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ETC TRANSPORT CONSULTANTS

Rail & Road Based Mass Rapid Transit System on Jogoo Road Corridor

Results of the Harmonisation Study

Stakeholder Presentation

Nairobi, May 16th 2014

SEAMLESS CONNECTIVITY

MINISTRY OF TRANSPORT AND INFRASTRUCTURE

AFRICAN DEVELOPMENT BANK GROUP
Building today, a better Africa tomorrow

Agenda

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1. **Project Scope**
2. **Aim of the Harmonisation Study**
3. **Structure of the Report**
4. **Part A - Harmonisation Study**
   - *Data Collection, Analysis*
   - *Stakeholder Consultation*
   - *Harmonised Approach for Future Development*
5. **Part B - Proposed MRTS Network**
   - *Traffic Modeling*
   - *Network Layout*
   - *Mode Selection*
   - *System Operation – Service Plan*
6. **Organisation & Implementation Concept**
7. **Recommendations**

1. Project scope

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Terms of Reference

Review of Reports with respect to Jogoo Road within 4 weeks

Design of Jogoo Road to start after 4 weeks based on MRTS Feasibility Study

Amended scope

Major gaps in MRTS Feasibility Study

- **Coherent network missing**
- **Commuter Rail** was **not considered** adequately
- **Missing city-wide operation plan**: integrated headway, required vehicles, depots (FS: 19 depots!), tariff system…
- Jogoo Road MRT ends in CBD → **Terminus in CBD impracticable** → Corridor pairing required to reduce terminus requirements and transfer needs
- **Connection in City Centre** (only 1 node) is **technically not feasible** (Capacity) and leads to additional traffic
- **Several ongoing studies on spatial structure and transport system** with different solutions to FS (FS: LRT on Outer Ring Road, KURA currently plans BRT)

Network wide issues to be solved before designing Jogoo Road to avoid uncoordinated network planning and design resulting in inefficient investments (Harmonisation Study: 3 months)

2. Aim of the Harmonisation Study

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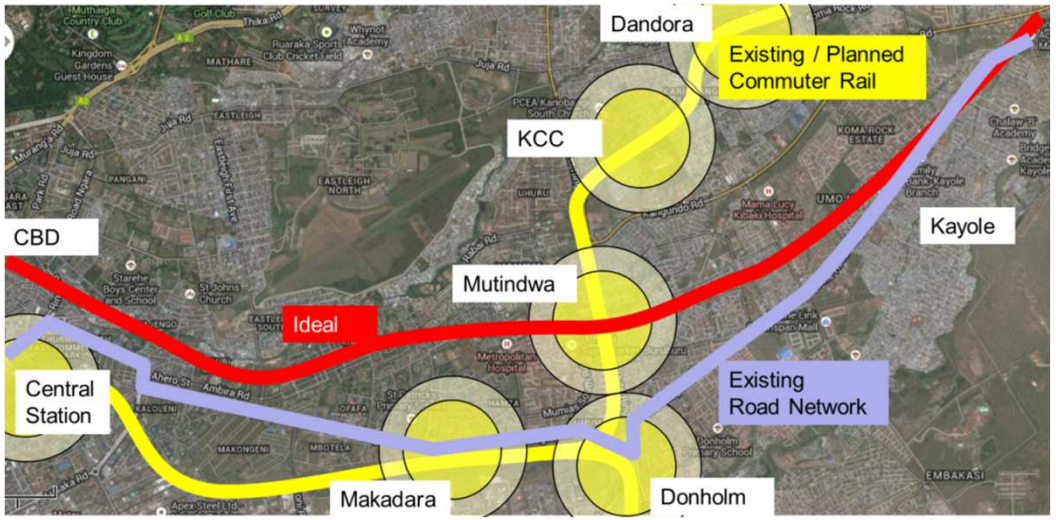
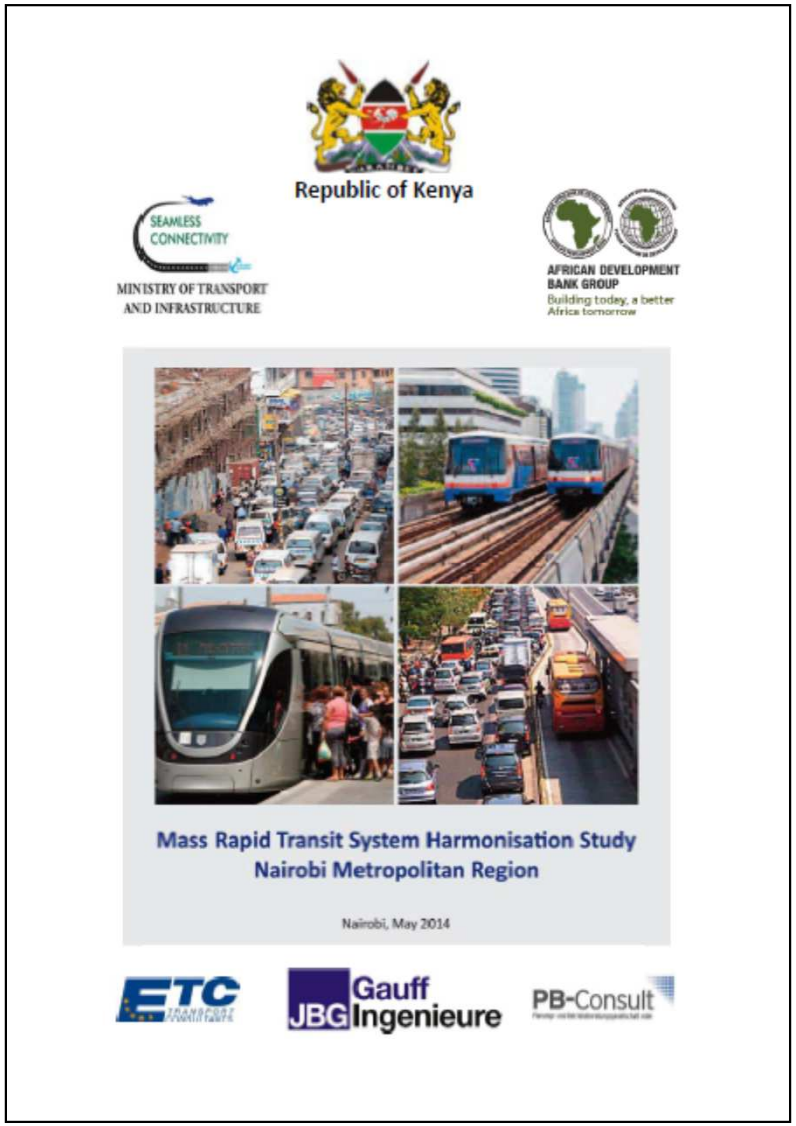
- …**developing** a consistent network of all MRTS corridors
- …**creating** a realistic and justified solution for all key corridors in the future
- …**defining** an overall strategy for the implementation of integrated transport solutions
- …**avoiding** parallel investments along the same corridor
- …**examining** alternative alignments for the Jogoo Road Corridor
- …**maximising** stakeholder participation



3. Structure of the report



Part A - Harmonisation of completed and ongoing studies (Chapter 2 and 3 and Annex A and B)

- Data Collection, Analysis
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- Harmonised Approach for Future Development

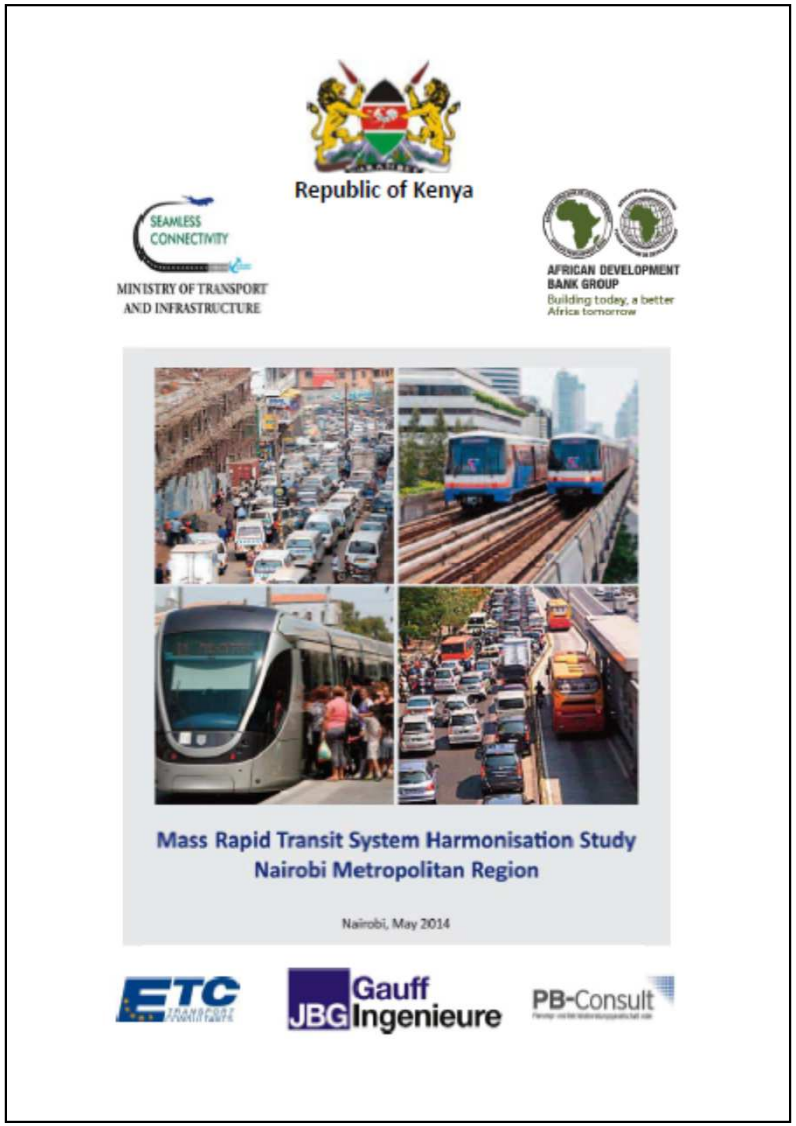
Part B - Development of an integrated MRTS network (Chapter 4-7 and Annex C)

- Traffic Modeling
- Network Layout
- Mode Selection
- System Operation

Organisation and Implementation Plan (Chapter 8)

Recommendations and Priorities for Implementation (Chapter 9)

3. Structure of the report



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Recommendations and Priorities for Implementation (Chapter 9)

4. Harmonisation Study – Part A

Data collection and analysis

1. Definition of overall basis for MRTS and traffic development, Definition of political aims and goals to be reached

2. Planned urban development (spatial structure)
as the essential basis for future traffic/transport demand

3. Definition of one harmonised plan for MRTS implementation (commuter rail and Metro/LRT/BRT) in correspondence with the planned urban development

4. Harmonisation in detail; Adaption of technical parameters across initiatives and projects, definition of standards and planning principles

4. Harmonisation Study – Part A

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Data collection and analysis

1. Overall political aims and guidelines
   - National Road Safety Action Plan (MOT&I, 2009)
   - Integrated National Transport Policy (MOT&I, 2009)

Overall basis for MRTS and traffic development,
All projects have to correspond with these political aims

2. Overall urban development plans
   - Nairobi Metropolitan Spatial Development Plan (DoNMED, 2012)
   - Nairobi Metro 2030 (DoNMED, 2008)

Planned urban development (spatial structure)
is the essential basis for future traffic demand

3. Transport Masterplanning documents
   - Integrated Urban Development Master Plan (Nairobi County, ongoing), also urban development
   - Urban Mobility Study for Nairobi (EU Delegation, ongoing)
   - Promoting Sustainable Transport Solutions for East Africa (UN Habitat, ongoing) → BRT on A104
   - 50 Year National Transport Master Plan (MOT&I, ongoing)
   - Development of a Comprehensive Traffic Management study (KURA, planned)
   - Mass Rapid Transit System (MRTS) feasibility study (MOT&I , 2011)
   - Nairobi Commuter Rail Level One Study (KRC, 2009) and SGR under realisation, planned updating
   - NUTRANS Nairobi Urban Transport Study (MOT&I , 2006), also urban development

There must be one harmonised plan for MRTS implementation (commuter rail and Metro/LRT/BRT) in correspondence with the planned urban development

4. Detailed infrastructure and microscopic planning
   - BRT Service Plan on A 104 (UN Habitat, ongoing)
   - BRT Detailed Design Study and BRT Service Plans for Outering and Juja Roads (KURA , planned)
   - Detailed Design for Ngong Road, including elevated LRT (KURA, planned realisation)
   - Decongestion Study for the Nairobi CBD (DoNMED, ongoing)
   - ToR Feasibility Studies and Project Specification of the Commuter, Metro and Light Railway Network, for the Nairobi Metropolitan Region (KRC, planned)
   - Inter Disciplinary Land Use and Transport Analysis around Commuter Rail Station (DoNMED, planned)
   - Feasibility and Detailed Design for NMT Facilities in Nairobi (DoNMED, planned)

- Harmonisation in detail
- Adaption of technical parameters
- definition of standards and planning principles

4. Harmonisation Study – Part A

Stakeholder consultation

MOT&I	AfDB	World Bank	NTSA
KURA	KENHA	EU Delegation	JICA
DONMED	NCC	UNHABITAT	NIPPON KOEI CO. LTD
KAA	KRC	Mechanical Div., MOT&I	Mott MacDonald

No.	Institution	Date(s)	Met/Contact Person(s)	Data Collection	Inception Report	Draft Results
1	MOT&I	14-02-2014 17/19-03-2014 08-04-2014 10-04-2014 14-04-2014	Nduva Muli George Wanjau	(✓)	(✓)	(✓)
2	AfDB	02-04-2014	George Makajuma Zerfu Tessema Stefan Atchia		(✓)	
3	NCC	17/19-03-2014 27-03-2014 07-04-2014 23-04-2014	Eng. Christine Ogut Rose Muema Eng. Sammy Muthama Prof. Marion	(✓)	(✓)	(✓)
4	KRC	27-02-2014 17/19-03-2014 08-04-2014	Eng. Benedict Kimau Dr. Mucemi Gakuru Eng. Solomon Ouna	(✓)	(✓)	(✓)
5	NTSA	10-03-2014 17/19-03-2014	Francis Meja	(✓)	(✓)	
6	World Bank	17/19-03-2014 15-04-2014	Josphat Sasia Solomon Waithaka		(✓)	(✓)
7	EU Delegation	06-03-2014 17/19-03-2014	Dorian Kivumbi	(✓)	(✓)	
8	JICA	20-02-2014	Dr. Steve Mogere Koji Jitsukawa	(✓)		
9	UNHABITAT	07-03-2014 17/19-03-2014	Debashish Bhattacharjee Rahab Mundara	(✓)	(✓)	
10	KENHA	11-03-2014 17/19-03-2014	Eng. Denis Odeck	(✓)	(✓)	
11	KURA	26-02-2014 17/19-03-2014 14-04-2014	Eng. Silas Kinoti Eng. Michael Njonge Dickson Mbugua	(✓)	(✓)	(✓)
12	DONMED	25-02-2014	Eng. John Maina	(✓)		
13	KAA	17/19-03-2014 09-04-2014	Fred Odawo	(✓)	(✓)	(✓)
14	Mechanical Div., MOT&I	15-04-2014	Eng. Nzuka Eng. Fredrick Kathanga	(✓)		
15	Mott MacDonald	13-02-2014 14-03-2014 17/19-03-2014	Richard Lebon Nick Richardson	(✓)	(✓)	
16	NIPPON KOEI CO. LTD	23-04-2014 17/19-03-2014	Akifumi WATANABE	(✓)		(✓)

