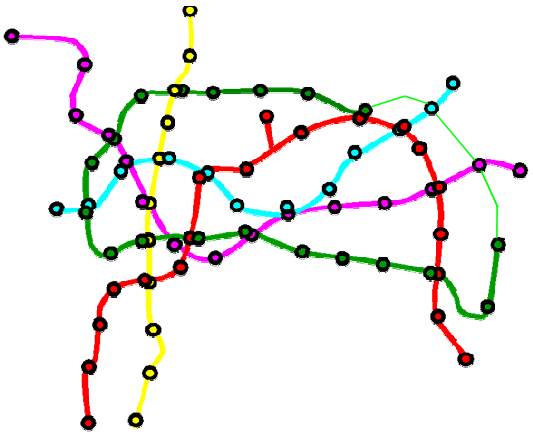
Development Plan for Baku Metropolitan



Baku Metropolitan Extension Plan

Contents

1. Determination of the Plan for Baku Metropolitan Extension

1 Determination of Baku Metropolitan Extension Plan

1.1 General assessment process

Phase A of the Project: determination of long term planning and implementation program for extension of Baku Rapid Mass Transit System – Baku Metropolitan Extension Plan (close co-operation with Baku authorities)**:**

- Assessment of socio-economic data and urban development concerning Baku:
  - **Urban development plans** of Baku City
  - **Economic development plans**
- Evaluation of **different previous studies** of Baku development and trends
  - JICA study (2000), ROM study (2008)
- Determination of characteristics of transport development in Baku:
  - **Flow generators**
  - Land use
- **Public Surveys** to determine the origin and the destination of the people travelling in public transport

1 Determination of Baku Metropolitan Extension Plan

1.2 Socio-economic studies in Baku

1

•**Surveys:**

- **20 000 surveys** have been conducted in Baku Public Transports between 26th of June and 15th of July 2009
- They involved **250 surveyors** spread each day in Metro and bus network
- **70% of surveys** where done in **buses**, **30% in metro**, representing **10% of the Public Transport flow** on peak hour

• **Information extracted concerned**:

- **Bus network** update
- **Origin/destination matrix** within **136 zones** in conurbation
- **General characteristics** of demand: average length of trips, trip purposes, frequencies…

• **Comparison** with other similar metro systems

• **Mathematical modeling** of all results to determine the network

Surveyors training session

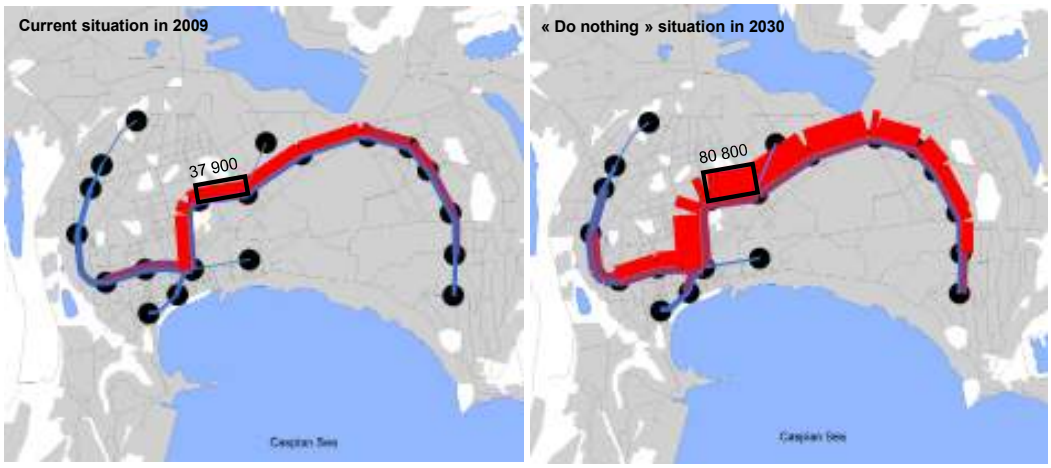
6 000 Metro surveys

14 000 Bus surveys

1 Characteristics of Baku Metropolitan Extension Plan

*1.3 Metro loads at rush hours in 2009 and in 2030 with "**do nothing" scenario***

1



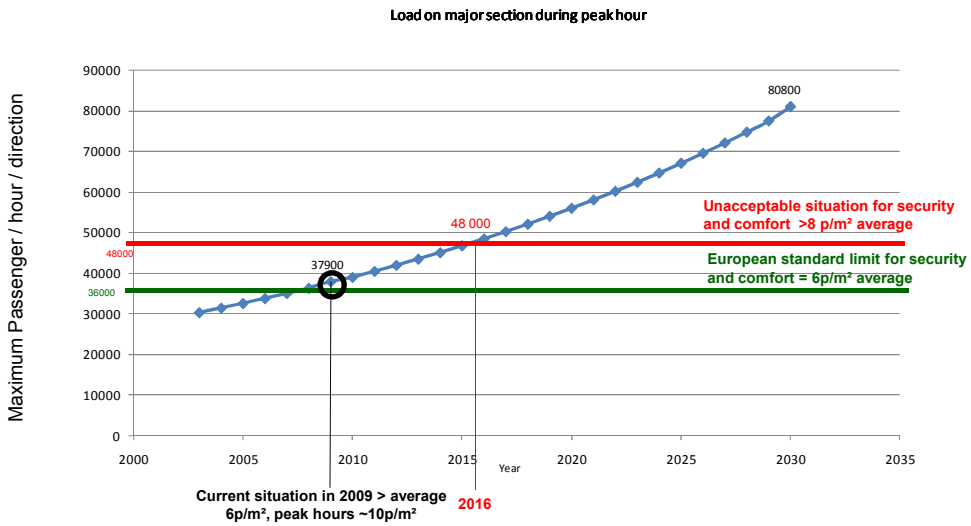
• Situation in 2009 is already critical: average 38 000 pphpd on "**Narimanov** - **Ganclik**" inter-station

