

9. Future Urban Structure

(1) The Present Urban Form

The present urban area has compact form with concentric pattern around a single center.

(2) Alternative Urban Growth Forms

Alternative I

Natural growth occurs in an incremental manner around the existing land use. This applies to both the expansion of the business district, and housing areas around the present built up area. Housing would grow around the existing built up area by filling up the empty lots and areas outside the Amphitheater.

Alternative II

The present compact city form is kept by redeveloping the central areas of the city to meet the additional demand for housing. The growth of the CBD around the existing center would be limited under this alternative. Enterprises that do not require central city locations (warehousing, distribution, and some service functions) will be encouraged to locate in four sub-centers to be developed.

(3) Recommended Urban Form

At present no urban structure plan nor land use plan in 2020 exists.

The JICA Study team has reached agreement with the Azeri planners that one of the objectives for land use planning is to maintain the compact urban form of Baku City. Thus all additional population should be accommodated within the Amphitheater if this is possible.

Proposed urban form is in principle based on Alternative II to restrain the expansion of future traffic load by maintaining the present compact urban form.

However, it partly combines elements of the two alternative forms. It is not likely that multiple sub-centers in the city with population size of 2 million would emerge; therefore 2 sub-centers at transport nodal point are proposed.

This alternative relies on further concentration of activities in the existing Central Business District. At the same time, some selective decentralization is to be promoted in two locations. However, due to the lack of zoning system for land use restriction and inducement, restriction of extension of urban area at an early stage is difficult. Therefore, infiltration of population outside of existing urban area will be inevitable.

The future land use pattern is derived from proposed urban structure. Expansion of CBD to the east and north, land use conversion from industrial area in the central Baku to housing area, housing development in the southwest, new commercial areas to be developed, and all redevelopment of low density housing into high densities are incorporated in future land use.

(4) Distribution of Residences and Work Places

Future population distribution is estimated by unit method. The future resident population in each traffic zone is estimated by using the land use categories in each traffic zone and population unit. There will be no need for suburban development if the plots identified by the

Study Team are redeveloped. Some development will actually occur outside the Amphitheater and this will reduce the need for redevelopment to some extent.

For the distribution of work place, the method to multiply work place density by land use by each land use is commonly adopted. In this study the same method is adopted.

However without detailed classification of industry (labor intensive manufacturing, land intensive material industry, etc.) and corresponding work place density by industry, it is likely that the magnitude of error in estimation will become large.

Therefore work places by traffic zone are estimated by confining the projections to the increments in employment to reduce the possible magnitude of error. This method assumes no drastic change in future land use and it is expected to be more advantageous than other methods.

Employment by traffic zones in the future is calculated by adding incremental employment to the existing base. Wholesale trade will locate in specialized zones in proportion to the share of the two relevant land use categories. Retail trade is assumed in proportion to the expected share of zonal resident population.

All of the incremental employment in credit and finance and in specialized public services is projected to locate in the city center as projected in the future land use plan. All incremental employment in construction is distributed to the Zones in proportion to the expected construction activity deriving from redevelopment and land conversion.

All of the remaining incremental employment is expected to locate in relation to the distribution of new population.