4. Harmonisation Study – Part A

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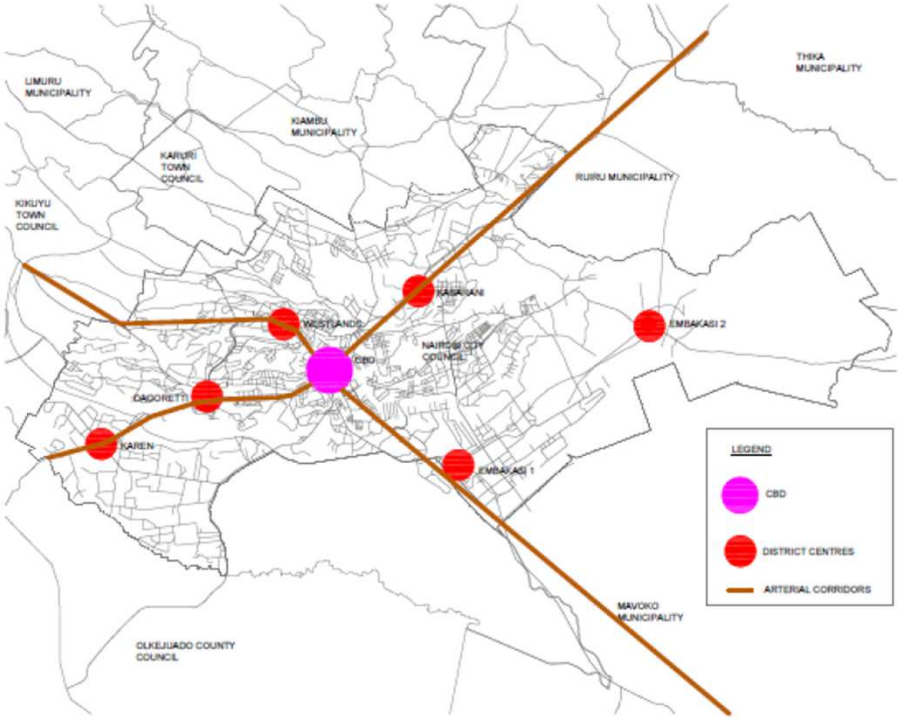
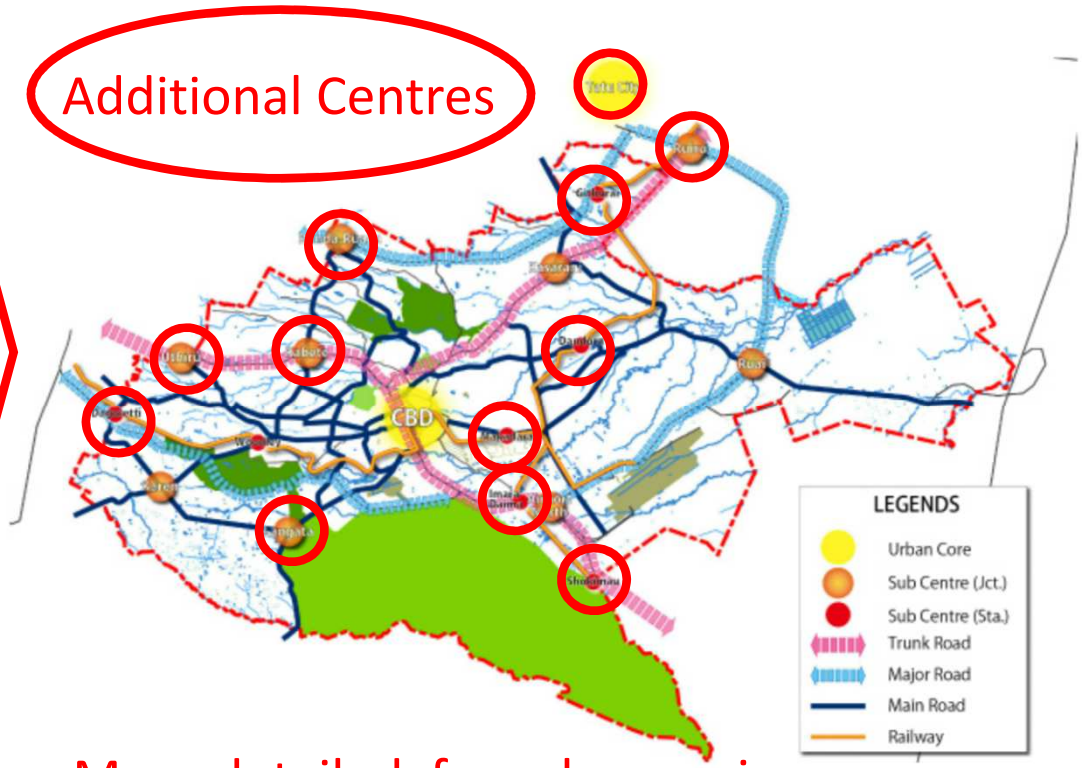
Harmonised Approach for Future Development – Spatial Structure Development

Spatial Planning Concept for
Nairobi Metropolitan Region



Source: Spatial Planning Concept for Nairobi Metropolitan Region (DoNMED)

Nairobi Urban Integrated Master Plan



More detailed for urban region
→ Basis for MRTS traffic forecast

Source: Nairobi Urban Integrated Master Plan (Nairobi County)

4. Harmonisation Study – Part A

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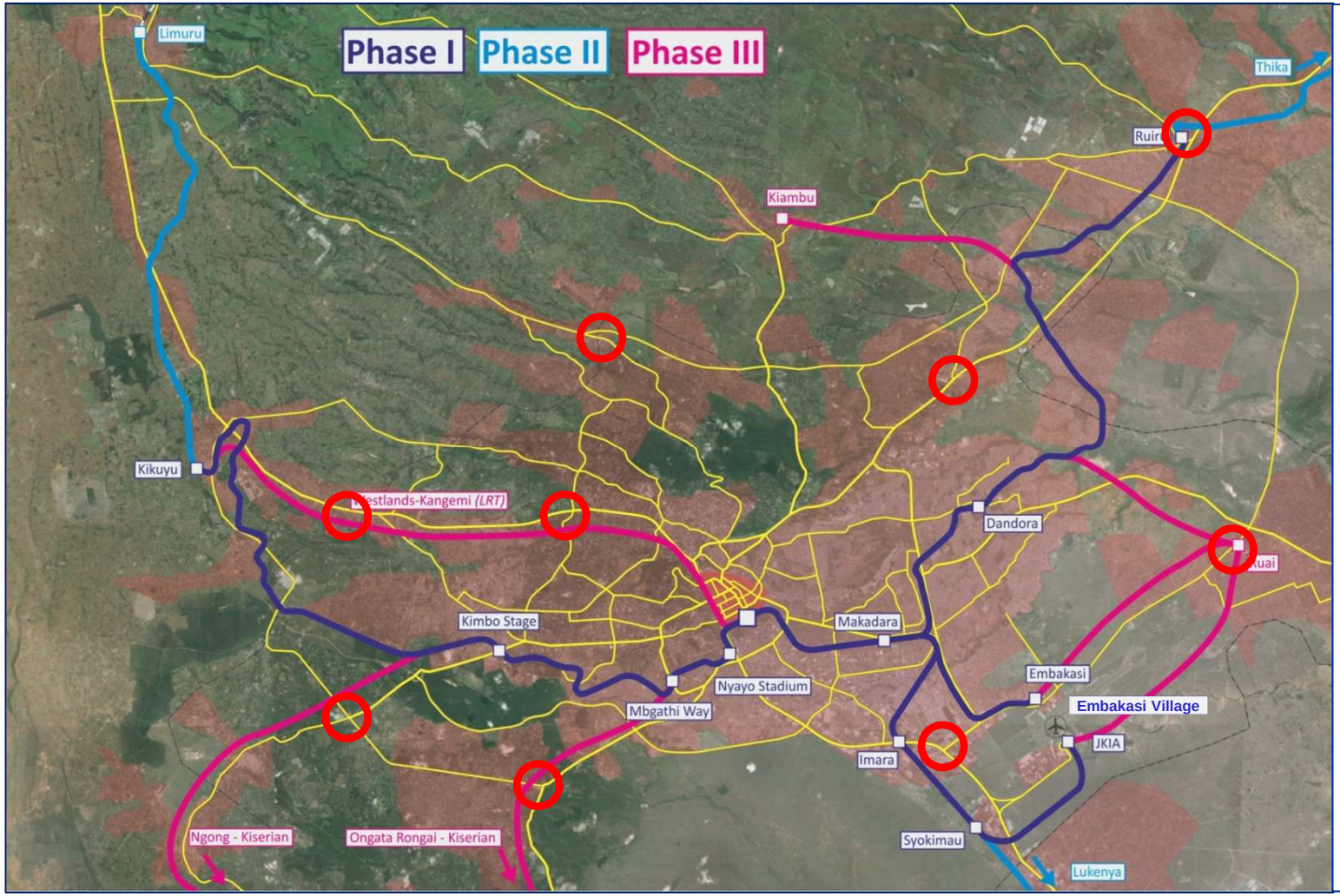
Harmonised Approach for Future Development – Commuter Rail, planned sub-centres

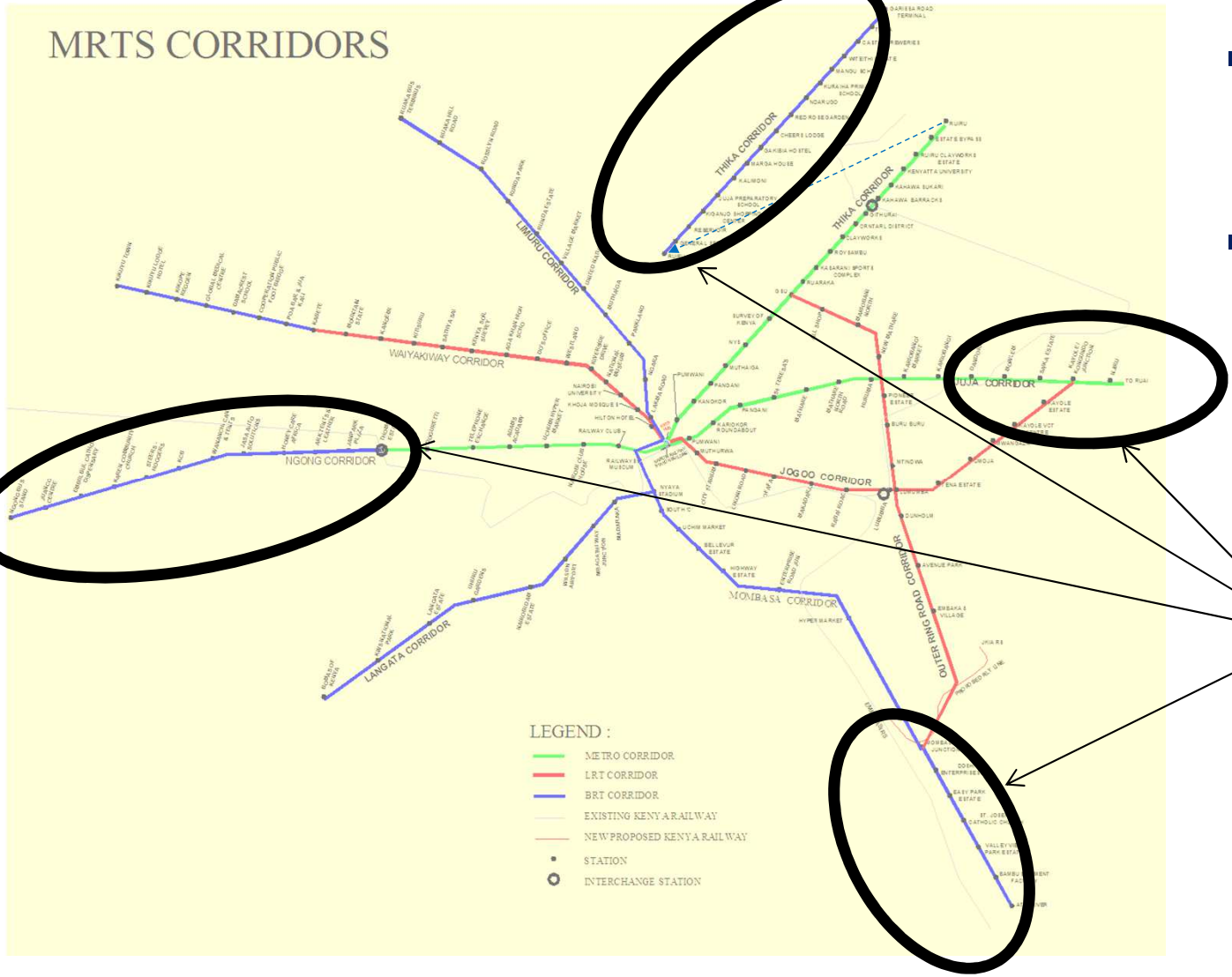


- **Phase I**
  Existing railway lines in urban area + new link to JKIA
- **Phase II**
  Existing railway lines in NMR
- **Phase III**
  New links

Commuter Rail covers most of the planned sub-centres

4. Harmonisation Study – Part A

Harmonised Approach for Future Development – Commuter Rail – MRTS in parallel

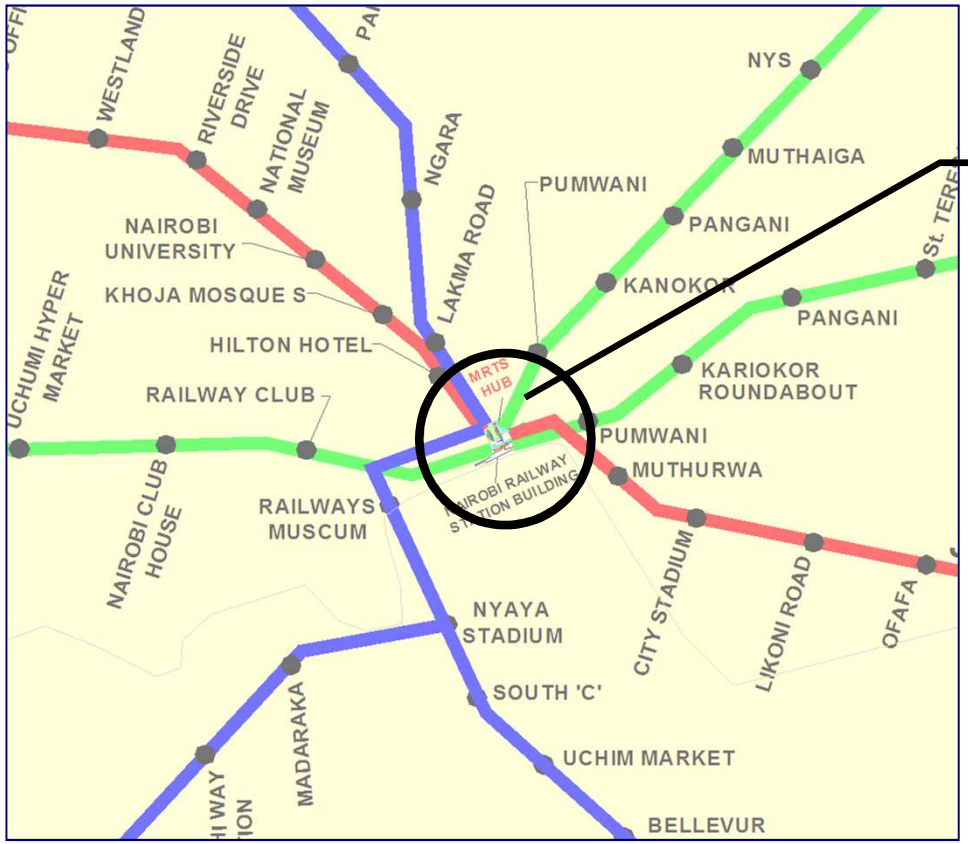


- Proposed MRTS Corridors (Feasibility Study 2011)
- 8 Central Corridors + Outer Ring Road

Parallel sections out of Nairobi Centre according to Commuter Rail, Phase III

4. Harmonisation Study – Part A

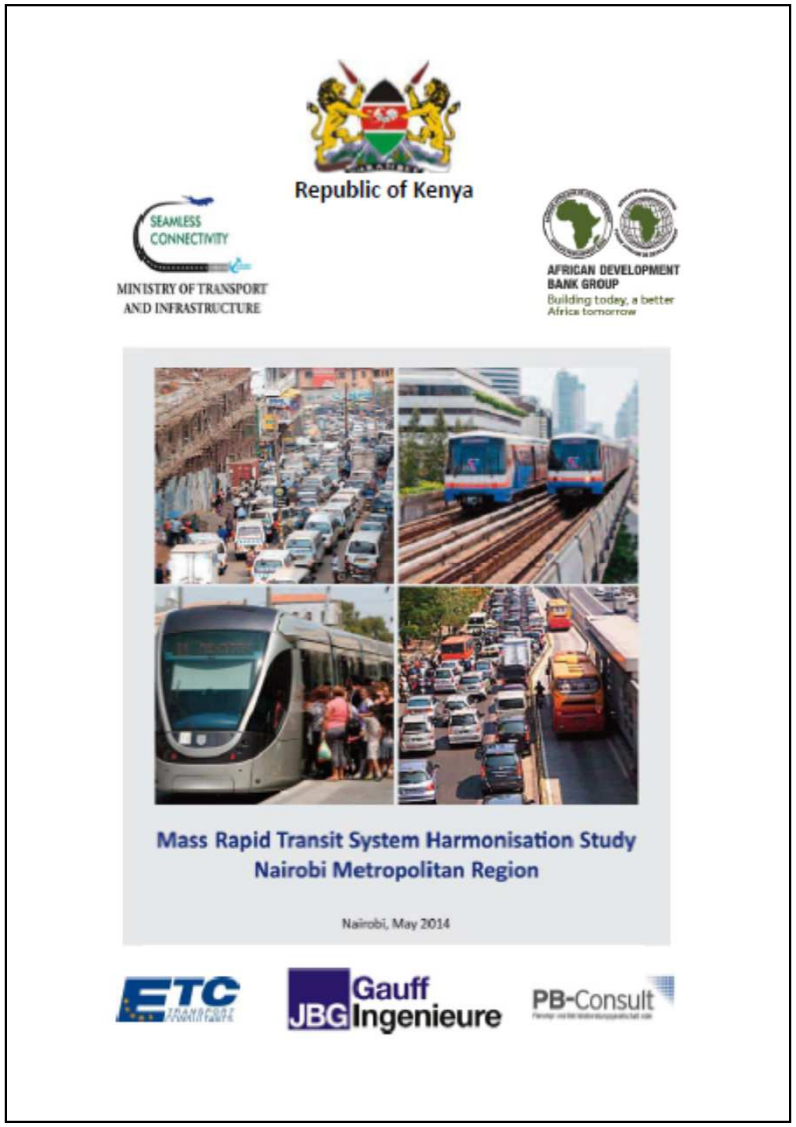
Harmonised Approach for Future Development – Integration of MRTS in the City Centre