• Situation in 2030 would be impossible: average 81 000 pphpd on same inter-station

1 Characteristics of Baku Metropolitan Extension Plan

1

1.4 Forecasted evolution of metro loads for Baku Metropolitan



- Current physical capacities of Baku Metropolitan will be reached in 2016
  - average 48 000 pphpd with minimum interval of 2 minutes on morning rush hour

1 Determination of Baku Metropolitan Extension Plan

1

1.5 Multi-criteria analysis of different scenarios

•**Baku Metropolitan Extension Plan** has been defined on the basis of a comprehensive process for assessment and comparison between multiple scenarios:

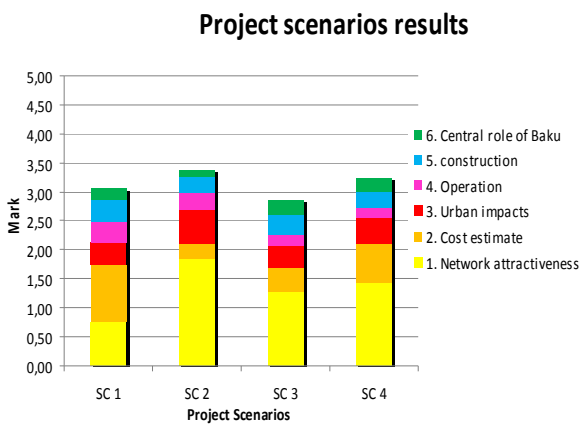
- 4 scenarios selected out of 14 initially proposed
- 1 scenario selected from the above said 4, using a multi-criteria analysis; this scenario becomes **Baku Metropolitan Extension Plan**
- 6 fields of audit, 18 criteria, 23 indicators

Network attractivness 40%	Accessiblity / city coverage
	Network efficiency
	Travel easiness
Cost evaluation 20%	Construction costs
	Rolling stock costs
Urban impacts 15%	Support of urban developement
	Urban intergration of network
Operational issues 10%	Operational facilities
	Flexibility
Construction issues 10%	Construction risks
	Impact on urban functionnalities
Central role of Baku 5%	Connection with airport, seaport, railways

1 Determination of Baku Metropolitan Extension Plan

1

1.6 Results of Multi-criteria analysis of different scenarios and choice of best scenario



/5	3,06	3,38	2,86	3,24
%	61,18	67,63	57,19	64,85
RANK	3	1	4	2
	SC 1	SC 2	SC 3	SC 4
40%	0,74	1,85	1,27	1,43
rank	4	1	3	2
20%	1,00	0,25	0,41	0,66
rank	1	4	3	2
15%	0,37	0,60	0,39	0,47
rank	4	1	3	2
10%	0,38	0,30	0,17	0,17
rank	1	2	3	3
10%	0,35	0,26	0,36	0,27
rank	2	4	1	3
5%	0,21	0,12	0,25	0,24
rank	3	4	1	2

- Network in scenario 2 is best adapted for Baku Metropolitan (score = 68):
  - Best network in attractiveness and urban impacts
  - Good network for operations
  - More stations and better service

2

2. General Presentation of Baku Metropolitan Extension Plan

2 General Presentation of Baku Metropolitan Extension Plan

2.1 Baku Metropolitan Extension Plan – general characteristics

2

Existing network in 2010:

- 34.7 km 23 stations
- Global interstation = 1.65 km

New built network:

- 84.3 km 53 stations

Proposed network 2030:

- 119 km 76 stations
- Global interstation = 1.68 km

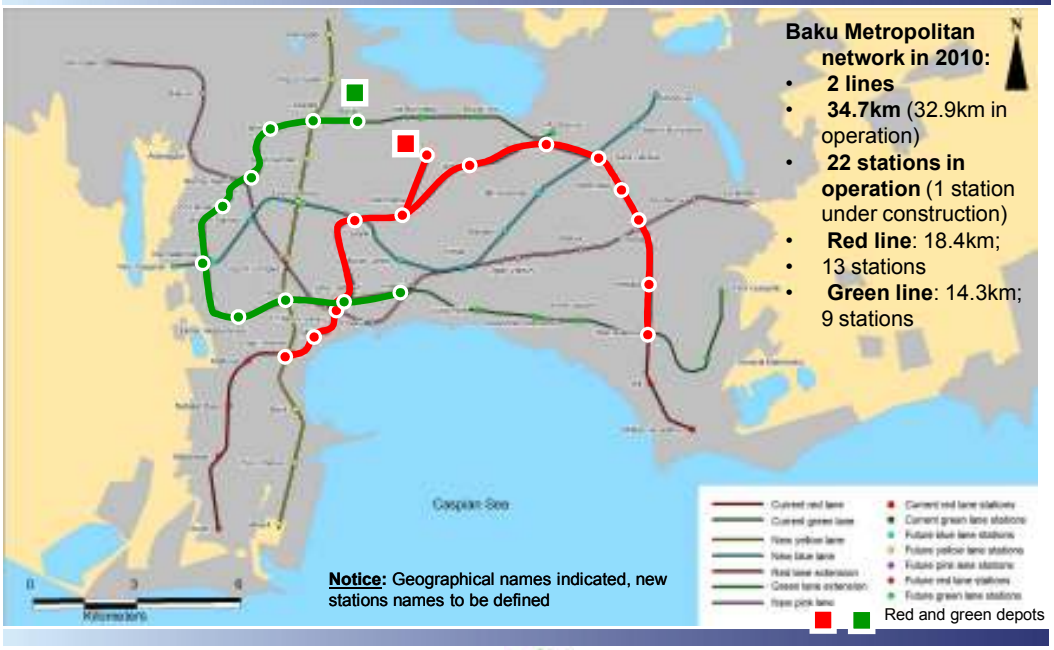
Key issues:

- Best population and territory cover (more stations and lines)
- Each line interchanges all other lines: + 42% interchange stations

2 General Presentation of Baku Metropolitan Extension Plan

2.1 Situation at end of year 2010

2



2 General Presentation of Baku Metropolitan Extension Plan

2.2 Baku Metropolitan Extension Plan – general view 1

2

Baku Metropolitan network in 2030:

- **5 lines**
- **119 km**
- **76 stations**
- **Red line**: 29.8km; 19 stations
- **Green line**: 32.2km; 19 stations (+10.2 km/ 5 stations later)
- **Yellow line**: 14.8km; 11 stations
- **Blue line**: 17.6km; 12 stations
- **Purple line**: 24.7km; 15 stations

3

3. Characteristics of Baku Metropolitan Extension Plan

3 Characteristics of Baku Metropolitan Extension Plan

3.1 Public transportation demand in 2030 (corresponding to main road network)

3

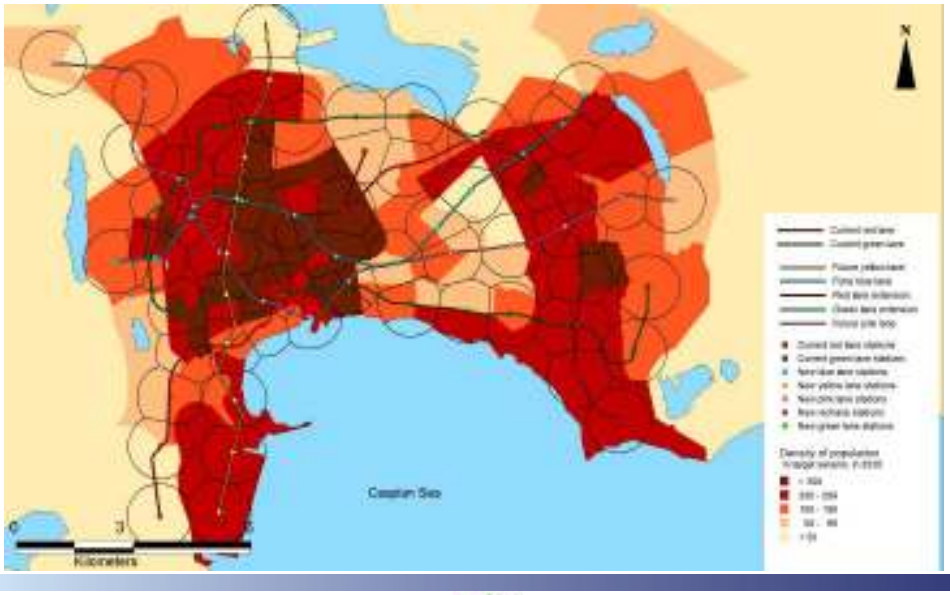
- The future Baku Metropolitan network will respond to traffic demand in 2030 (figured as per morning rush hour):
  - Highway junction to existing Elmlar Akademiyasi station areas > 50,000 pphpd
  - North west (International Bus Terminal) to Center > 45,000 pphpd
  - East to Center > 120,000 pphpd, divided in 3 potential directions (north-east, east and south-east)