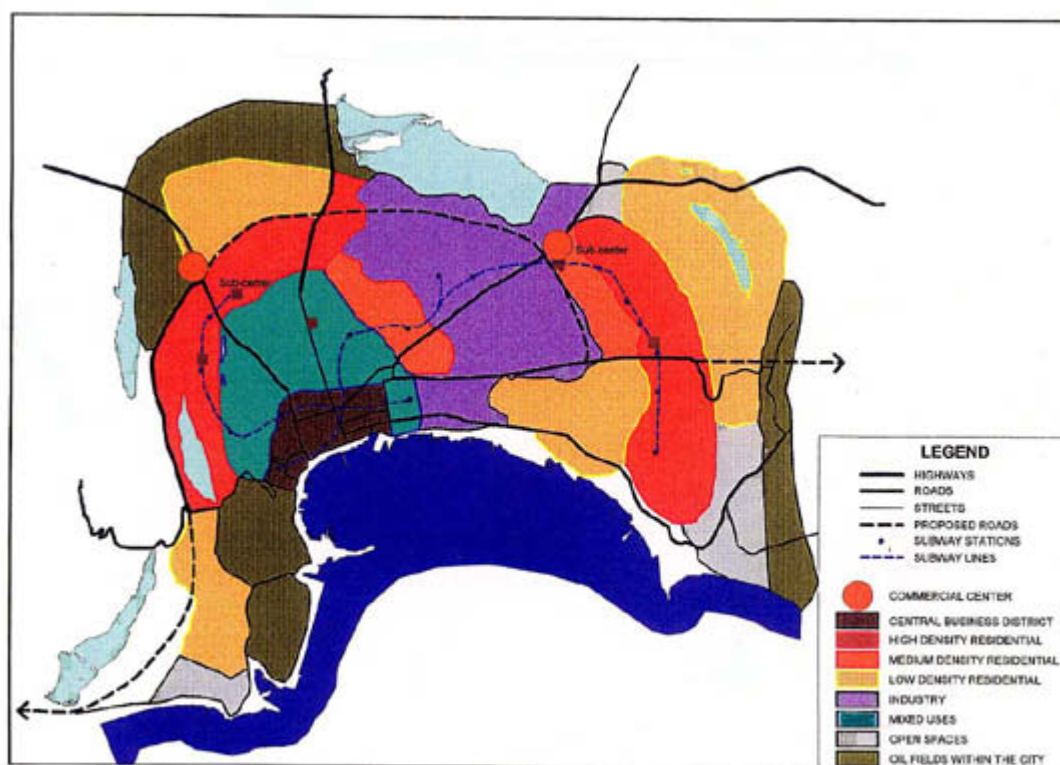


Figure 9.1 Proposed Urban Structure

10. Future Transport Demand

(1) Future Trips

With wide usage of the application (JICA STRADA), forecasting transportation demand for the study area followed the four-step approach.

Future trip rates were forecast by the trip production models derived, using future household incomes and car ownership.

Based on existing trip rate table by trip purpose and household car ownership and the total framework, the total trips produced in the whole study area was forecast to expand to 6,171,320 trips per day in 2020 from 3,921,785 trips in 2000 by the trip production model. As a result, trip rate per person in the year 2020 was estimated to reach 2.71 trips in 2020 from 2.04 in 2000.

(2) Results of Future Traffic Assignment

The modal share of vehicles as representative transport mode for trips in 2020 was forecast to increase further from existing 16.9% to 31.3% in Do-nothing case.

The modal share of public transport by rail transit systems including subway, state railway, and tram was forecast to decrease, in spite of the increase of total number of passengers from existing one. The decrease of bus modal share is significant. Also walking was forecast to lose slightly its share in the modal split by a shift from walking to other transport modes, which implies the shift to vehicles.

As regards vehicle traffic in 2020, it was forecast that large volumes of vehicles would be on the roads between the residential area in the east and central area of Baku within the planning area, reaching a total of 500,000 pcu. (passenger car unit/day) at the maximum section of roads.

Nearly 100,000 pcu/day was forecast on Sumgayit road connecting with Sumgayit and M. Useymov road connecting with southwest.

The forecast result also showed dispersed reaches with large congestion rate due to the large traffic volume compared with capacity. In the central area of Baku, the congestion rates were expected below 1.0 by the diffusion of traffic owing to the densely provided grid pattern roads. Instead the parking problem is supposed to affect vehicle trips in the central area of Baku.