Feasibility Study: Only <u>one</u> Central Transit Hub ➔ Some questions arise:

- *Capacity needs versus available area?*
- *Coverage of City Centre?*
- *Destination needs of passengers?*
- *Flexibility of the system due to disruptions?*
- *Maintainability of the infrastructure?*

Structure of the report



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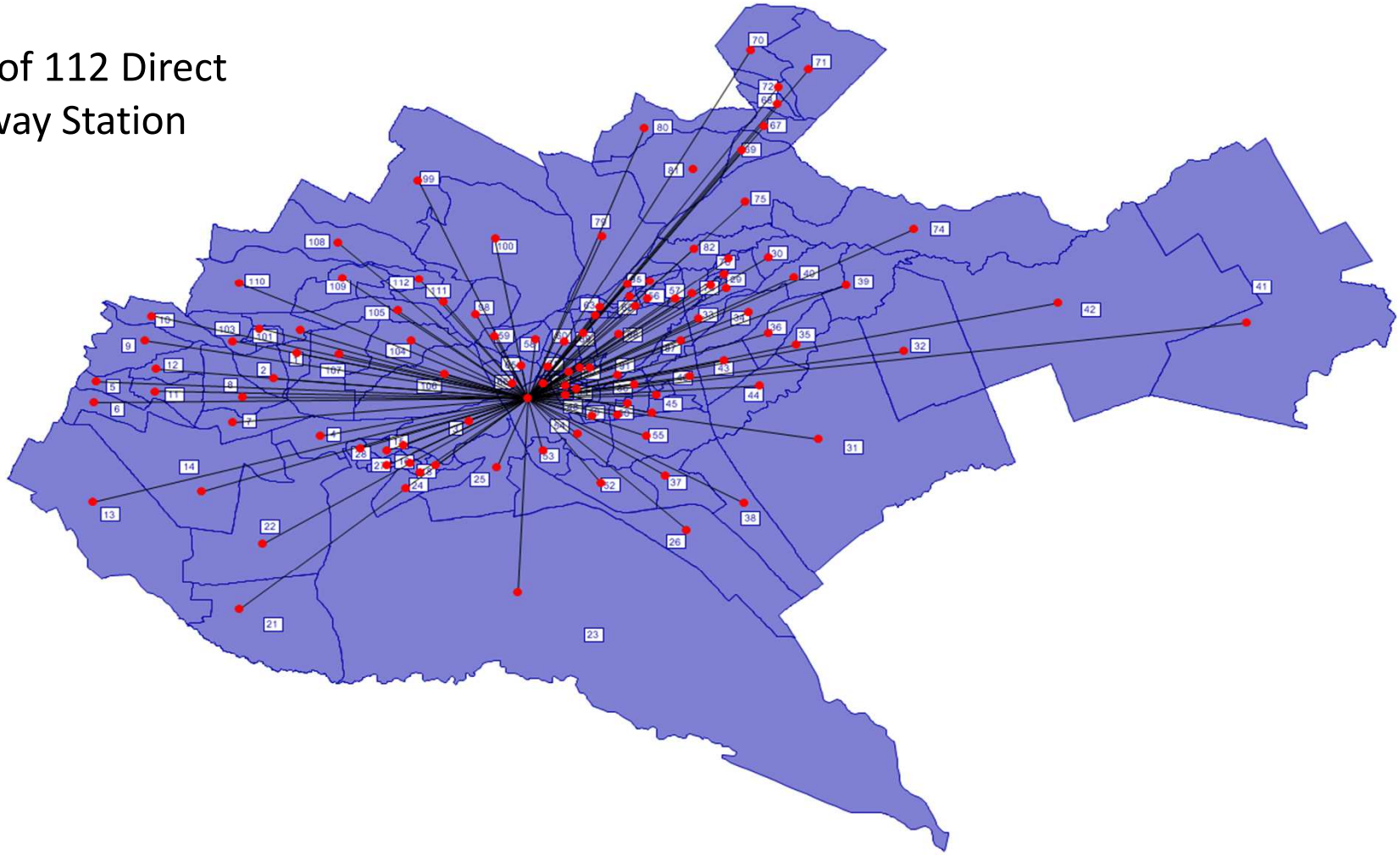
5. Harmonisation Study – Part B

Traffic Modeling

- Zoning Map (112 Zones)
- Implementation of 112 Direct Links to the Railway Station



5. Harmonisation Study – Part B

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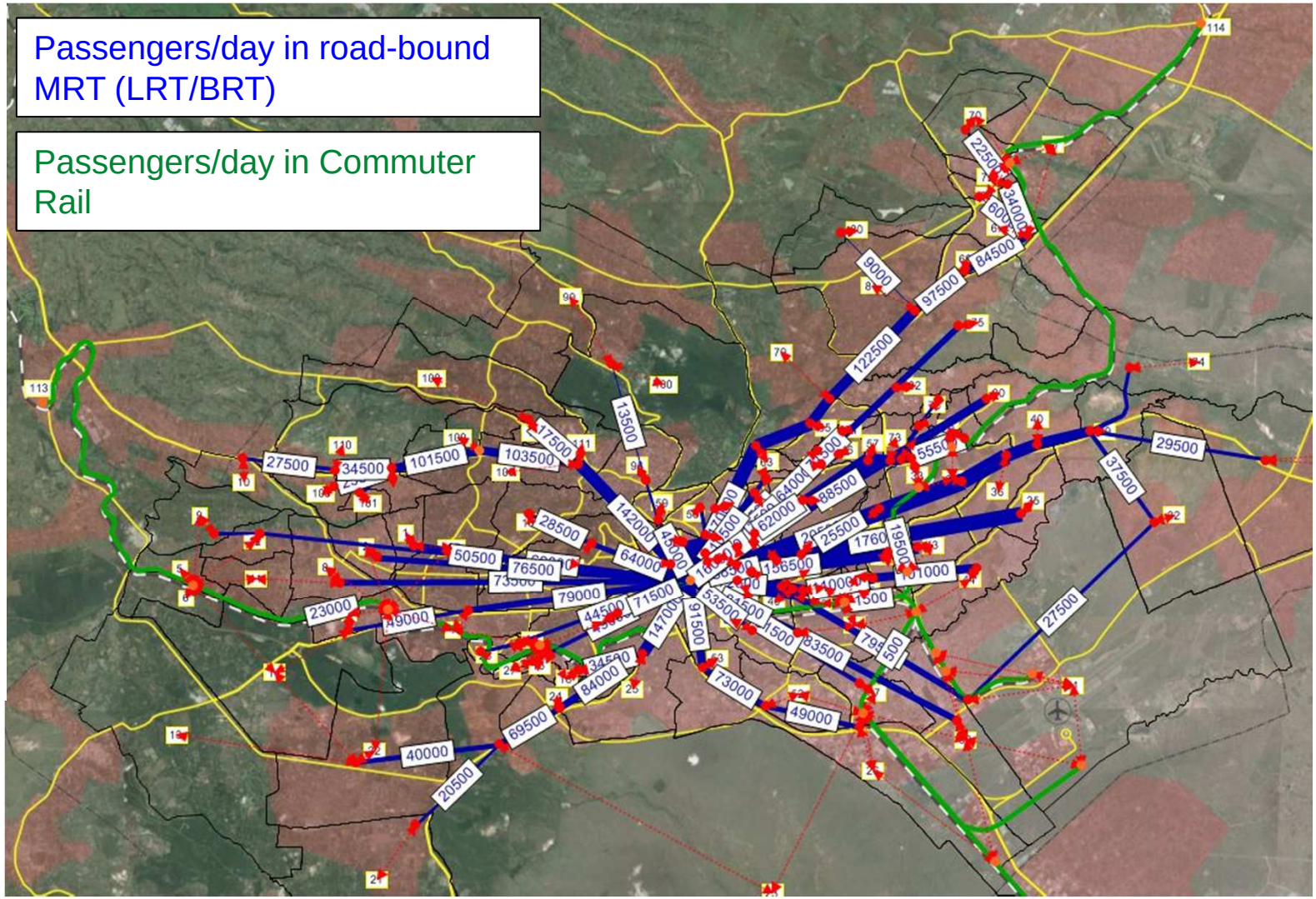
Traffic Modeling

- Addition of the Commuter Rail Network
- Aggregation of Links with the smallest Demand
- Development of Feeder Lines
- Development of Tangential Lines



5. Harmonisation Study – Part B

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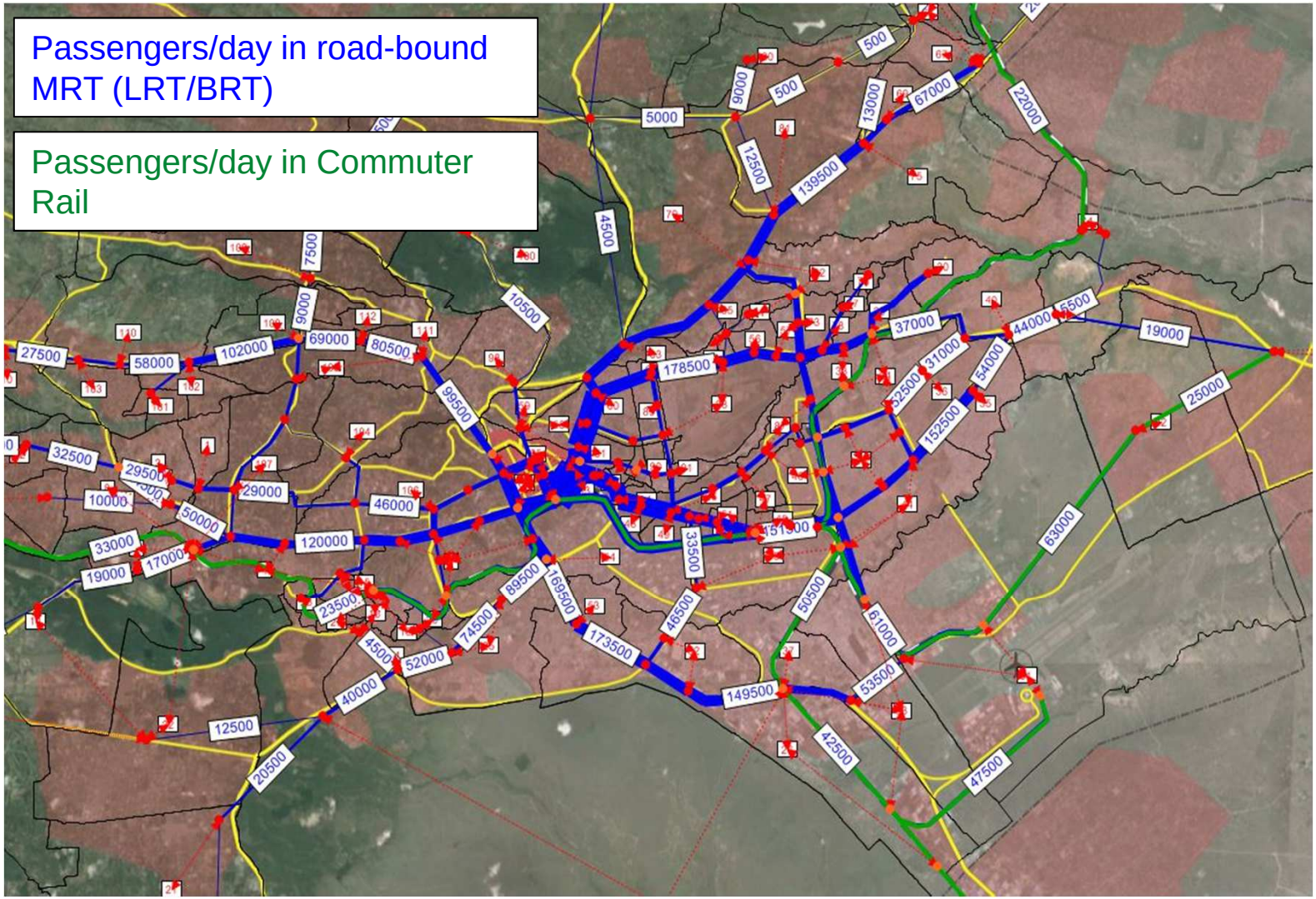
Traffic Modeling

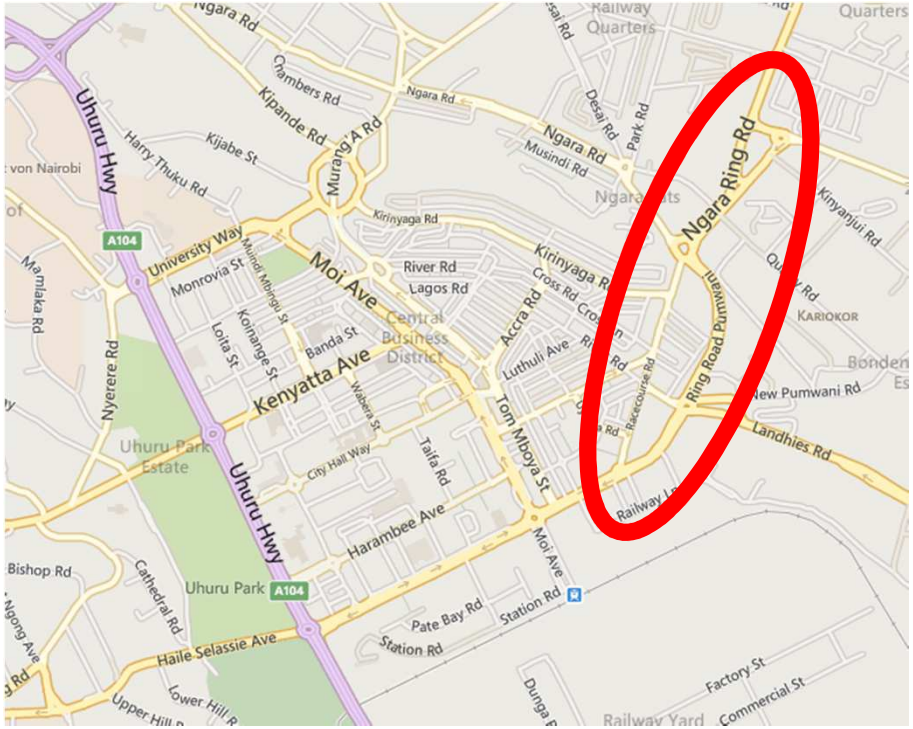
- Aggregation of Links with the smallest Demand
- Development of Feeder Lines
- Development of Tangential Lines
- Adjustments with Regard to the Street Network

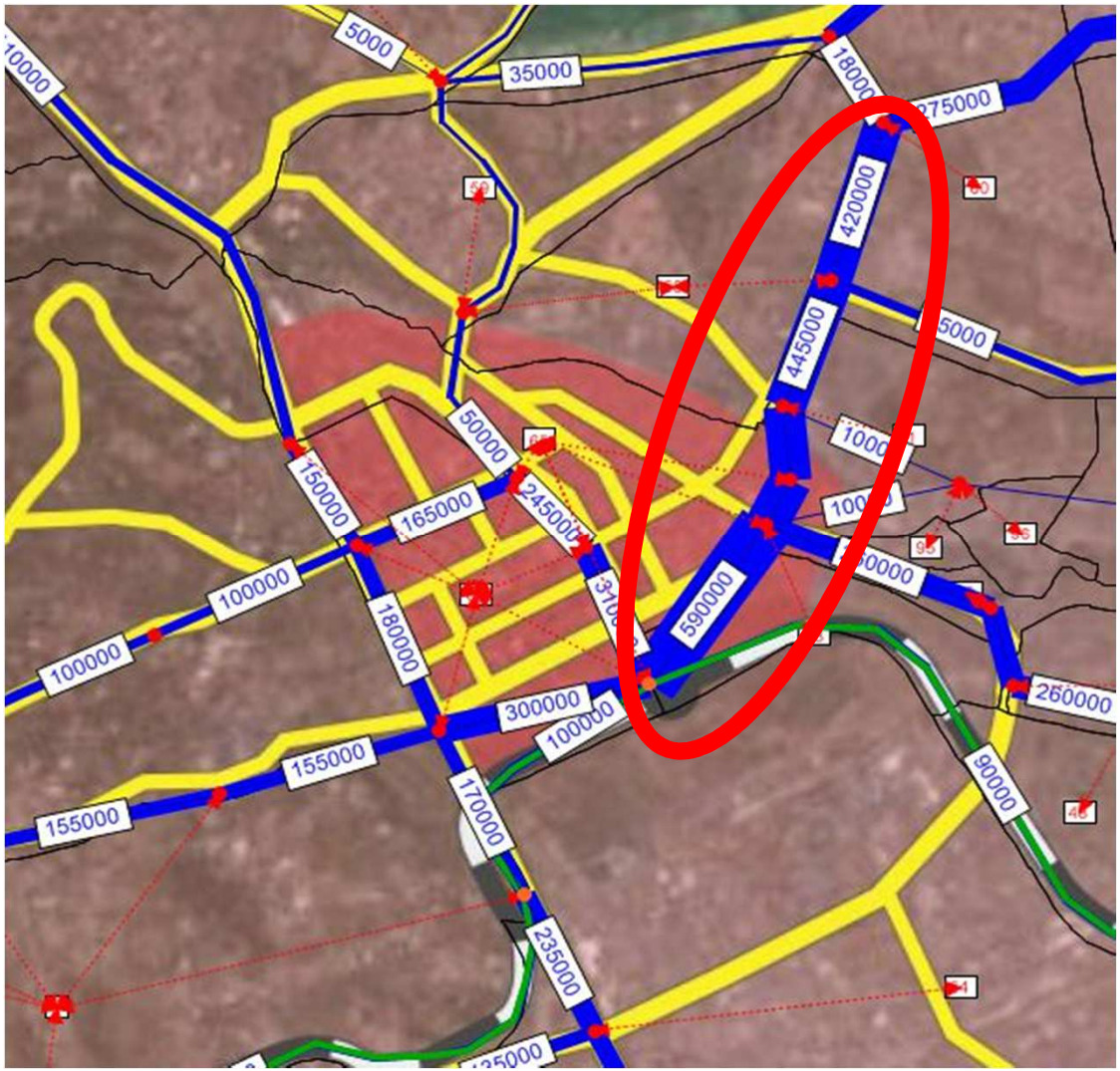


5. Harmonisation Study – Part B

Traffic Modeling - CBD

- Demand Structure of CBD
- High Concentration of passenger volumes east of Railway Station along H. Selassie, Ring Rd. and Ring Rd. Ngara