3 Characteristics of Baku Metropolitan Extension Plan

3.2 Accessibility / city coverage: Population coverage by metro network in 960m radius

3

Future Baku Metropolitan network will cover: 2,597,443 inhabitants

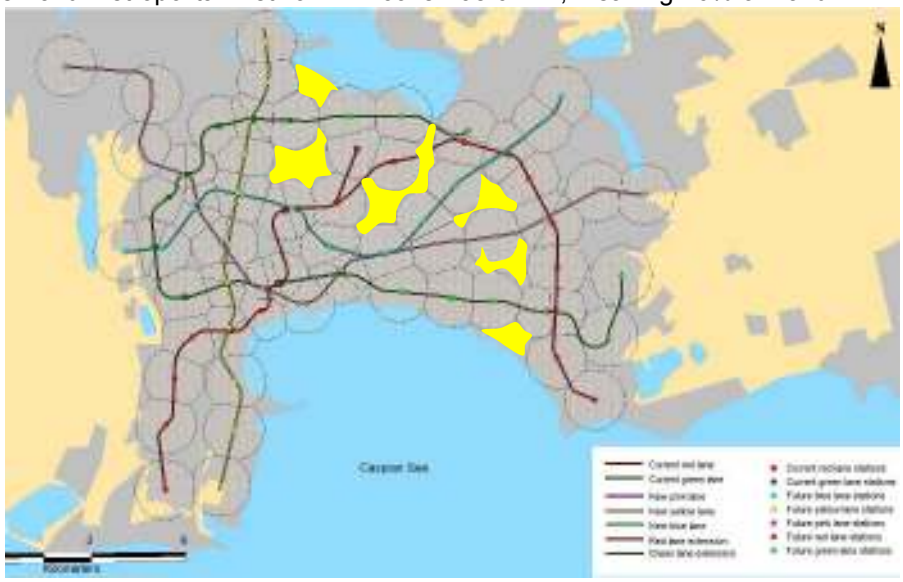


3 Characteristics of Baku Metropolitan Extension Plan

3.3 Accessibility / city coverage: Population coverage by metro network in 960m radius

3

Future Baku Metropolitan network will cover: 98.6 km², meaning 76% of Baku



3 Characteristics of Baku Metropolitan Extension Plan

3.4 Network efficiency: Traffic on morning rush hour, distribution of loads and commercial speeds

3

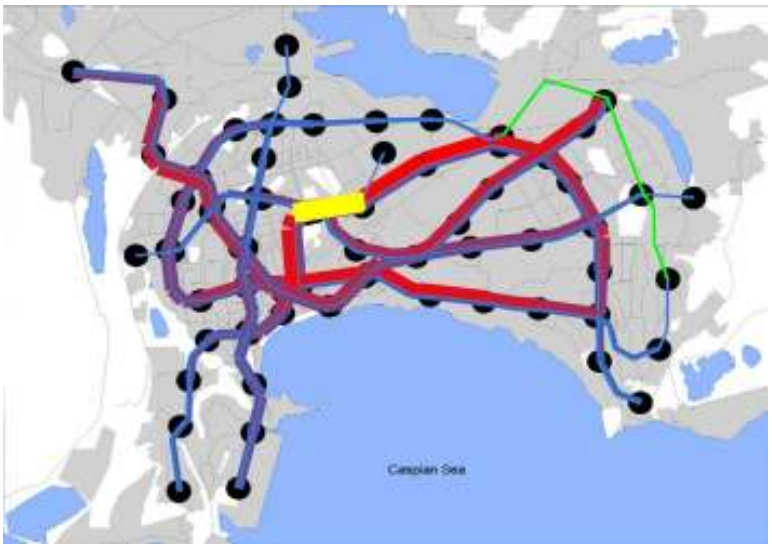
- **Traffic on morning rush hours:**

345,753 metro users

- **Most busy section of the network in 2030:**

Narimanov – Ganclik: 34,400 pphpd, representing a lower charge than in 2009

- **Commercial speed:**
  - **37.5 km/h on existing lines**
  - **45 km/h on new lines**



3 Characteristics of Baku Metropolitan Extension Plan

3.5 Support of urban development: Current and future traffic generators

3

Flow generated served by future Baku Metropolitan network:

173 served / 181 total flow generators

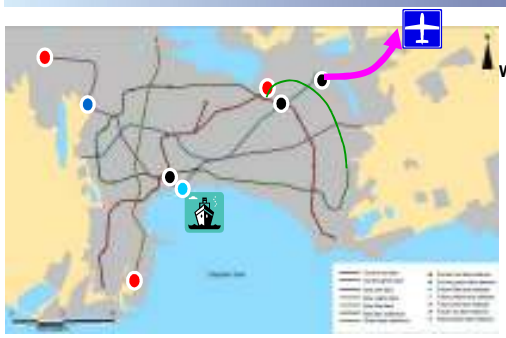
Metro lines serving universities:

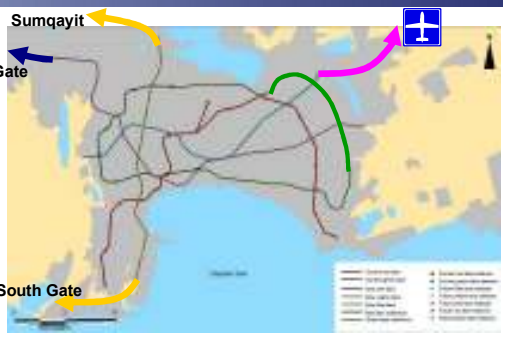
2 lines serving each university

3 Characteristics of Baku Metropolitan Extension Plan

3.6 Connections with other infrastructures and flexibility for extensions – enhancement of PT

3





Existing and planned interchanges with other public transportation national and international means:

- **- Azerbaijan Railways: 3 metro stations**
- **- International Bus Terminal (IBT): 1 metro station**
- **- Port Baku: 1 metro station**
- **- Planned regional Bus Terminal: 3 metro stations**
- **- To airport: by tram or BRT on highway**

Further possible extensions of the future Baku Metropolitan network – great flexibility towards important destinations

4

4. Estimation of Costs and Planning of Investments

4 Estimation of Costs and Planning of Investments

4.1 Global estimation for capital costs: infrastructures and rolling stock

4

Important figures (to be defined during following designing stages):

- **Future Baku Metropolitan extensions will comprise:**
  - **3 new lines,**
  - **extensions of the 2 existing lines,**
  - **53 stations and 84km**
- **Investment costs for new lines and extensions of existing lines are estimated at:**
  - **5,449 M€,**
  - **meaning ~ 64.7 M€ per km**
- **Rolling stock procurement costs are estimated at 1,148 M€**