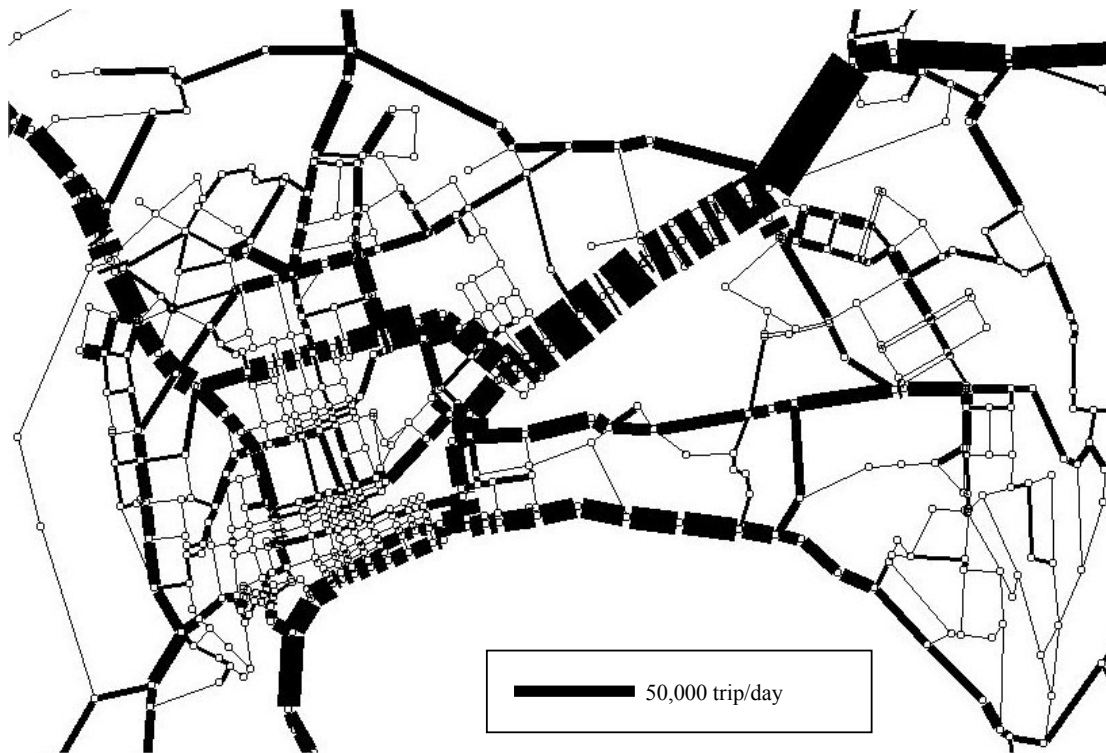


Figure 10.1 Bus Assignment Results in 2020 (Do-nothing)

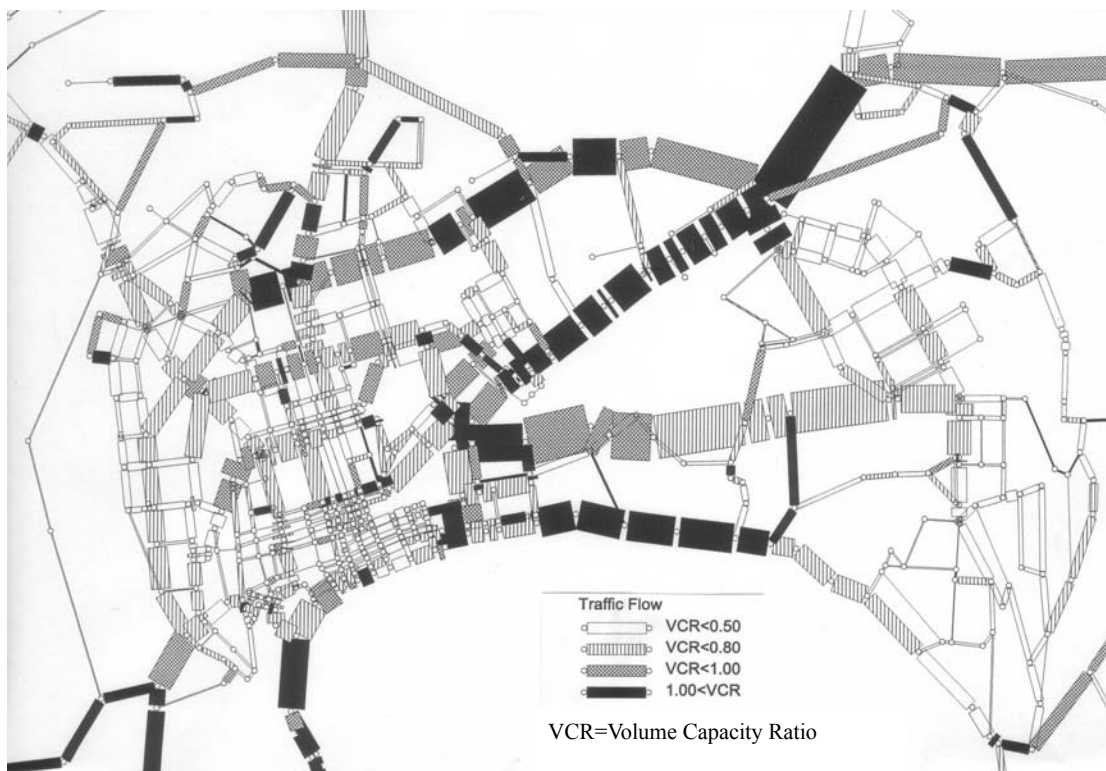


Figure 10.2 Road Congestion Rate in 2020 (Do-nothing case)

IV. Urban Transport Improvement Plan

11. Planning Goals

(1) Planning Goals of the Urban Transport Improvement Plan

The goals for the urban transport improvement plan in the city of Baku in this Study were established as follows:

a) Improvement of Mobility and Sustainability

Improvement of the ability of transportation system to meet the transport demand generated in the course of daily life and economic activity (mobility) shall be primarily pursued in a sustainable manner by the urban transport improvement plan. The improvement of mobility means that everyone can promptly move to his destination with safety and comfort at low cost and at any time.

b) Realization of Urban Transport System Harmonized with Environment

Individual viewpoints on the impact on the life of citizens and existing buildings caused by noise, vibration and air pollution, and also the global impact on the terrestrial ecological system need to be taken into account in the implementation of the plan.