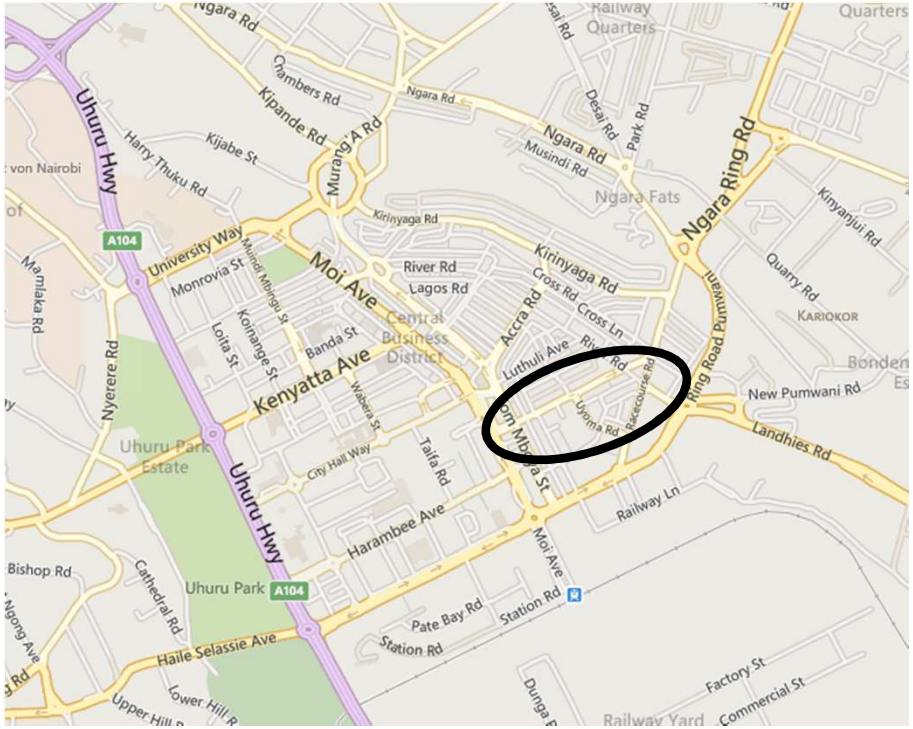


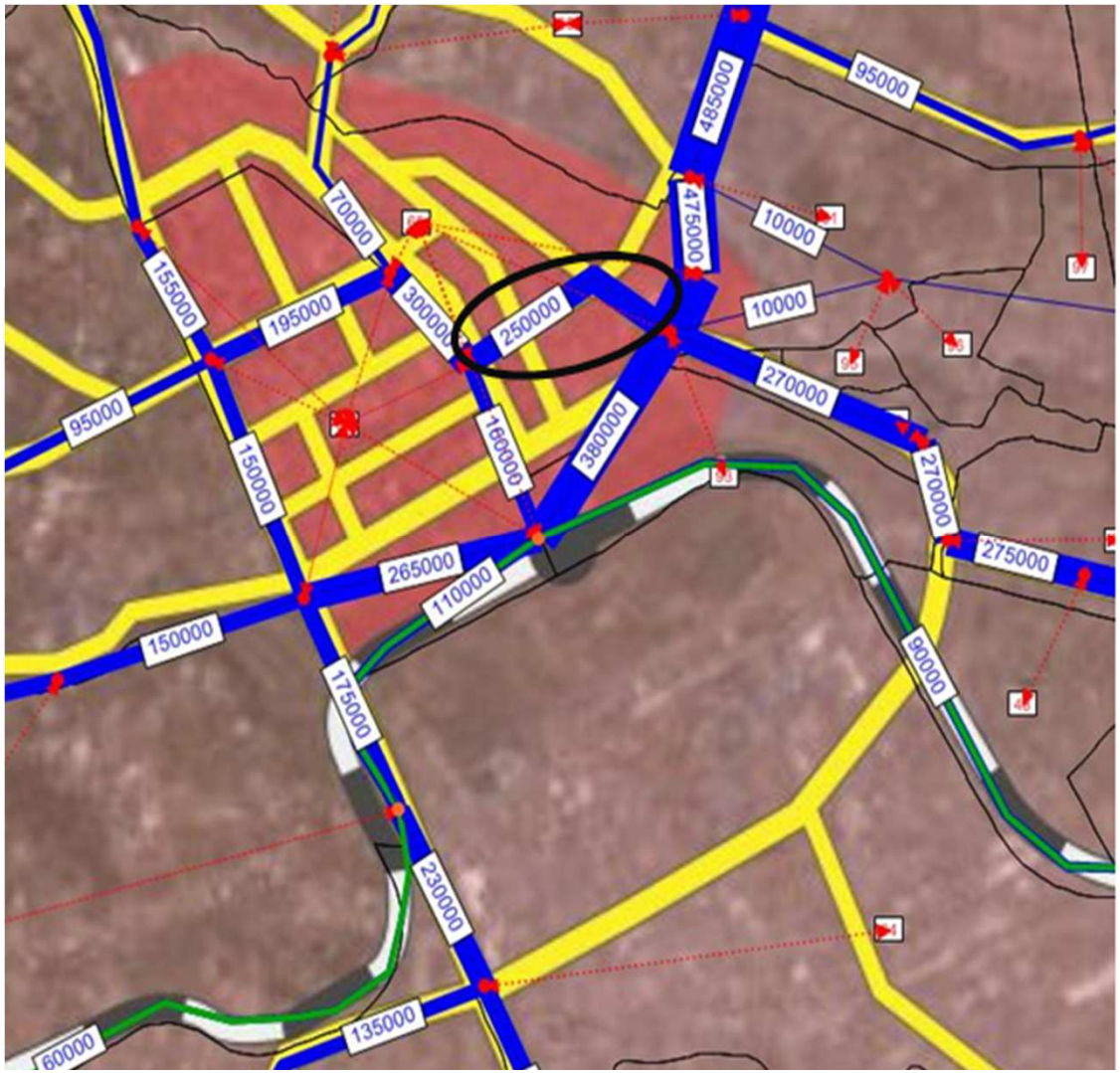
5. Harmonisation Study – Part B

Traffic Modeling - CBD

Step 1

- Direct Connection from Landhies Rd. via River Road and Roland Ngala Rd. to Moi Avenue



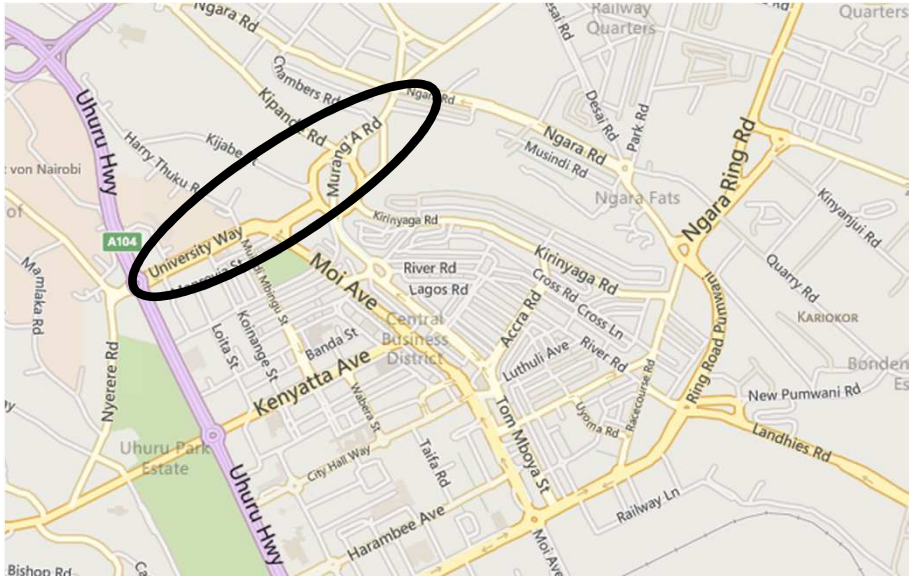


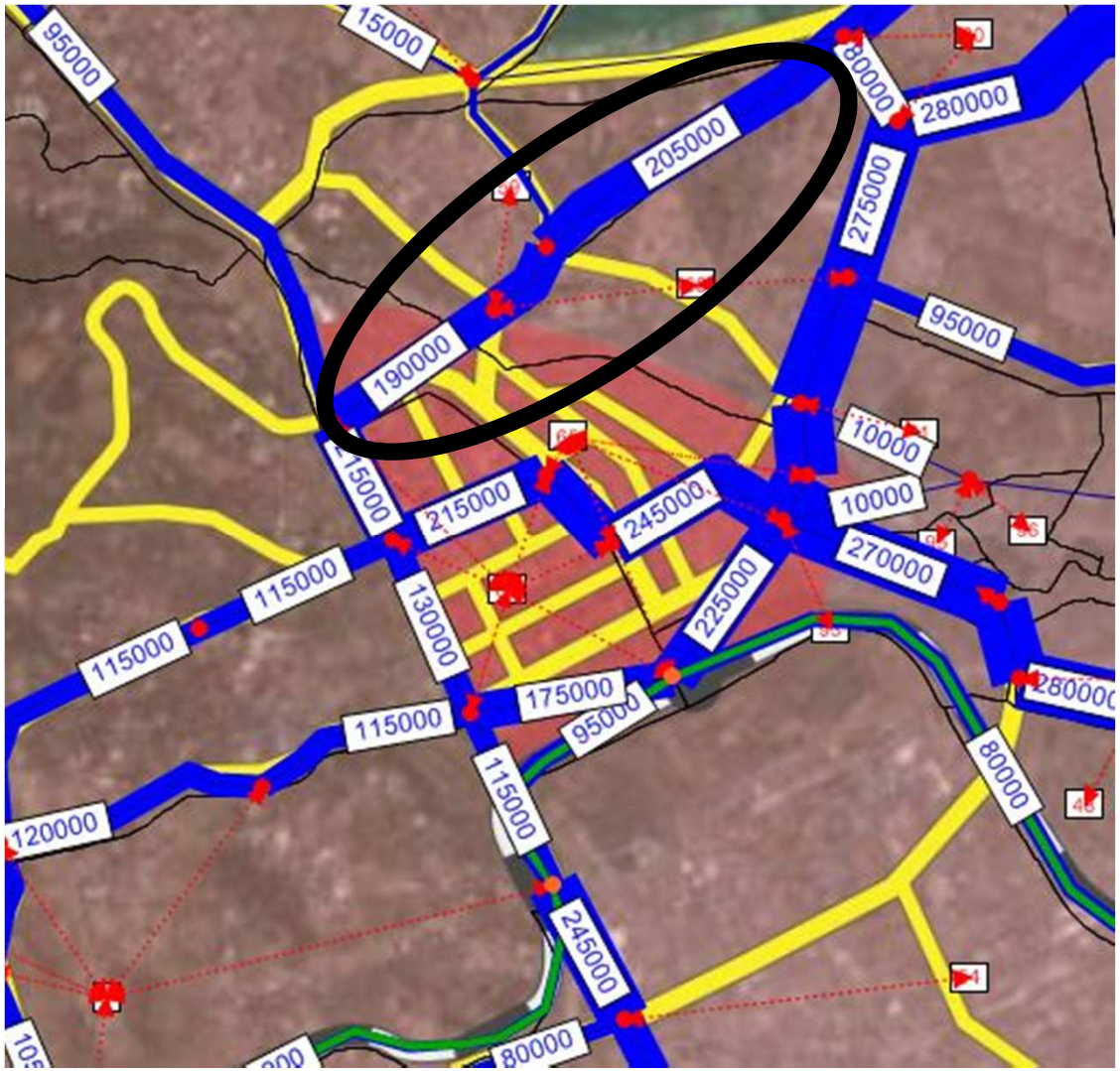
5. Harmonisation Study – Part B

Traffic Modeling - CBD

Step 2

- Direct Connection from Thika Highway to Uhuru Highway
- Every BRT / LRT section in the CBD has a daily demand between 130.000 passenger /day and 300.000 passenger/day