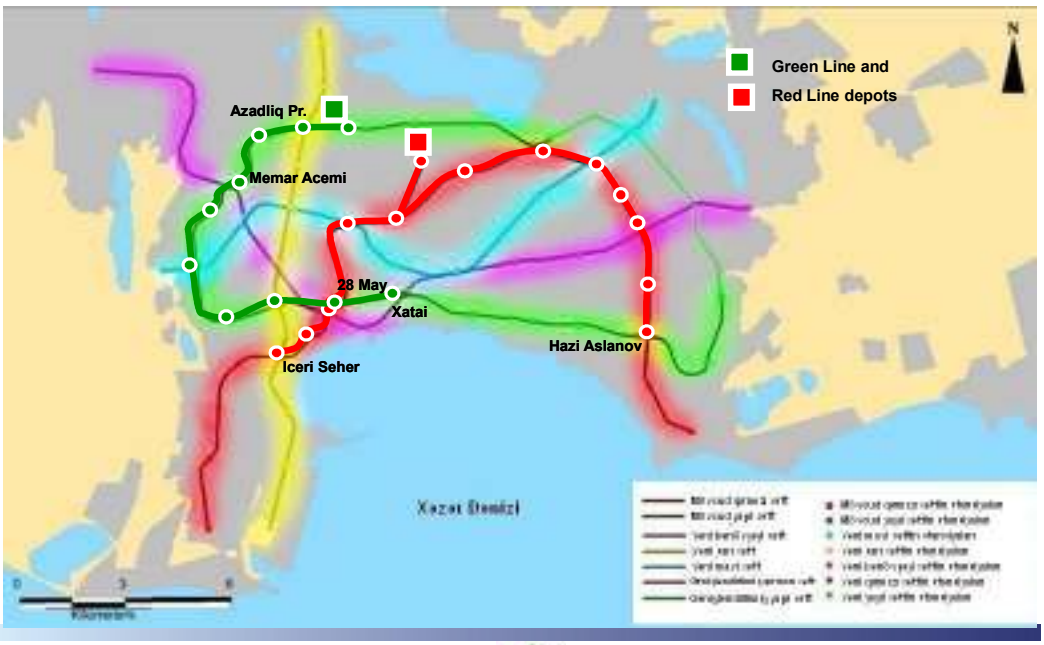
The network will be operated with:

178 trains (890 cars) in total (including the existing ones, already in operation), out of which 137 (685 cars) new trains - 104 new trains (520 cars) on new lines and 33 new trains (165 cars) of «existing type» on existing lines extended

4 Estimation of Costs and Planning of Investments

4.2 Planning of investments - Situation at end of year 2010

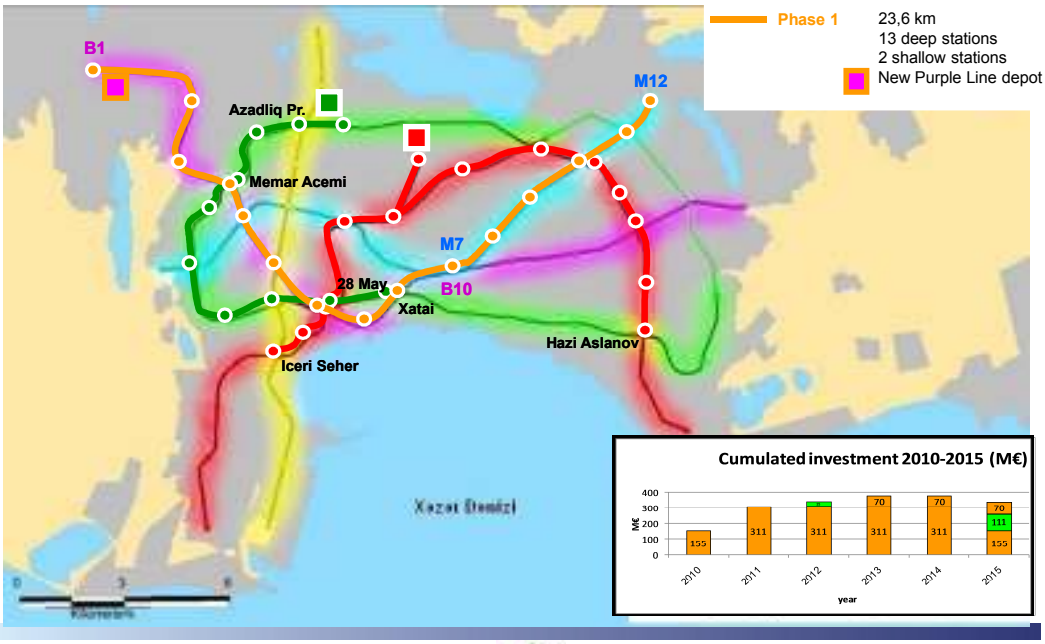
4



4 Estimation of Costs and Planning of Investments

*4.3 Planning - **Phase 1**: Western Purple Line + Eastern Blue Line connected in Kesla: **1 907 M€***

