve the targets	Integration with Land Use and Demand Management Policies addressed through the Subsidiary Plans to allow integration of the GKL/KV LPTMP with Land Use. Stakeholder engagement process is developing those linkages such as between the URDP and City Plan and Structure Plan.
Allow LPT to be socially inclusive to be the mode of choice for all users.	Wider rail network coverage will increase the catchment areas for rail usage. Good design of the rail network will allow access for all users.
Provide for increased accessibility and connectivity	The improved rail network will increase accessibility and connectivity to and between services.
Take account of the hierarchy of centres;- primary centres in particular should be served by rail, where possible to encourage modal transfer	The design of corridors has taken account of the key centres within the Region.
Provide capacity to meet future demands efficiently and reliably to allow the region to grow economically	The rail network design matches capacity to demand and will increase accessibility and reduce travel times thus providing benefits to the local economy.
Provide additional capacity to serve central KL given its economic importance to the country.	The rail network includes MRT lines to serve the city centre which will increase accessibility and reduce travel times thus providing benefits to the local economy. The expansion of the KTMB capacity will also complement the new lines.
Be based on a process of engagement with Stakeholders	This process is ongoing through the GKL/KV LPTMP development and will continue through implementation and review.
Take account of previous studies and plans where appropriate	The development of the GKL/KV LPTMP has reviewed previous studies and taken account of the needs of the local authority development plans.
Seek to provide environmental benefits to the region in terms of noise and air quality	The rail network will encourage modal transfer which will reduce car traffic levels allowing improvements to the environment.
Corridors should be served according to the appropriate mode to meet demands	This is achieved through the GKL/KV LPTMP development process.