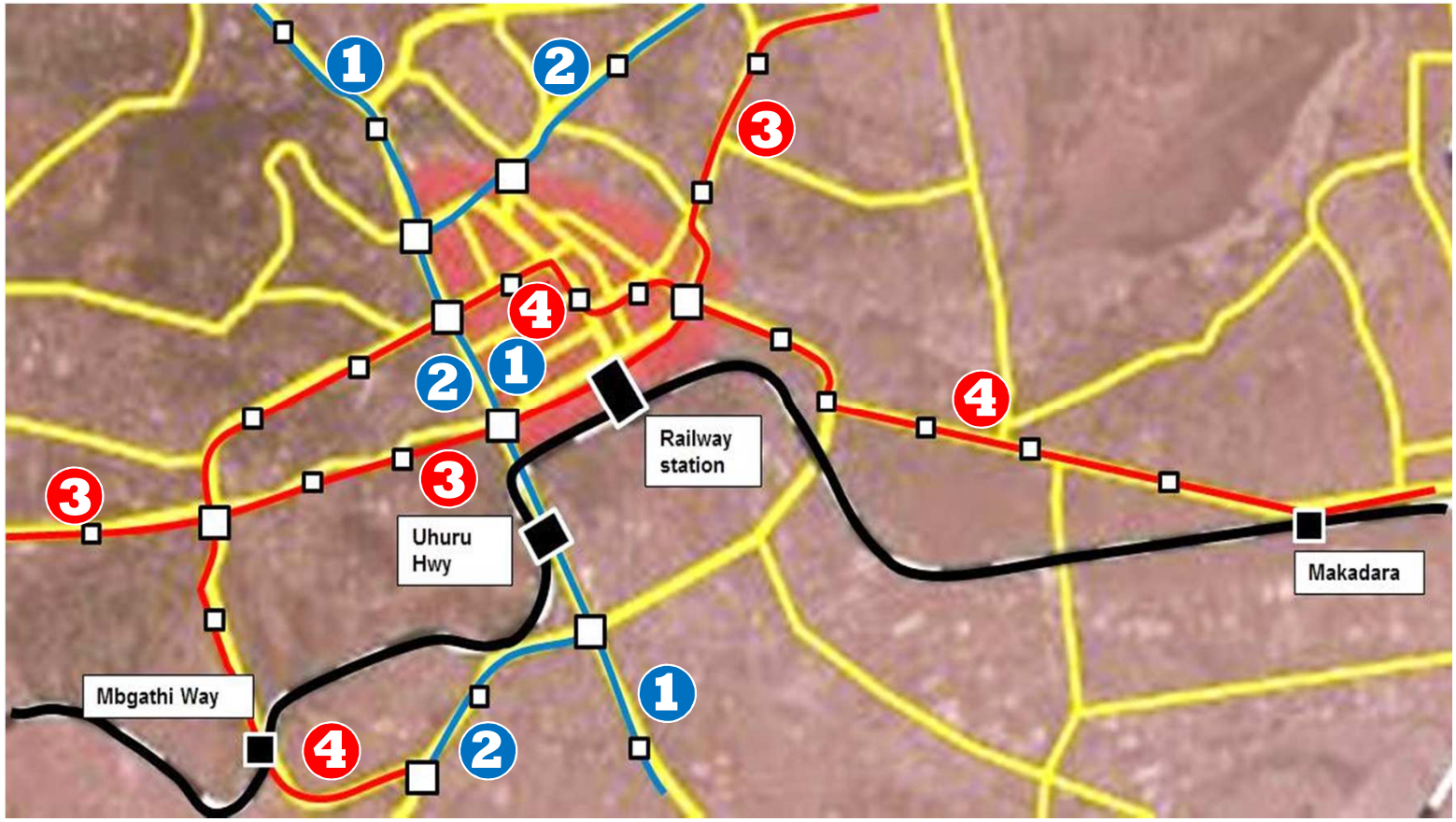


5. Harmonisation Study – Part B

Network layout - CBD

Principal Network Design

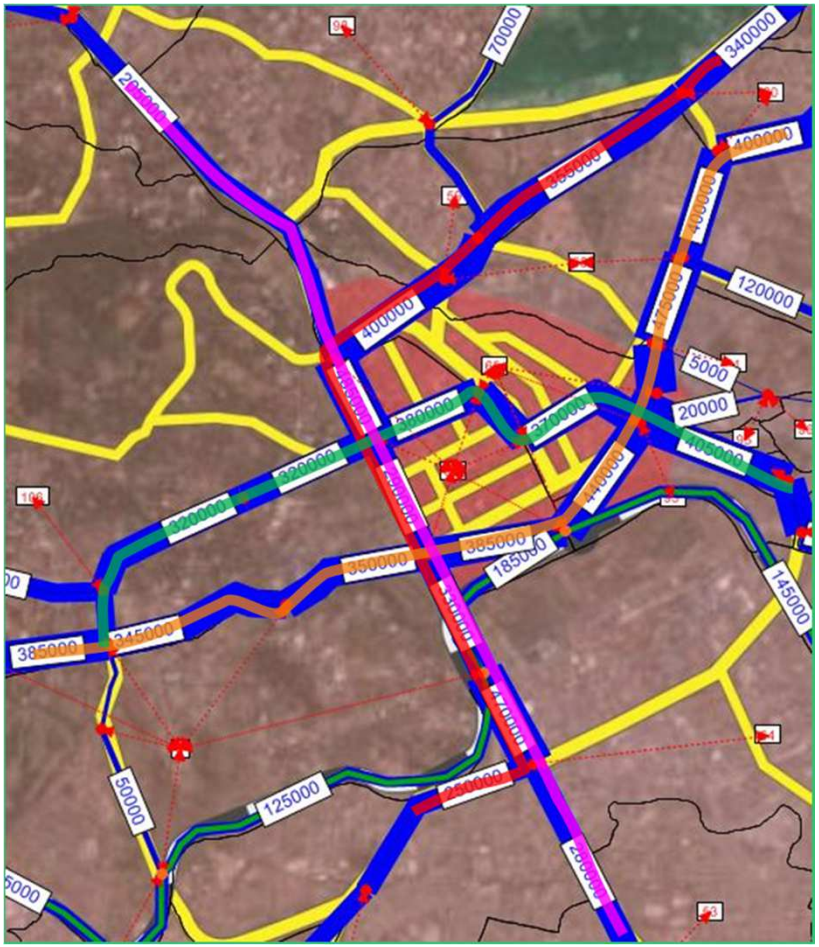
- **Line 1** and **Line 2** concentrated at Uhuru Highway passing CBD in north-south direction west of CBD
- **Line 3** and **Line 4** passing CBD on two different corridors at H. Selassie and Kenyatta Avenue in east-west direction



5. Harmonisation Study – Part B

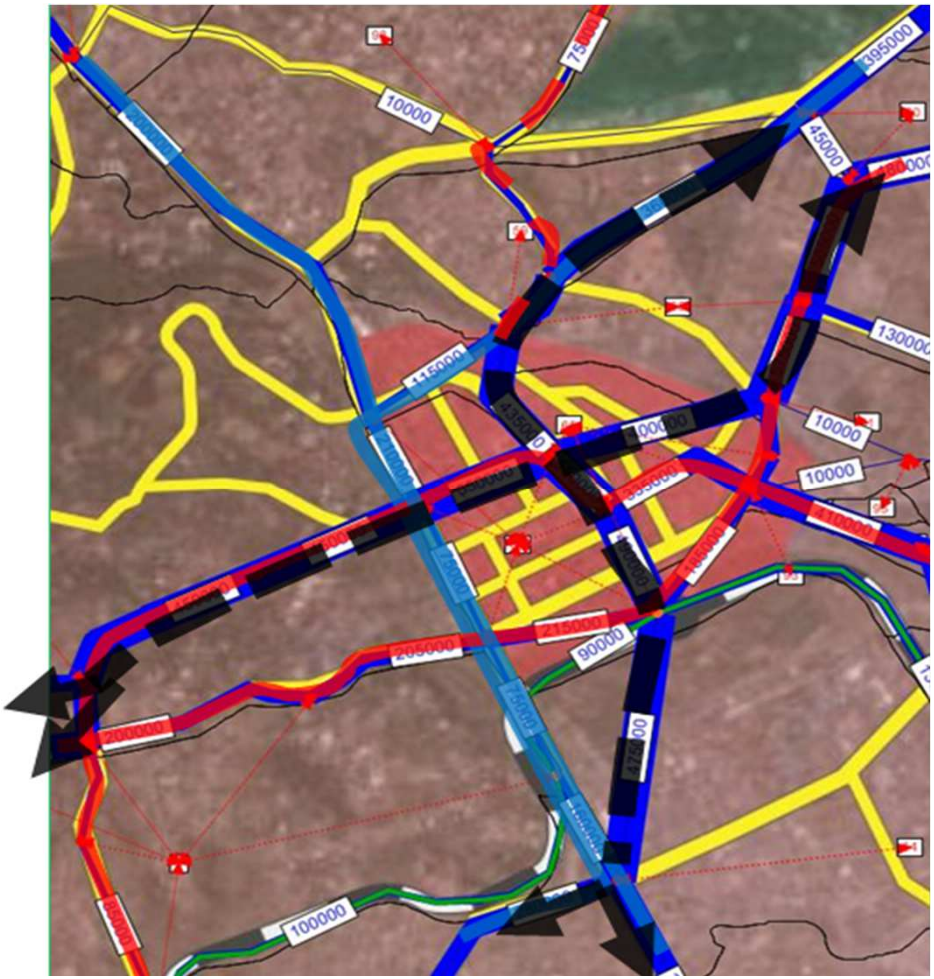
Network layout – CBD – future extension

Phase I (2018 – 2030)



4 cross-city MRTS lines (BRT/LRT)

Phase II, Draft (after 2030)



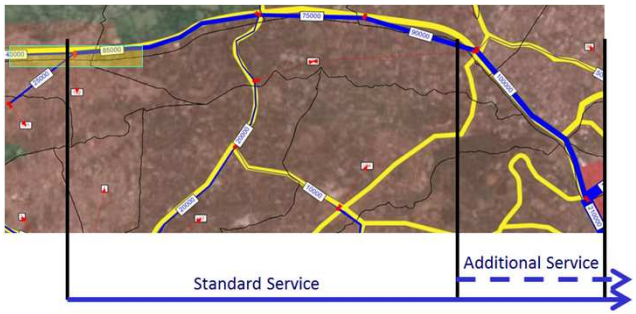
Additional rail-bound MRTS (tunnel/elevated)

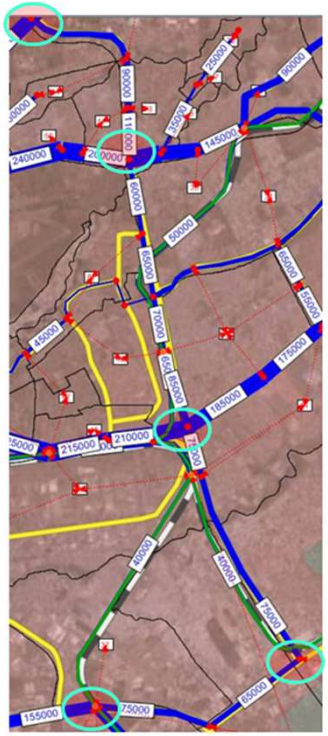
5. Harmonisation Study – Part B

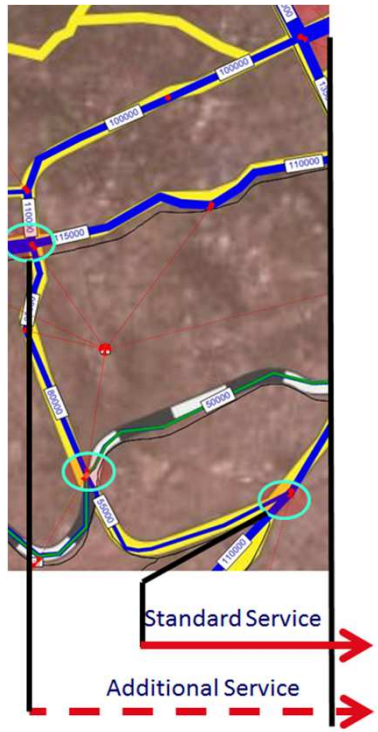
Network layout

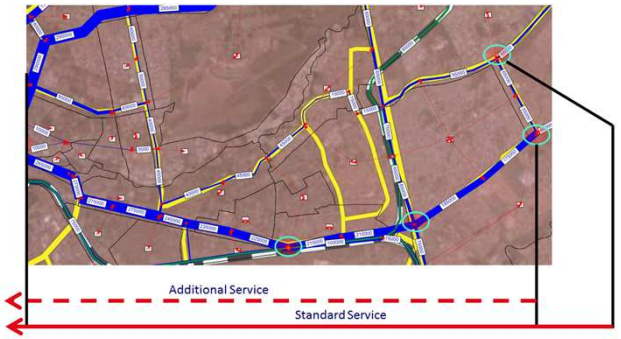
Analysis of Corridors

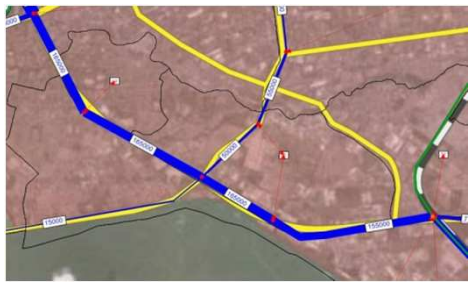
- Waiyaki Way
- Kenyatta Avenue
- Ngong Road
- Langata Road
- Mombasa Road
- Outer Ring Road
- Jogoo Road
- Juja Road
- Thika Highway
- Limuru Road