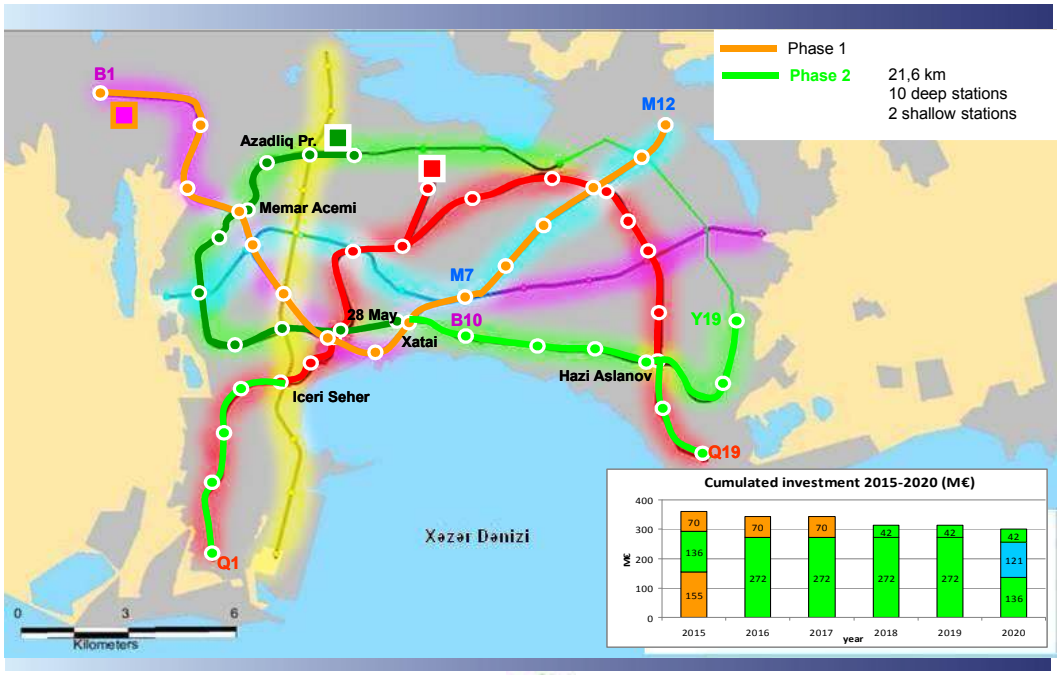
4



4 Estimation of Costs and Planning of Investments

*4.4 Planning - **Phase 2**: Southern extension of existing lines: **1 574 M€***

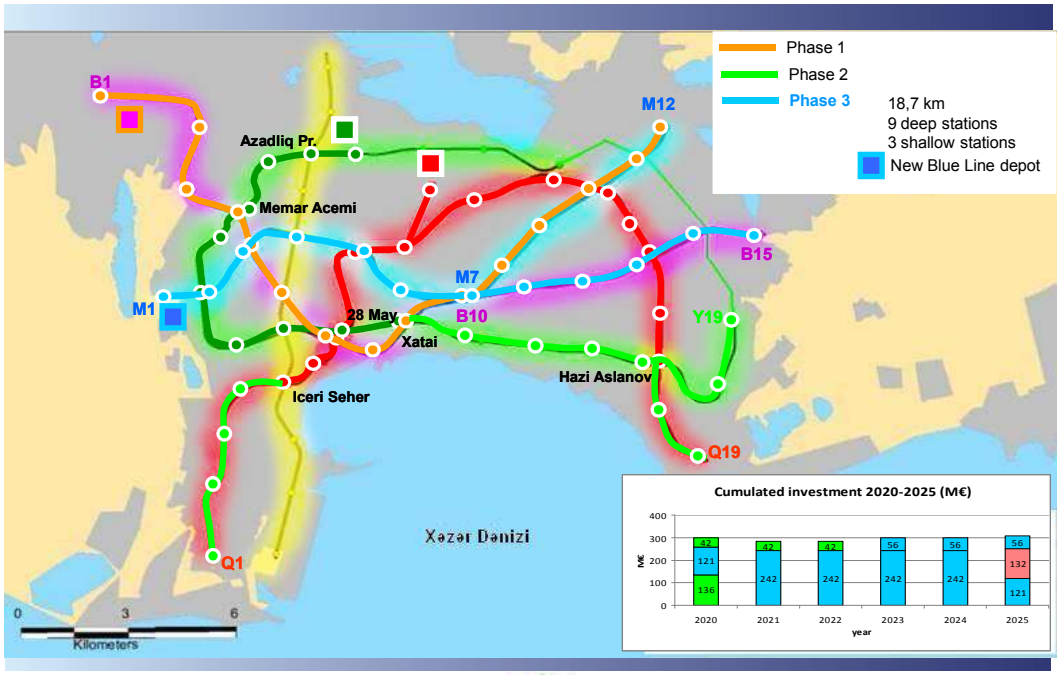
4



4 Estimation of Costs and Planning of Investments

*4.5 Planning - **Phase 3**: Eastern Purple Line + Western Blue Line connected in Kesla : **1 490** M€*

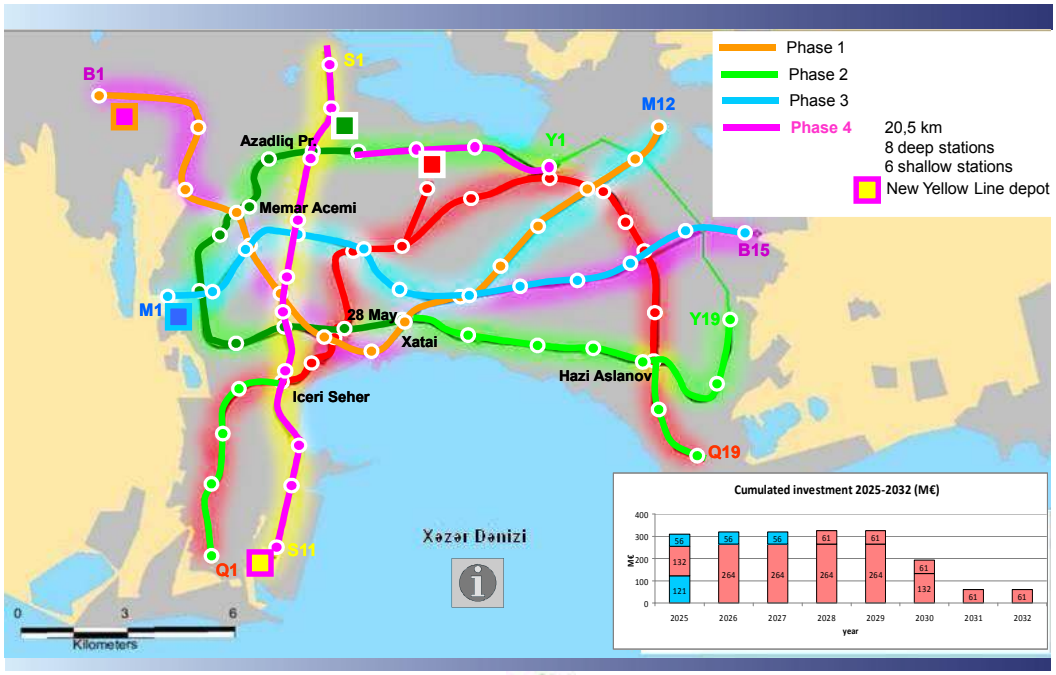
4



4 Estimation of Costs and Planning of Investments

*4.6 Planning - **Phase 4**: Yellow Line + Northern extension of Green line: **1 627** M€*