Criteria to evaluate the urban transport improvement plan

Indicator	Evaluation Criteria
EIRR	15%
Average vehicle running speed	32.5km/h
Average public transport operation speed	25km/h
Coverage area of public transport	Planning area is covered by public transport within 40 minutes from the central area of Baku as much as possible.
Modal split	Modal share of private vehicle is less than that of public transport.
Environmental load	Total amount of CO ₂ emitted from vehicles on trunk roads is less than 1 mil.ton/year in 2020. (70% of the one in Do-nothing case)

(2) The New Traffic Concept

1) Public Transport

Transport Corridor

Rail transit system (mass rapid rail transit, main public transport) with mainstay of subway will be reinforced for transport corridors to alleviate the load on the road by vehicle traffic. Multiple rail transit linkages will be formed to cope with the forecast future large transport demand between central area of Baku and residential area in the east of the planning area.

Roles of Public Transport Modes and Network

- Tram (new type tram) will be regarded as supplementary public transport means to subway system. Existing trams in Baku will be maintained with rehabilitation works. Then trams will be renovated as new type tram (LRT) step by step in the long term. New type tram will also function as a public transport system in the center of the city.
- Railway will be revitalized and reinforced also as a main public transport mode to bear urban transport demand by the most of existing favorable location of network. Railway will also bear the major role for regional transport corridors.
- Large bus will serve the transport demand in the area outside of the catchment area of rail transit with respect to the cost-performance to connect to the center of the city.
- Minibus will provide transport service for the transport demand which is not served by large bus.

- Existing trolley buses will be maintained making the most of its environment-friendly advantage.

Public Transport System in the Central Area

Concerning public transport in the center of the city, transport service comprising subway, tram (new type tram) and bus (including trolley bus) will be provided in consideration of catchment area, accessibility and service level of each transport means.

Transferring System

For the improvement of the convenience for public transport users, inter-modal facility improvement will be necessary together with rearrangement and rerouting of bus services.

Following four types of inter-modal facilities will be arranged.

- i) Multi-modal terminal
- ii) Feeder service terminal
- iii) Fringe terminal
- iv) Bus and bus ride terminal

2) Roads

Following basic structure of the future road network is formed taking into account the important corridors as regional artery and circular routes for the improvement of fluidity in the city.

- Silk Road Corridor
- Airport Corridor
- Sumgayit Corridor
- Southeast Corridor
- East-west Corridor
- Urban Ring
- Inner Ring
- Outer Ring

3) Traffic Management

Parking Management

Parking management system will be developed to regulate the total volume of vehicle trips. Roads within the central area of Baku will positively contribute to parking space, and expansion of parking capacity will be promoted together with the plan for off-road parking spaces. Construction of underground parking shall be promoted.

Traffic Calming

Traffic calming measures in the center of the city will be promoted. Realization of traffic cell concept, fringe parking and utilization of one-way system will be pursued.

Traffic Safety

Measures for pedestrian safety and for vehicle traffic safety will be developed. Especially safety measures for pedestrian and vehicle traffic at night including lighting facilities will be well arranged.

Traffic Control

Countermeasures by vehicle traffic regulation will be devised for smooth traffic flow. Priority on public transport, route designation for trucks will be considered.