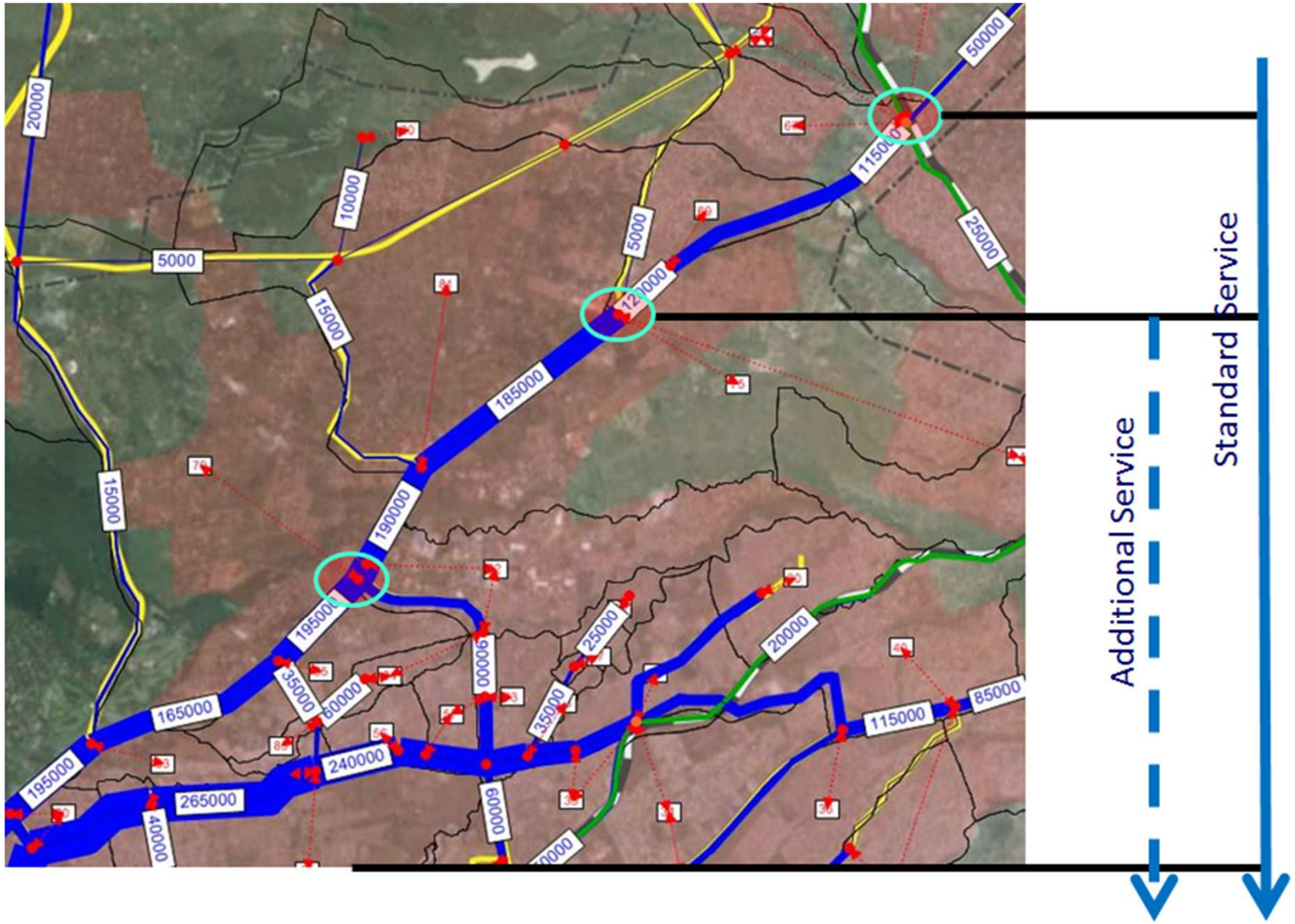






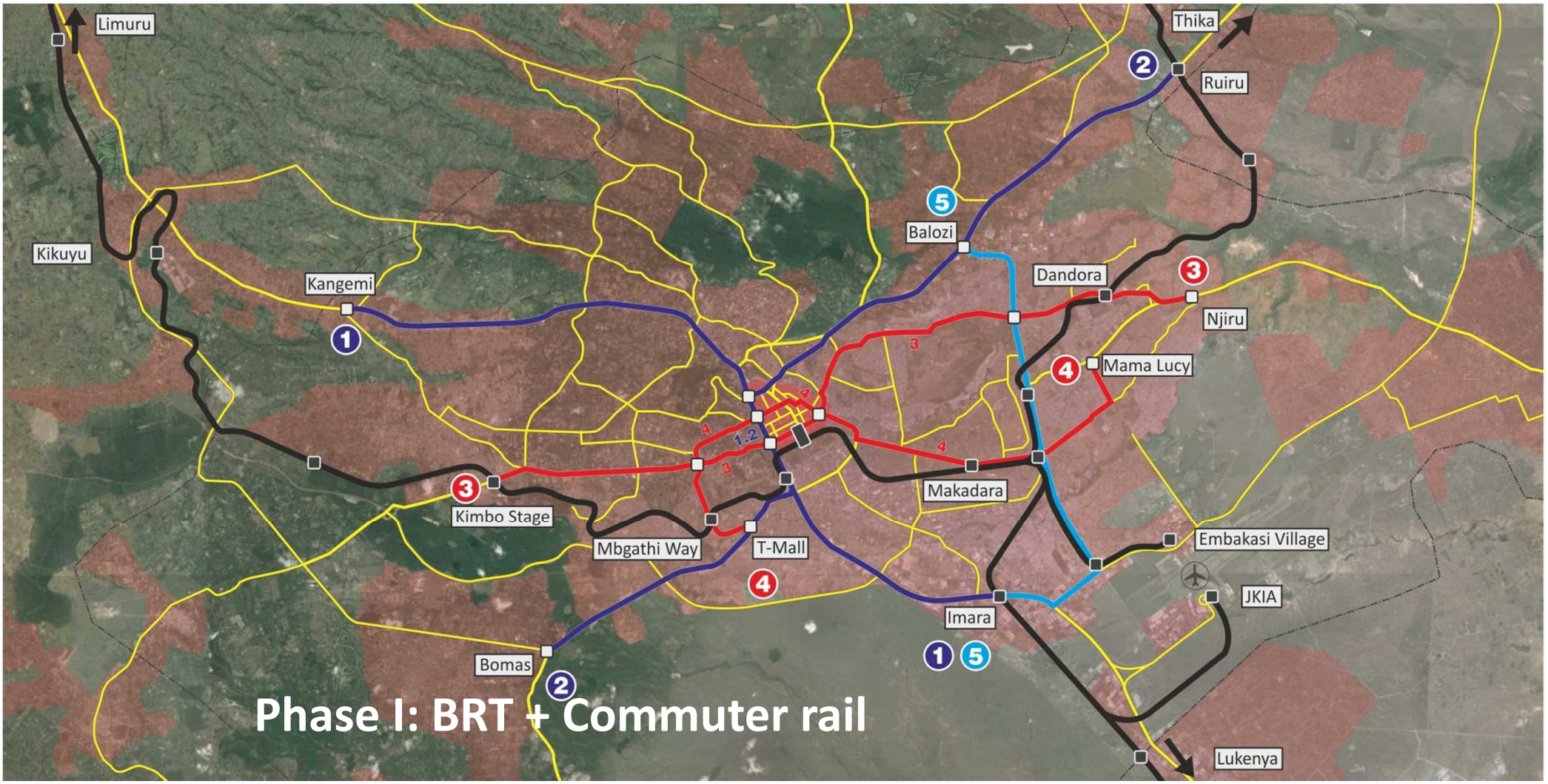
5. Harmonisation Study – Part B

Network layout – Example of Thika Highway



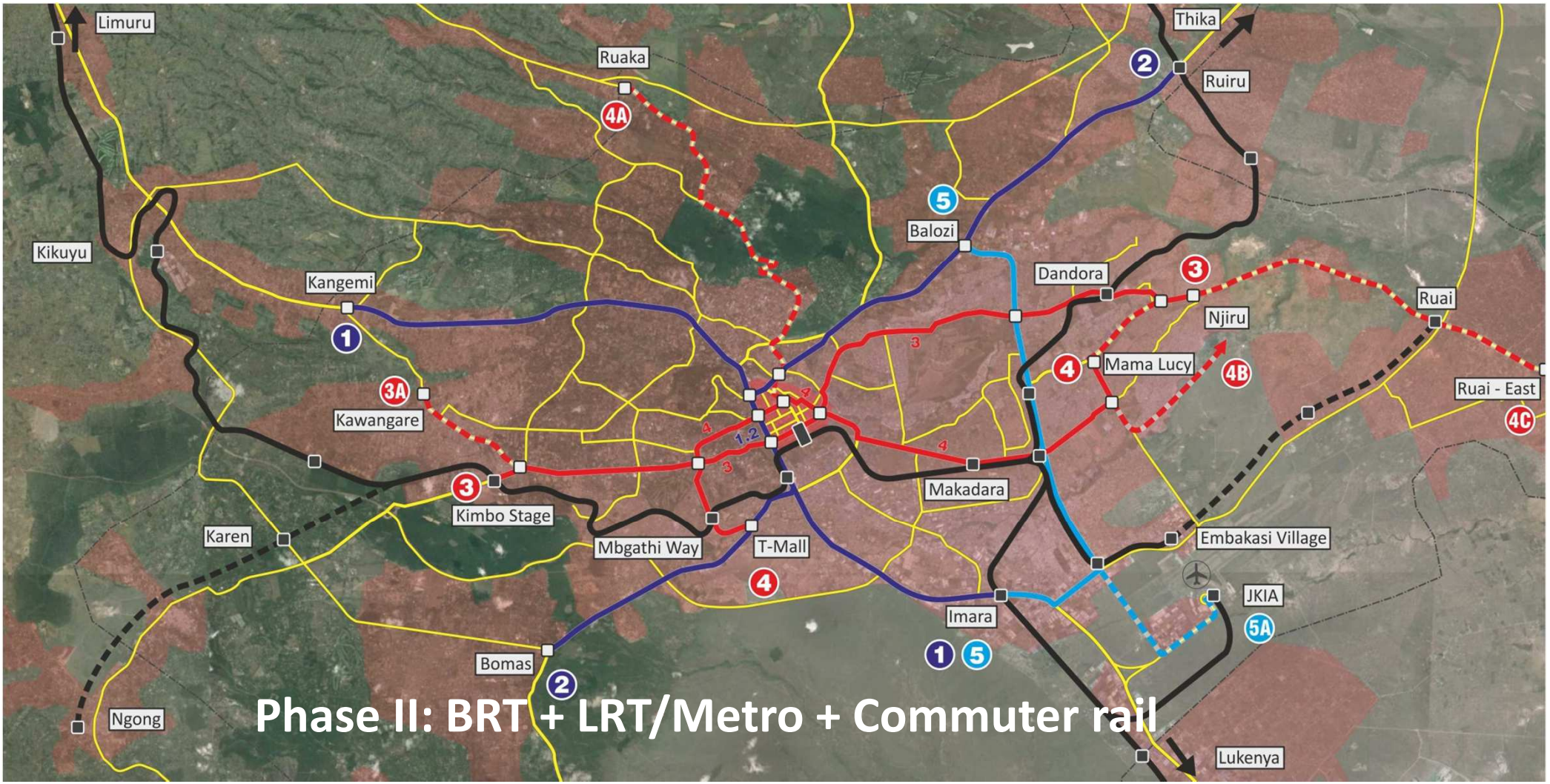
5. Harmonisation Study – Part B

Network layout – Phase I



5. Harmonisation Study – Part B

Network layout – Phase II



5. Harmonisation Study – Part B

Mode selection

Advantages of a BRT system for the first developmental stage

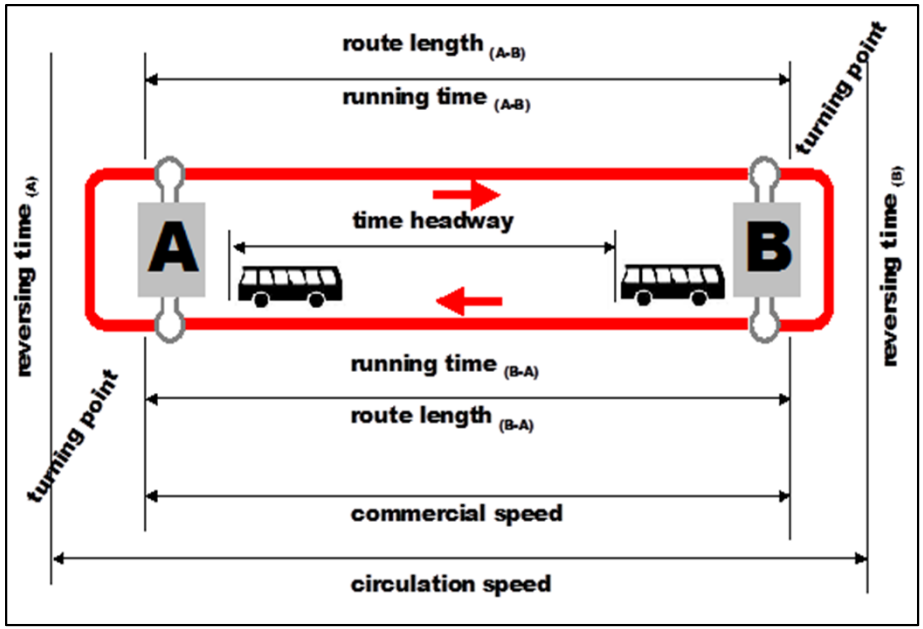
- Procurement (construction and purchase of vehicles) costs of a BRT system is cheaper than an LRT system
- The planning and construction time of a BRT system is shorter than that of an LRT system
- In case of further growing demand, additional capacity can be provided at short notice
- Network can easily be adjusted to demand
- Availability of high local content and know-how:
  - *Availability of local bus drivers*
  - *Diesel as energy source; well available in Nairobi.*
  - *Local experience in servicing and repairing diesel busses*

5. Harmonisation Study – Part B

System operation – Service plan

Operations in 2 stages:

- **Initial Service** with 75% of capacity to cover low initial demand – overall need: **665 buses**
- **Full service** at 100% capacity to cover overall demand after the complete establishment of the system – overall need: **940 buses**



The operation plan was drawn up on the basis of the following assumptions:

- Application of **18 meter articulated buses** with a capacity for 140 passengers (assumption of a maximum utilisation capacity of 6 passengers per square meter) as a standard for all lines.
- Low-floor buses with four doors respectively to facilitate the quick exchange of passengers at stop stations

5. Harmonisation Study – Part B

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System operation – Service plan

Nairobi Corridor Operation Analysis							
Criteria	Unit	Service level	Corridor/Line				
			1	2	3	4	5
Maximum cross-sectional load (outer section/both directions)	*[PAX/day]*	initial	67.500	90.000	63.750	60.000	82.500
		full	90.000	120.000	85.000	80.000	110.000
Maximum cross-sectional load (inner section/both directions)	*[PAX/day]*	initial	127.500	142.500	217.500	206.250	-
		full	170.000	190.000	290.000	275.000	-
Headway outer section	*[min]*	initial	2,5	2,0	2,5	2,5	2,0
		full	2,0	1,5	2,0	2,0	1,5
Average headway inner section	*[min]*	initial	1,3	1,2	0,8	0,8	2,0
		full	1,0	0,9	0,5	0,5	1,5
Length full corridor	*[km]*	all	19,4	25,6	21,7	17,2	10,2
Length additional service corridor	*[km]*	all	12,5	18,9	17,7	13,0	-
Total number of busses incl. reserve	*[unit]*	**initial**	**112**	**160**	**192**	**154**	**47**
		full	**138**	**221**	**289**	**230**	**62**
Total number of busses whole network	*[unit]*	**initial**	**665**				
		full	**940**				

5. Harmonisation Study – Part B

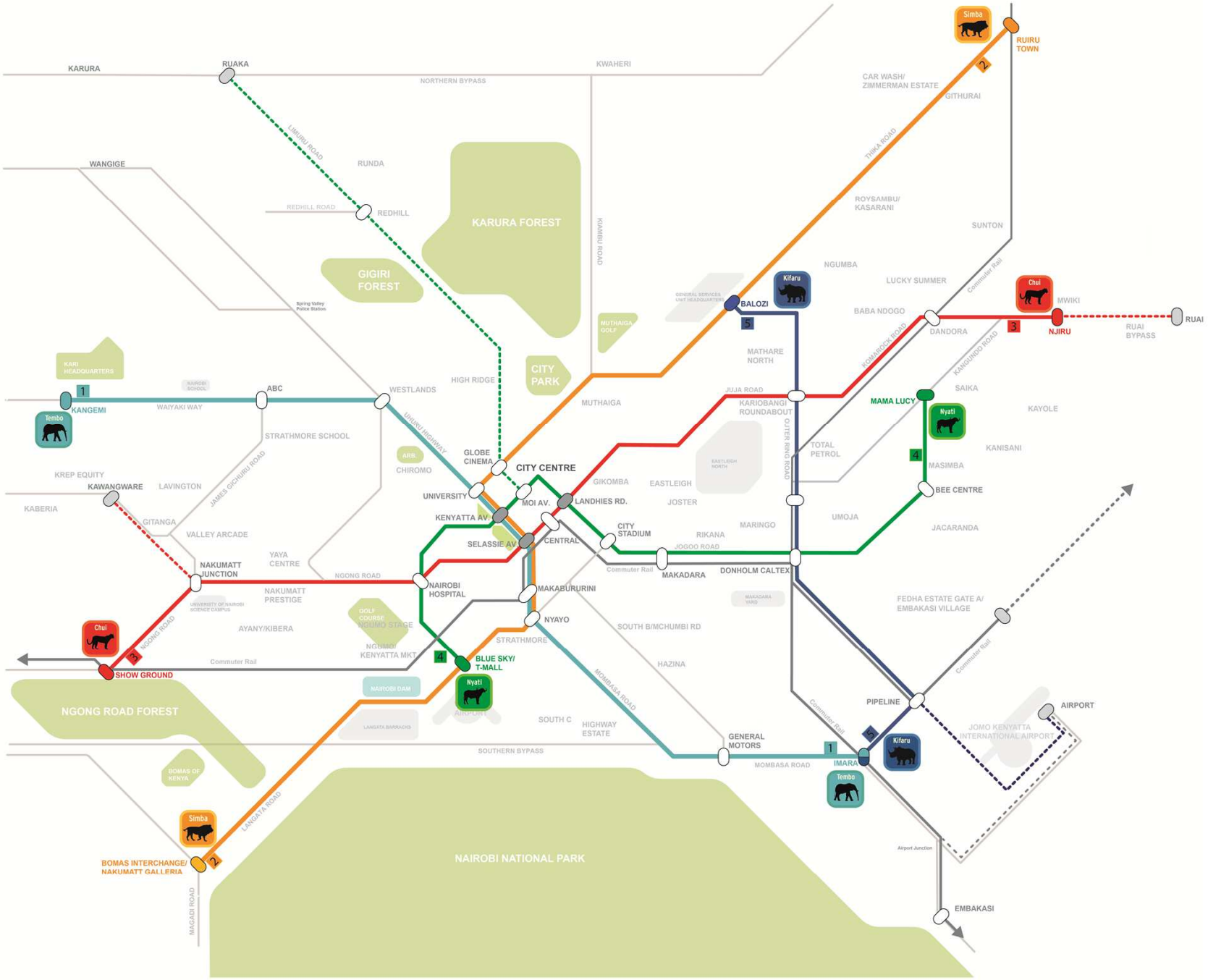
❶ **Tembo Line** *Kangemi – Imara*

❷ **Simba Line** *Bomas – Ruiru*

❸ **Chui Line** *Njiru – Show Ground*

❹ **Nyati Line** *Mama Lucy – T-Mall*

❺ **Kifaru Line** *Balozi – Imara*



MRTS / COMMUTER RAIL NETWORK

- 1 Tembo Line — Kangemi – Imara
- 2 Simba Line — Bomas – Ruiru
- 3 Chui Line — Njiru – Show Ground
- 4 Nyati Line — Mama Lucy – T-Mall
- 5 Kifaru Line — Balozi – Imara

Stations

Commuter Rail

Road Network

German Expertise since 1958
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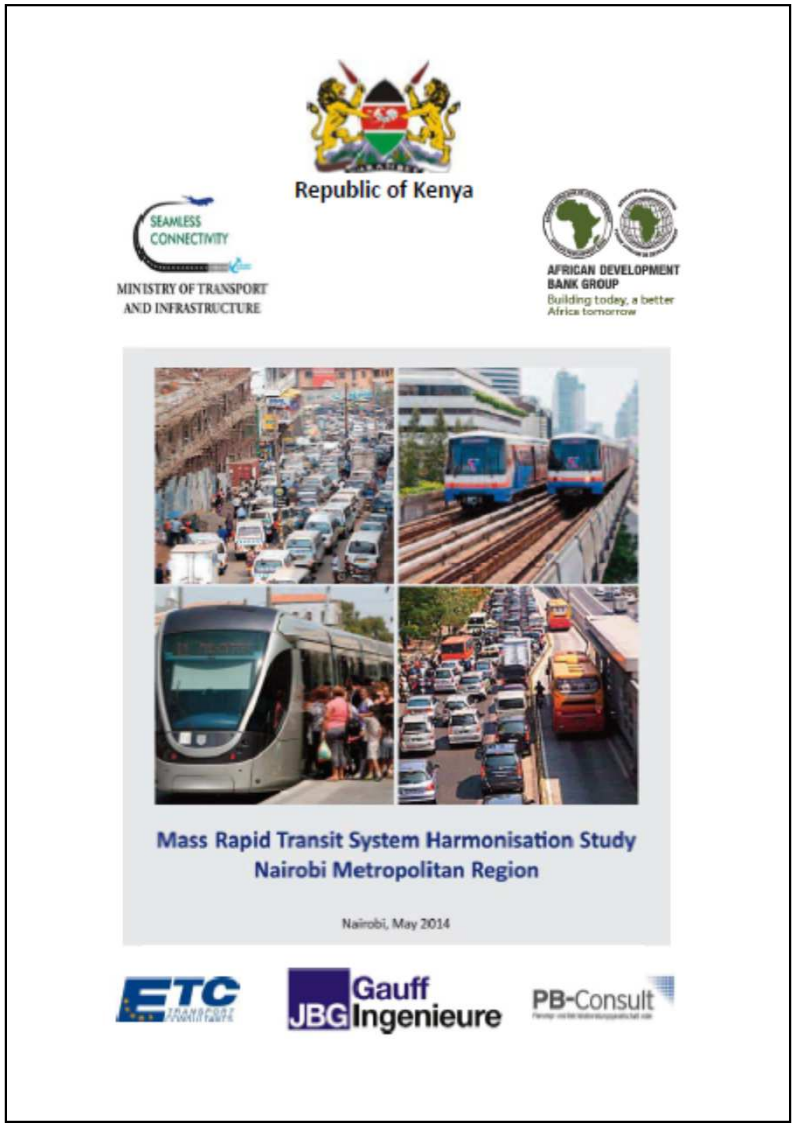
Structure of the report



Part A - Harmonisation of completed and ongoing studies (Chapter 2 and 3 and Annex A and B)

- Data Collection, Analysis
- Stakeholder Consultation
- Harmonised Approach for Future Development

Part B - Development of an integrated MRTS network (Chapter 4-7 and Annex C)