4

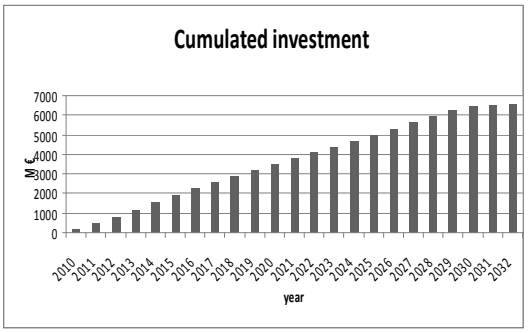


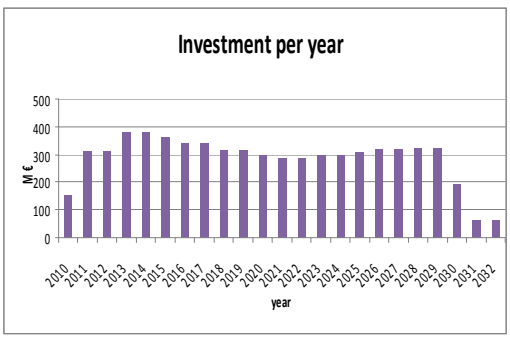
4 Estimation of Costs and Planning of Investments

4.7 Assumption for provisional costs and planning

4

- Construction of the future Baku Metropolitan network is divided in 4 similar phases between 2010 and 2032; costs per phase are estimated at:
  - **Phase 1: 1,907 M€**
  - **Phase 2: 1,574 M€**
  - **Phase 3: 1,490 M€**
  - **Phase 4: 1,627 M€**

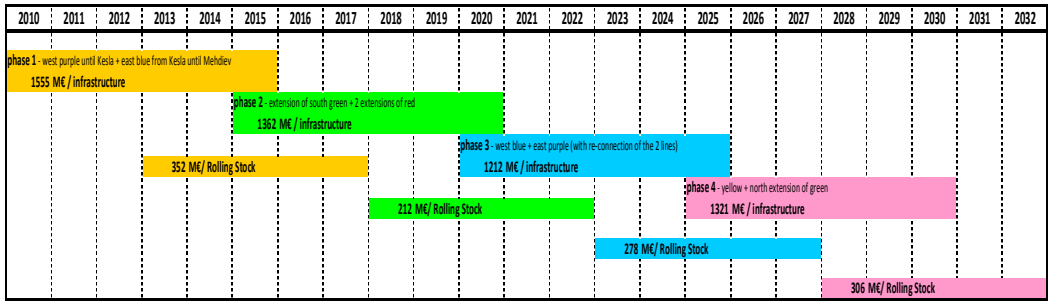




4 Estimation of Costs and Planning of Investments

4.8 Assumption for provisional costs and planning

4



- Details of the planning of investments necessary for the future Baku Metropolitan network:
  - 18 to 24 km of new lines for each phase
  - 300 to 400 M€ of investment / year between 2011 and 2030
  - Total cost for a total underground network is estimated at 6,597 M€

4 Estimation of Costs and Planning of Investments

4.9 Assumption for provisional costs and planning line by line

4

N°	Line	Alignment	Number of stations	Length [km]	Investments for infrastructure [M€]	Costs for Rolling Stock [M€]
1	**Red**	Q1 – Q19 (Shikh – Military Academy)	19 (out of which **6** new stations)	29.8 (out of which **11** km extensions)	**662**	**160**
2	**Green**	Y1 – Y19 – studied (Azizbeyov – Yeni Gunashli)	19 (out of which **9** new stations)	32.2 (out of which **16.2** km extensions)	**940**	**258**
		Y1 – Y24 – not studied *(circle line – Azizbeyov – Azizbeyov)*	*24*	*42.4*	*Not studied*	*Not studied*
3	**Purple**	B1 – B15 (Khirdalan – Surakhani)	**15**	**24.7**	**1,595**	**325**
4	**Blue**	M1 – M12 (Yeni Yasamal – Mehdiyev))	**12**	**17.6**	**1,211**	**215**
5	**Yellow**	S1 – S11 (Binagadi – Sabayil)	**11**	**14.8**	**1,041**	**190**
TOTAL	**5 lines**		76 (out of which **53** new stations)	119.1 (out of which **84.3** km new network)	**5,449**	**1,148**
TOTAL Investments in Infrastructure and Rolling Stock					**6,597**	

Notice 1: All investments and rolling stock costs are estimated on the basis of similar projects. More precise costs could only be indicated later on, after the completion of the following stages of the project (after completion of Detailed Design).
Notice 2: Infrastructure Investment Costs are estimated as average costs per kilometre.

Thank you!