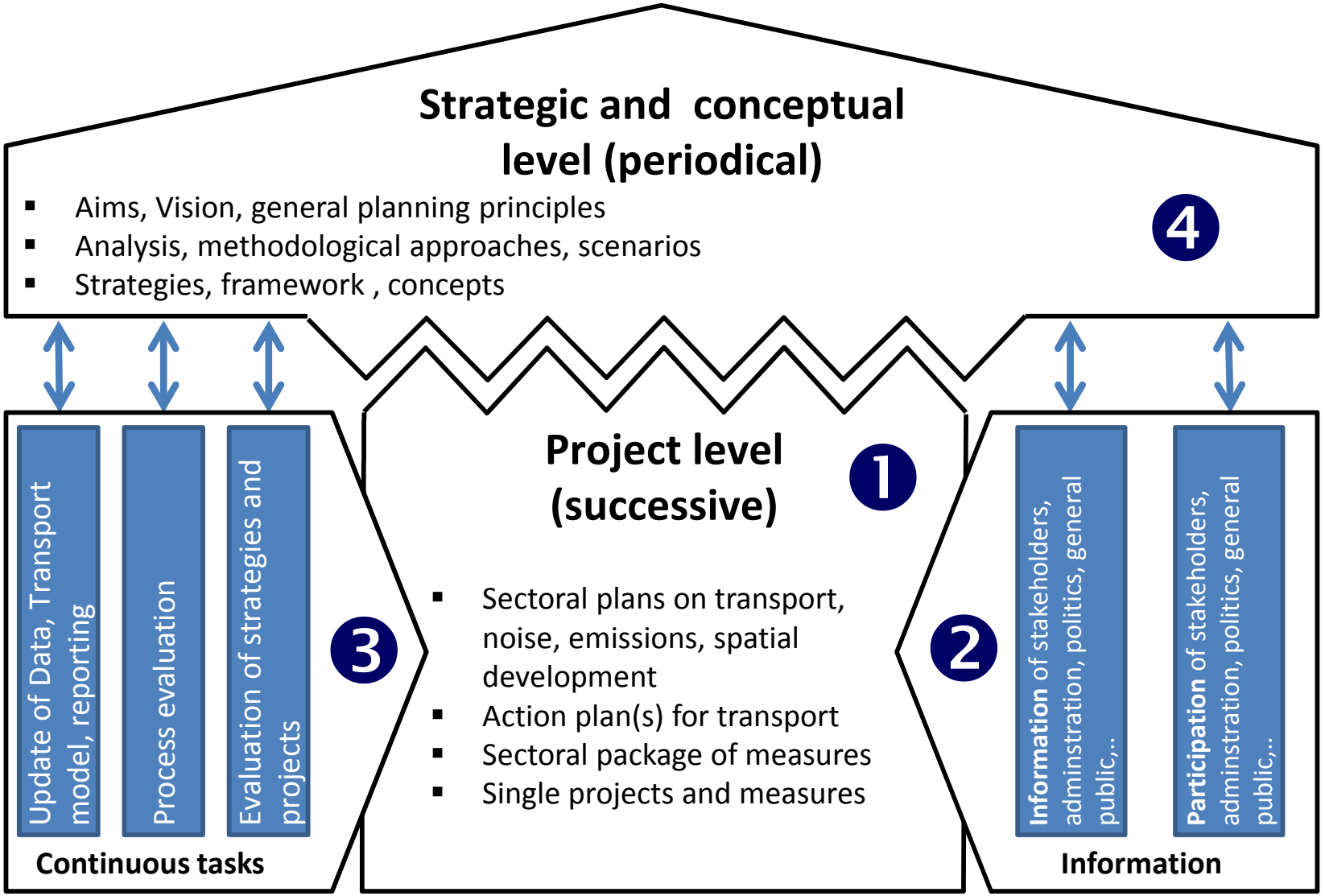
- **Traffic Modeling**
- **Network Layout**
- **Mode Selection**
- **System Operation**

Organisation and Implementation Plan (Chapter 8)

Recommendations and Priorities for Implementation (Chapter 9)

6. Organisation & Implementation

Four key elements for a modern and integrated transport development planning



6. Organisation & Implementation

German Expertise since 1958
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Success criteria for the implementation of transport projects

1. **Implementation** of a robust **legal and regulatory framework**, consistent with the overall political aims, for a level playing field.
2. **Establishment** of an **authority** or other competent body **responsible** for coordinating **public transport planning**.
3. **Establishment** of an **authority** or other competent body **responsible** for **regulatory oversight** of public transport
4. **Integrated land use** and **transport planning**
5. **Investments** in **public** and **non-motorised transport**
6. **Innovative financing methods** to raise resources for financing public transport operations
7. **Inclusion of stakeholders** and the informal sector

6. Organisation & Implementation

Organisational Framework - I

Role of GoK: Establishing a public transport department (PTD) to coordinate the stakeholders on national as well as regional level functioning as a *one-stop-shop* for public transport issues in Kenya

- **Continue** the started **harmonisation process** on MRTS and public transport
- Setting up **national guidelines for public transport** (coordinating the involved stakeholders)
- **Evaluation of MRTS/public transportation proposals** in accordance with the guidelines specified
- Periodic **review and modification of the guidelines** for choice of mode
- **Initiation and supervision of research and innovations** in MRTS projects, especially Commuter Rail
- **State-wide coordination** on **information** on best practice in public transport
- **Examine** and **evaluate urban** and **regional transport master plans**
- Recommend **optimal utilisation** of **dedicated MRTS funding** by the GoK
- Function as a **nodal agency** to ensure that MRTS projects across the country have access to professional project and transaction advisory services

6. Organisation & Implementation

Organisational Framework - II

In order to implement the sweeping changes necessary to establish a successful MRTS in Nairobi the efforts need to be coordinated and organised!

The **NMTA** to be established as a full time professional body with representation from all city agencies and stakeholders including the surrounding region.

- **Responsible** for establishing **transport development planning** as a "mandatory task“ with clear responsibilities & institutional framework
- **Responsible** for the integration and approval of **proposals by city authorities** such as the Municipality, Development Authority, Regional development authority and traffic police
- **Development of transport strategy** and **policy functions**
- **Monitoring transport demand** including the **development** of an up-to-date **traffic model** for all modes of transport
- **Organisation of public transport services** (tender and franchise management, fare system, fare collection and revenue distribution....)

7. Recommendations

Recommendations and Priorities for Implementation - I

It is recommended that the proposed network should be developed in two phases

Phase I
(short- to mid-term realisation) – Establishing the BRT / Commuter rail system as planned

Phase II
(mid- to long-term realisation) - Upgrading to rail bound MRTS systems where appropriate (LRT/Metro)

7. Recommendations

Recommendations and Priorities for Implementation - II

It is recommended that the proposed network should be developed in two phases

I. Once the proposed network has been approved, all **ongoing and planned transport infrastructure projects must be co-ordinated** with the planned MRTS in order to avoid uncoordinated development of the transport and traffic systems.

II. All **MRTS lines must be planned and implemented as compatible modes and in accordance with the same/compatible technical parameters!**

III. A **clear definition of standards and planning principles** needs to be agreed upon, this affects especially the linkage of MRTS corridors at interchange stations. There must be a definition of overall service level for the corridors/lines.

7. Recommendations

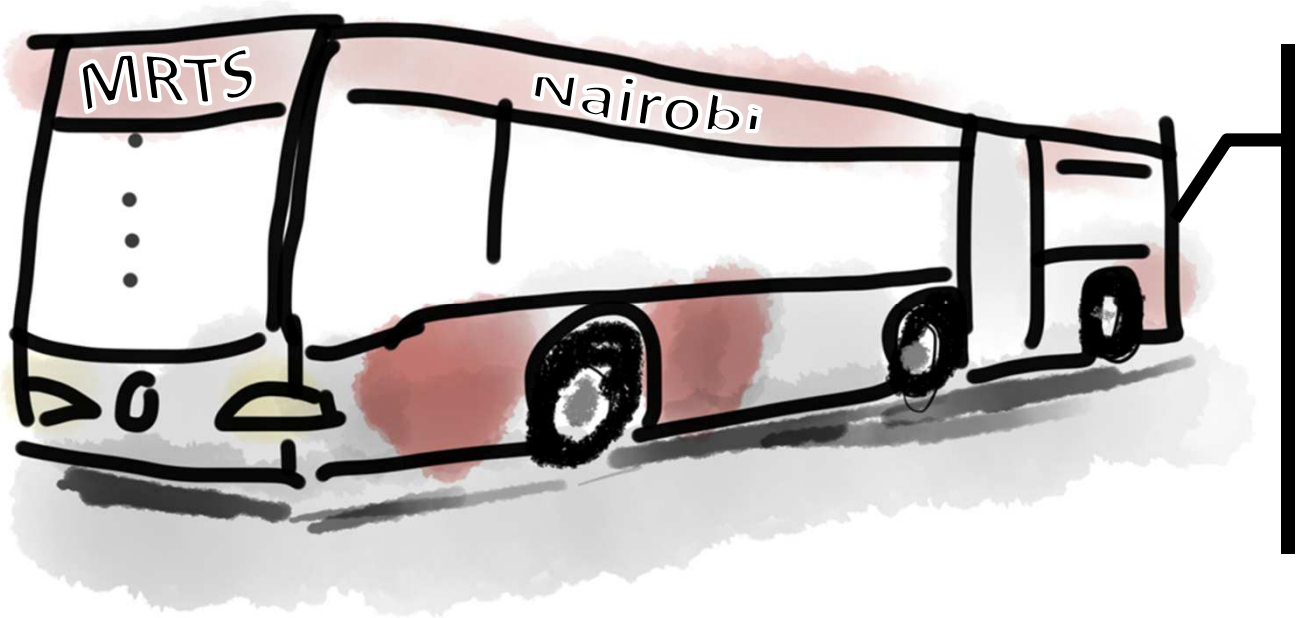
Recommendations and Priorities for Implementation - III

Planning for Phase I	Implementation for Phase I
Precise coordination for entire network	**Step 1 – Line 1 and Line 4**
Overlapping sections / *Interchanges* / *Common feeder bus network*	Early realisation possible due to the relatively advanced planning status on both lines. In addition, obstructions of the urban structure and road network in the City Centre are rather limited.
Design packages (integrating the lines)	
Line 1 (Tembo) / Line 2 (Simba) / Line 3 (Chui) / Line 4 (Nyati) / Line 5 (Kifaru)	**Step 2 – Line 3**
	Step 3 – Line 2 and Line 5

7. Recommendations

Recommendations and Priorities for Implementation - IV

What is the harmonisation process all about?



- Where are we going?
- Who is the driver?
- Who is on board?
- How fast are we going?
- Who pays for the ride?

Harmonisation process on a "*single platform*" has to continue in the coming years – to be managed by the Public Transport Department supported by a project implementation unit

7. Recommendations

Recommendations and Priorities for Implementation - V

In order to be able to commence construction latest in 2016 and start-up operations in 2017 on at least part of the network, **decisive action** needs to be taken now **in 2014**:

I. **Starting** with the **implementation** of the relevant **authorities/departments** (to oversee the design and implementation processes) to coordinate the harmonisation process (single platform)

II. **Continue** with the **design projects** already started (making sure the BRT design standards are adhered to) and coordinating them

III. **Establishing** the **necessary tools** and **processes** to oversee the planning and implementation (traffic model, design standards, fare system, reporting system,…).

7. Recommendations

Recommendations and Priorities for Implementation - VI

Year	Actions to be taken
2014	▪ Adoption of proposed network as standard for future planning and implementation ▪ Institutional and legal framework establishment plan ▪ Establishment of the PTD within MOT&I ▪ Setting up Project Planning Implementation Unit ▪ Development of traffic model ▪ Setting up coordination and supervision (harmonisation process) ▪ Definition of BRT-design standards ▪ …
2015 (tentative)	▪ Finalising outline/tender design for lines 1 and 4 and tender of Design&Build projects ▪ Setting up organisation and operation plan ▪ Setting up tariff and fare revenue model ▪ Economic model and financing strategies ▪ Preparing franchise/operation tender procedures ▪ Start setting up the NMTA ▪ …
2016 (tentative)	▪ Finalising detailed design for line 1 and 4 and begin of construction works ▪ Finalising outline/tender design for other lines and tender of Design&Build projects ▪ Tender of operation of first lines ▪ Start of acquisition process for BRT-busses ▪ Finalising setting up the NMTA ▪ Final operation plan and fare system implementation plan ▪ …
2017 (tentative)	▪ Start-up of first operation ▪ Implementing the NMTA (taking over from the PPIU) ▪ Continue with planning & implementation of the other lines/corridors ▪ Design & construction supervision ▪ …

- To be defined and updated -

"Until the lion has its own historians, the tale of the hunt will always glorify the hunter!"