5

5. Annexes

5.1 Complementary modes

Potential LRT or BRT lines between airport and metro

5

Urban Bus Rapid Transit in Nantes, France

Light Rail transit in Ontario, Canada

Highway Bus Rapid Transit in Curitiba, Brazil

Tramway track on highway in Salt-Lake City, USA

Tramway in Strasbourg, France

5.2 Station types

Underground and viaduct type stations

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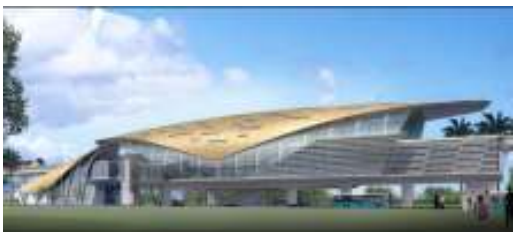
Underground shallow « Al Rigga » station in Dubai (source: Systra)

Underground shallow « City Centre » station in Dubai (source: Systra)



Viaduct station in Dubai, United Emirates (source: Systra)

Viaduct station in Lahore, Pakistan (source: Systra)

5.3 Organization of exchanges and intermodality

Transfer organization between metro lines and other modes

5

Project for suburban metro station in Paris with parking and Avtovagzal (source: RATP)

Example for Azizbeyiov station (source: Systra)

Tramway and RER near Paris (source: EPASA)

5.4 Station types

Example on 2 lines hub station organized in 3 levels (Ganclik)

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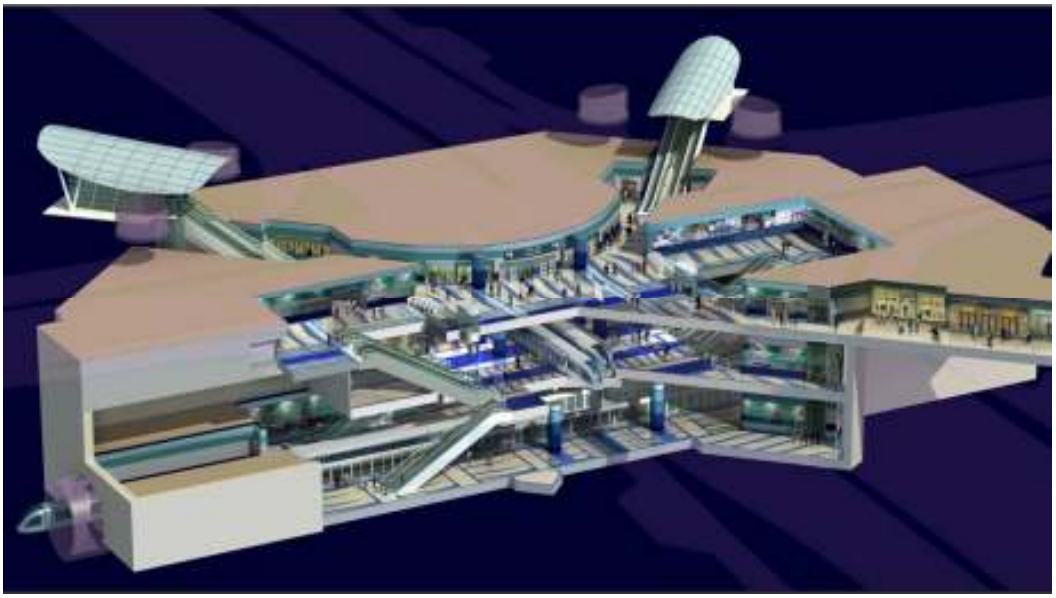

5.5 Station types

Example on 2 lines hub station organized in 2 levels (Kesla)

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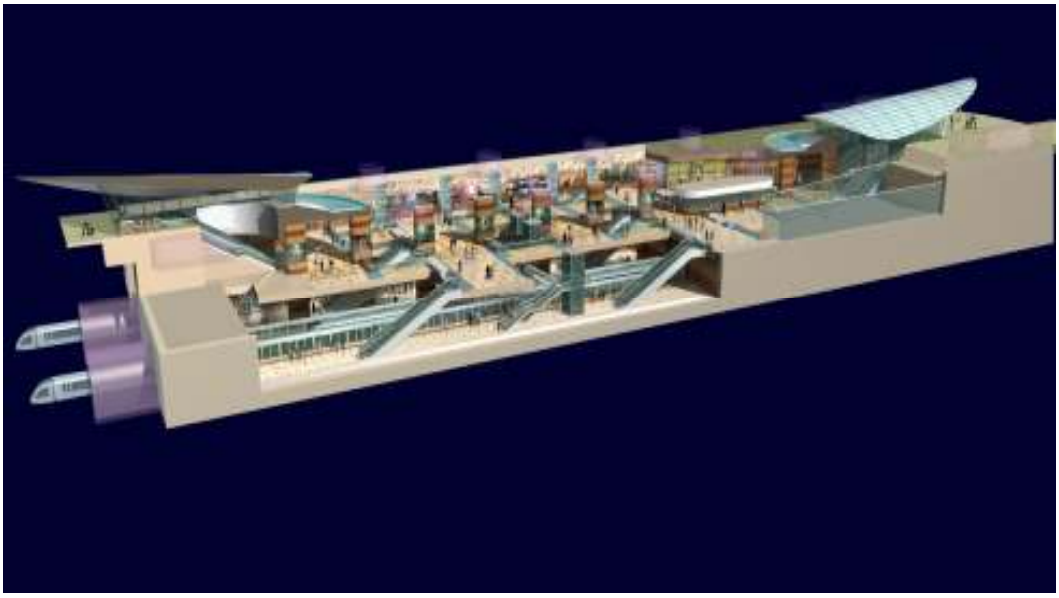

5.6 Station types

Example on 1 line shallow station

5