*Until you tell your own story you will be defined what others say about you!**

*Komla Dumor 02/2014

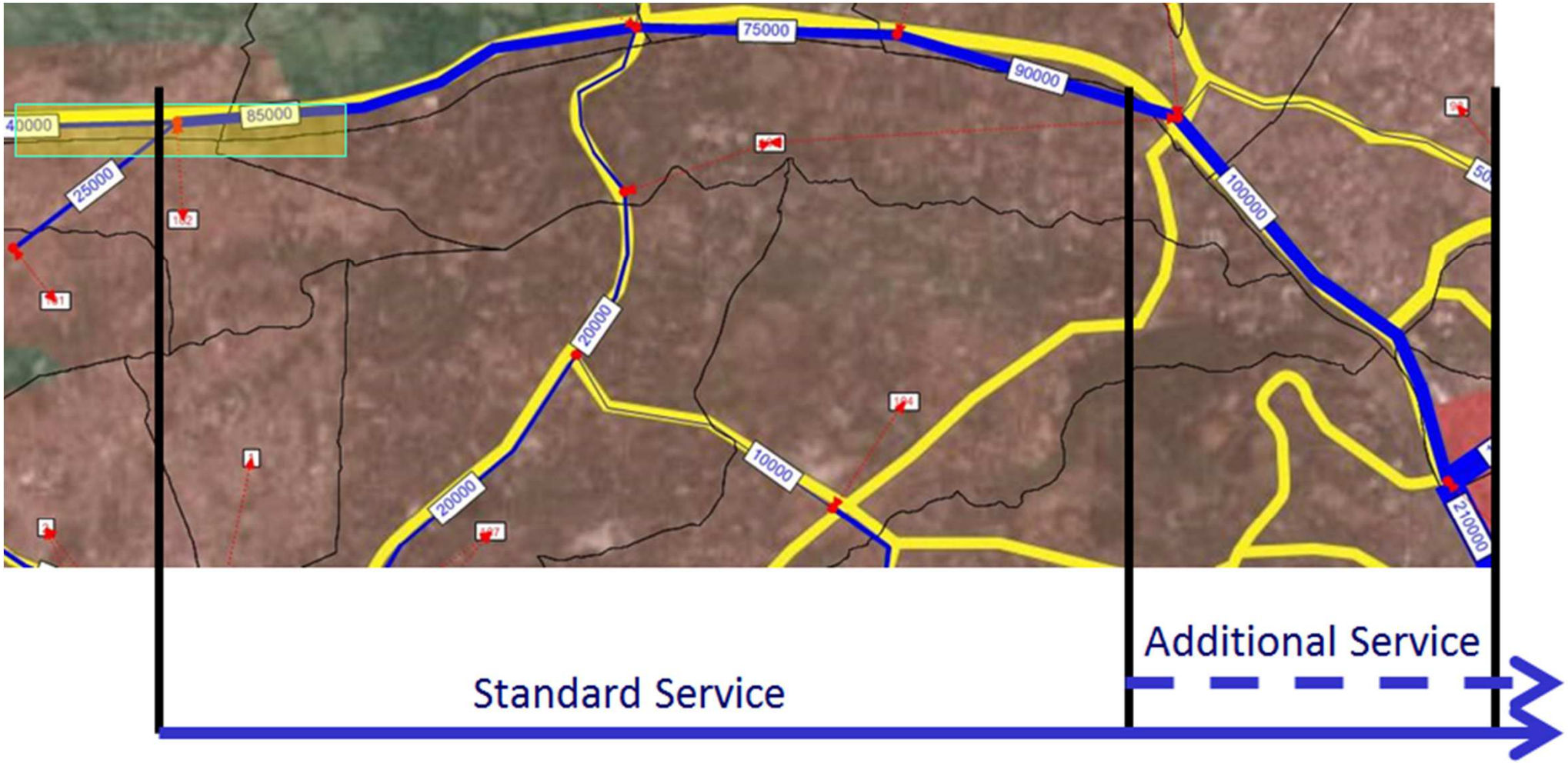

Thank you for your attention

Asanteni sana

BACKUP

Harmonisation Study – Part B

Network Layout – Waiyaki Way



Harmonisation Study – Part B

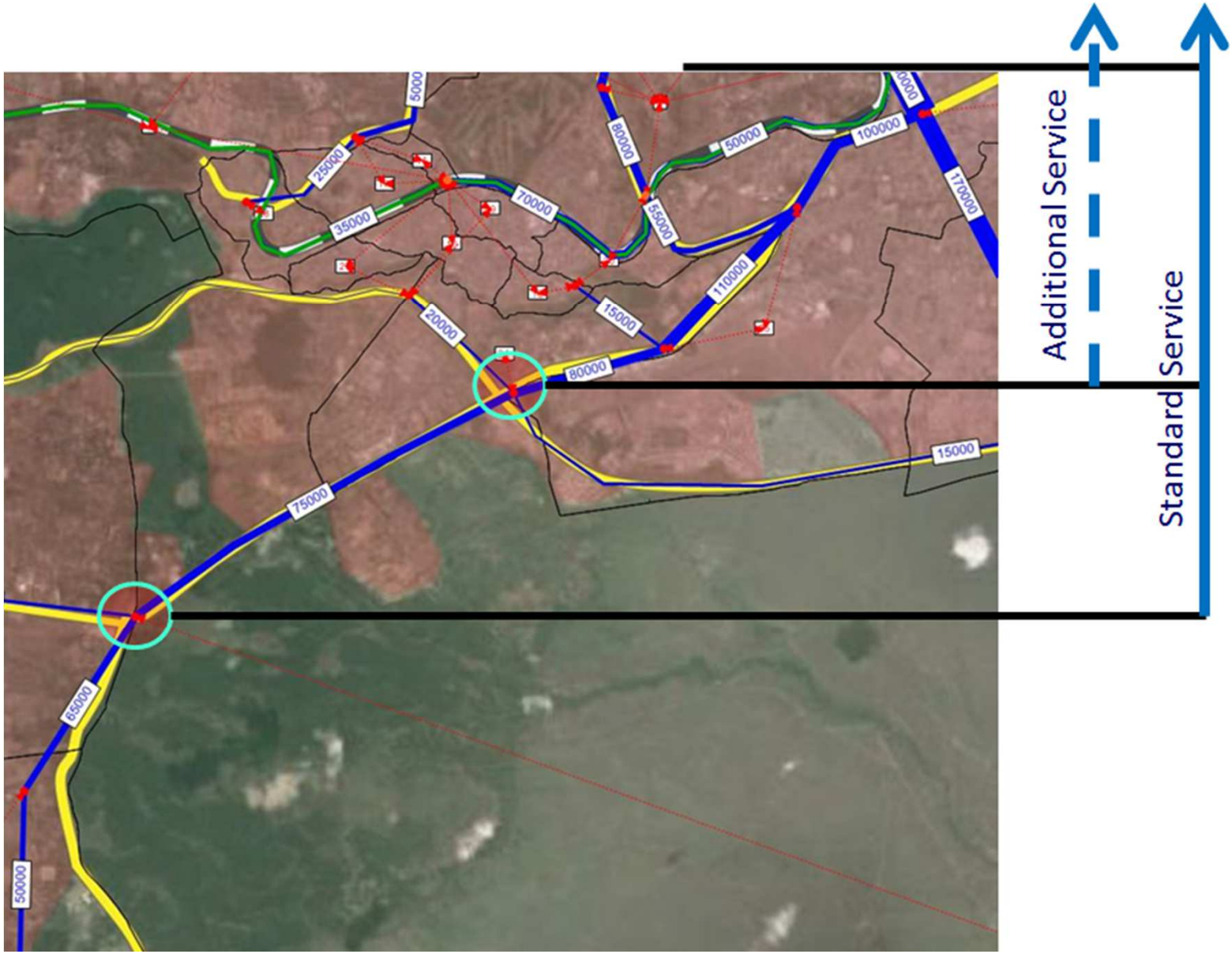
Network Layout – Kenyatta Avenue

Harmonisation Study – Part B

Network Layout – Ngong Road

Harmonisation Study – Part B

Network Layout – Langata Road

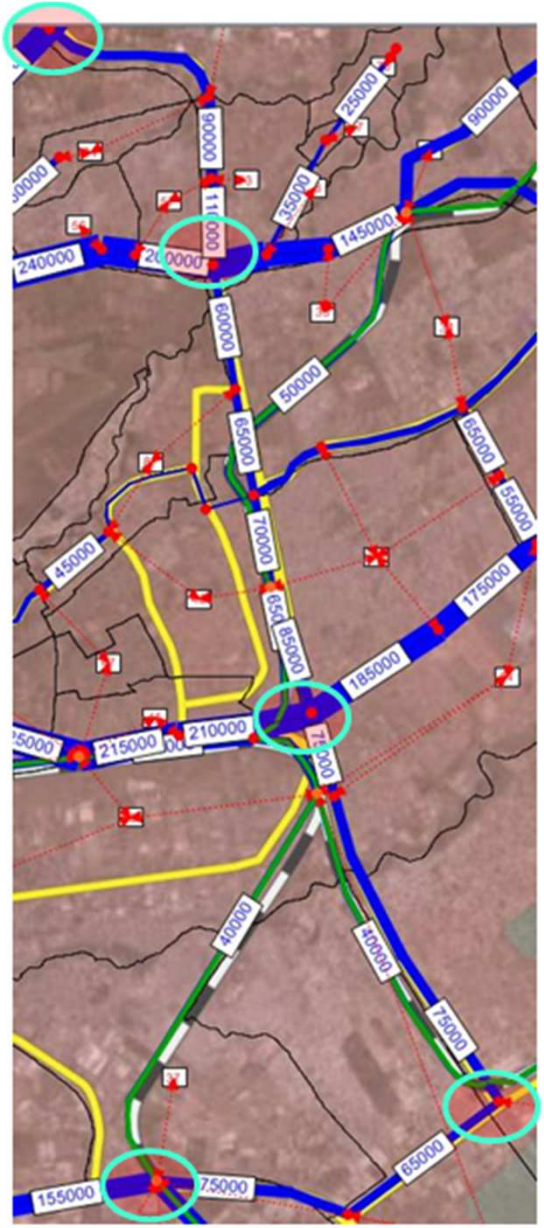


Harmonisation Study – Part B

Network Layout – Mombasa Road

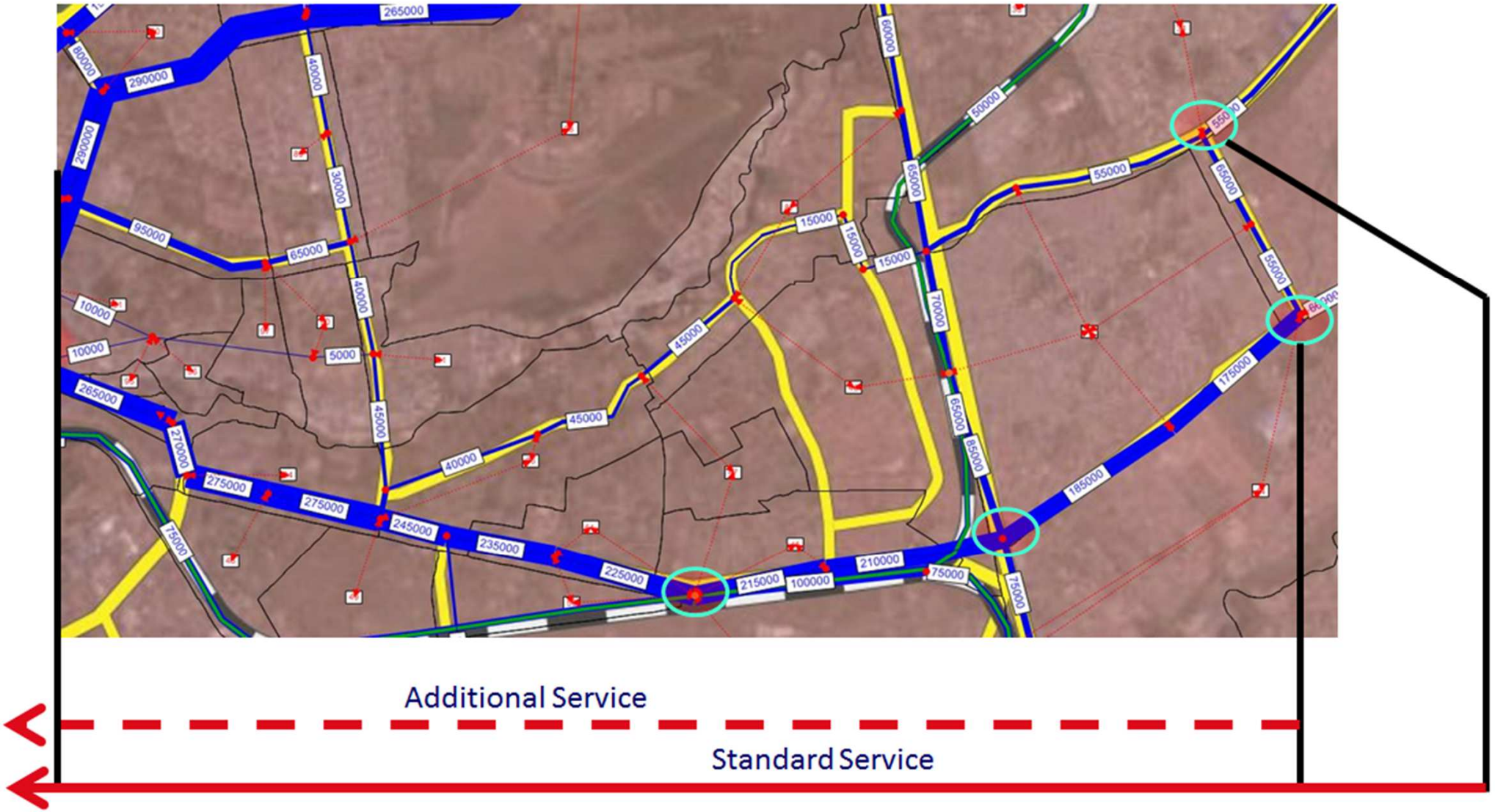
Harmonisation Study – Part B

Network Layout – Outer Ring Road



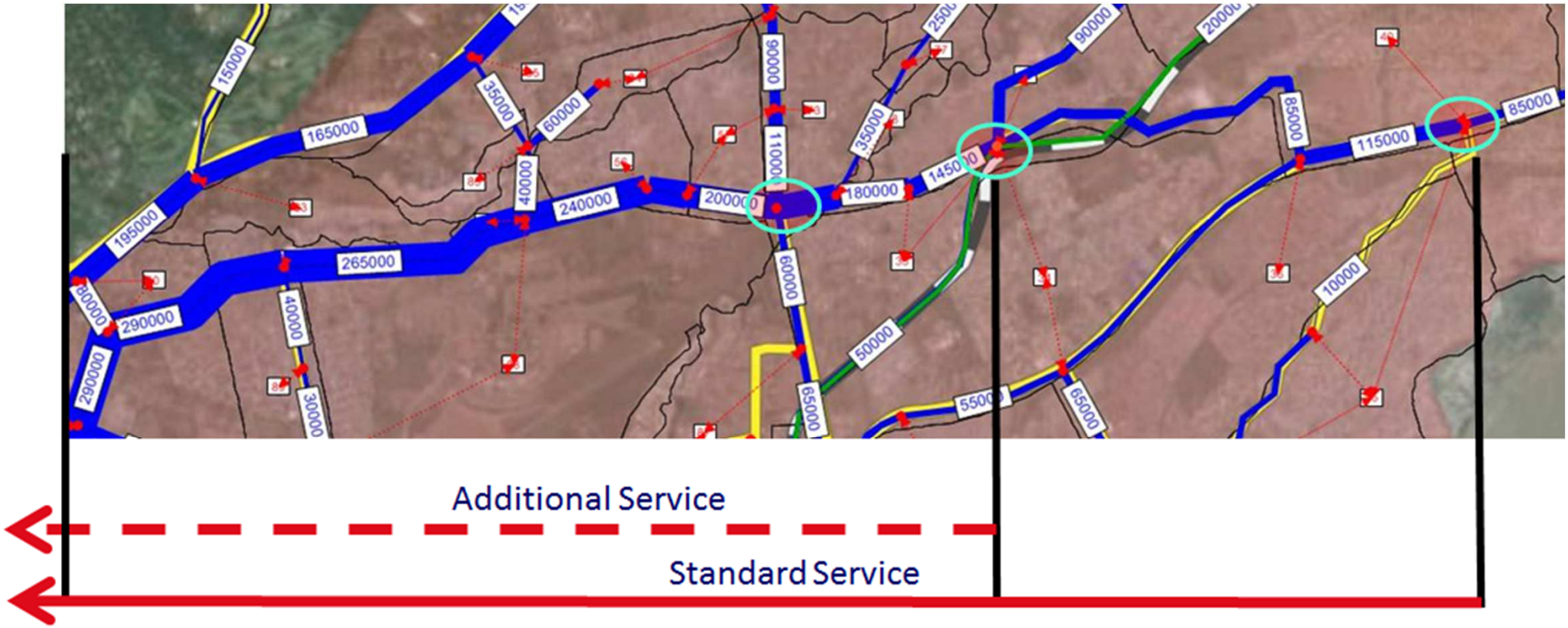
Harmonisation Study – Part B

Network Layout – Jogoo Road



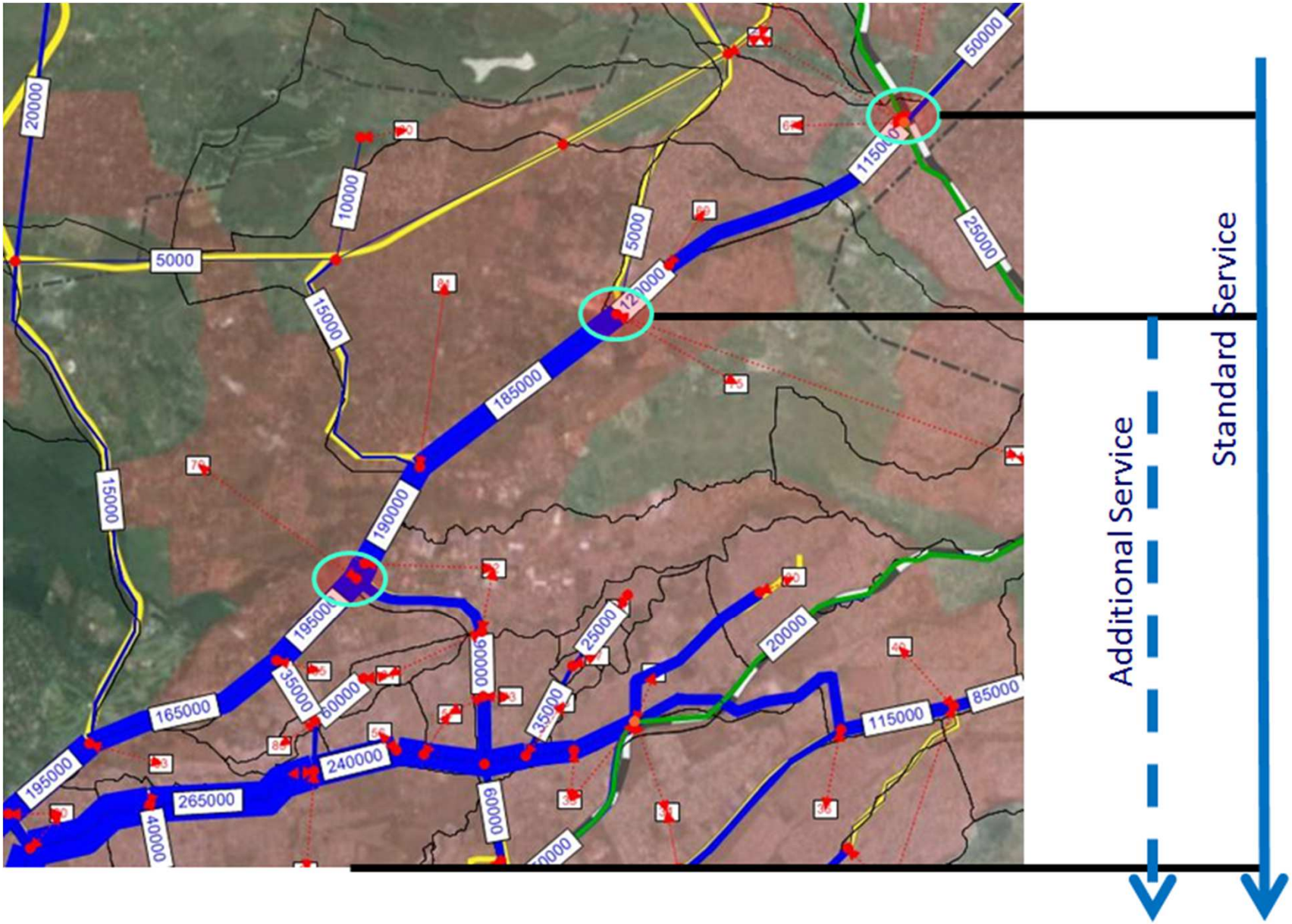
Harmonisation Study – Part B

Network Layout – Juja Road



Harmonisation Study – Part B

Network Layout – Thika Highway



Harmonisation Study – Part B

Network Layout – Limuru Road