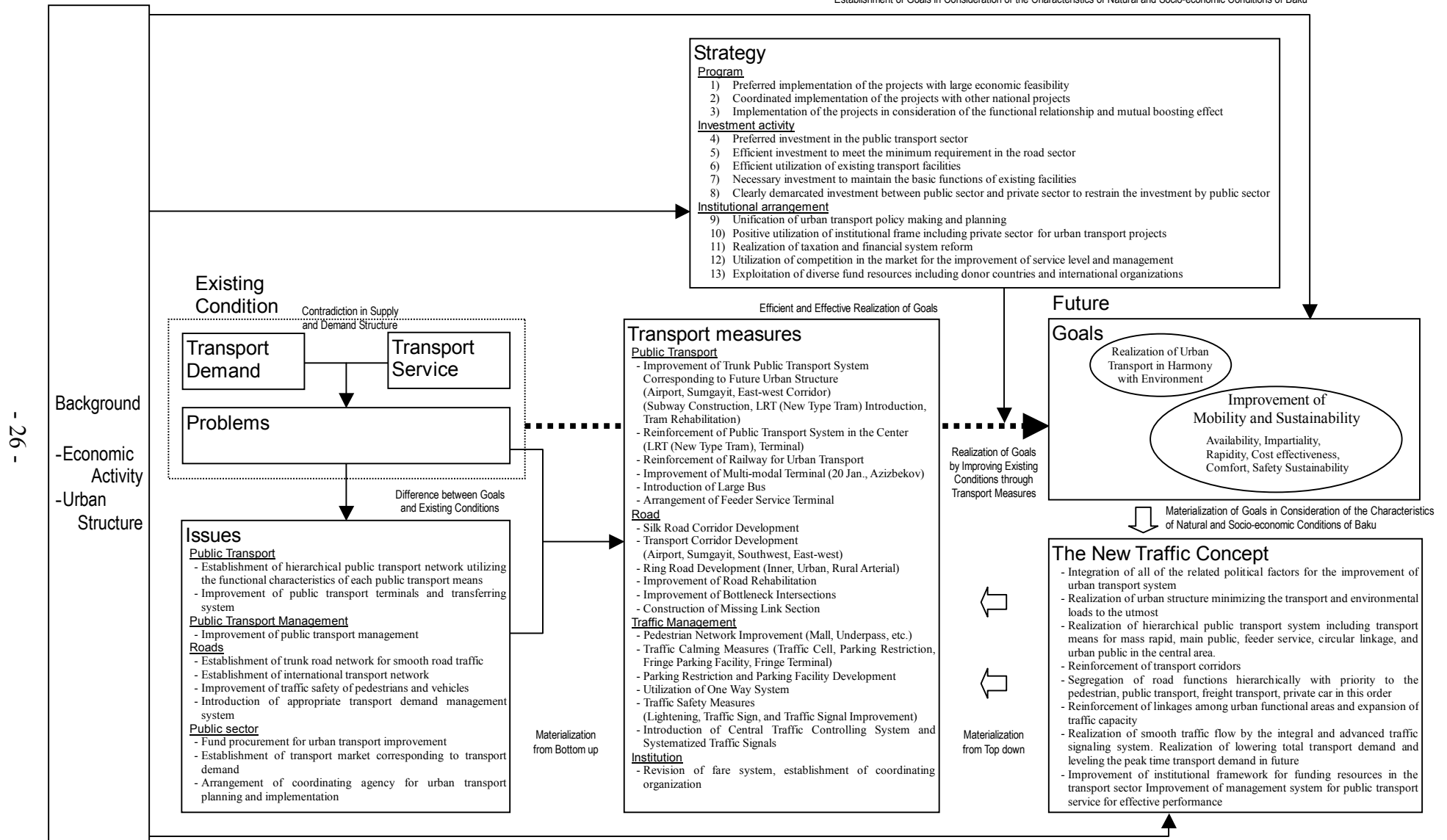


Figure11.1 Planning Goals

12. Urban Transport Improvement Plan Formulation

(1) Network Alternatives

Components to formulate Urban Transport Improvement Master Plan alternatives are road network, public transport network and traffic management system.

For the road, there are two alternatives, i) Concept oriented network and ii) Restrained road network are formulated. For the traffic management, there are also two alternatives, i) Confining parking capacity to present level and ii) Expansion of parking capacity to meet future parking demand in the central area of Baku. Nine Public transport network alternatives were established based on the rail transit system.

(2) Possible Investment Frame and Environmental Restriction

Providing that the investment frames are 12 mil. USD and 94 mil. USD in 2000 and 2020 respectively and interpolation is applied for intermediate years, the possible investment frame for 19 years from 2002 to 2020 was estimated at 1,085 mil. USD.

From the environmental viewpoint, the four items, mitigation of the impact of air pollution, maintaining historical cityscape, consideration of resettlement impact, and maintaining greenery area were chosen as a precondition for planning.

(3) Selection of Basic Alternative

1) Effect on the Economic Feasibility by Road Sector Investment

In the cases comprising concept oriented road network, the number of congested road sections relatively diminishes. The EIRRs are 1.8 to 6.5% higher than those in cases comprising Restrained road network under the same condition of public transport network and traffic management.

2) The Magnitude of Mobility Improvement and Environmental Effect

Improvement in road sector only will make it difficult to attain the targeted evaluation criteria from the viewpoint of environment.

A comparison of the cases with parking restriction and without parking restriction as a traffic management measure on the same condition of road and public transport network was made. The EIRR of the case with parking restriction was 16.8% and that of the case without parking restriction was 15%. It was proven that the case with parking restriction in the center of the city is more economically feasible from the viewpoint of mobility.

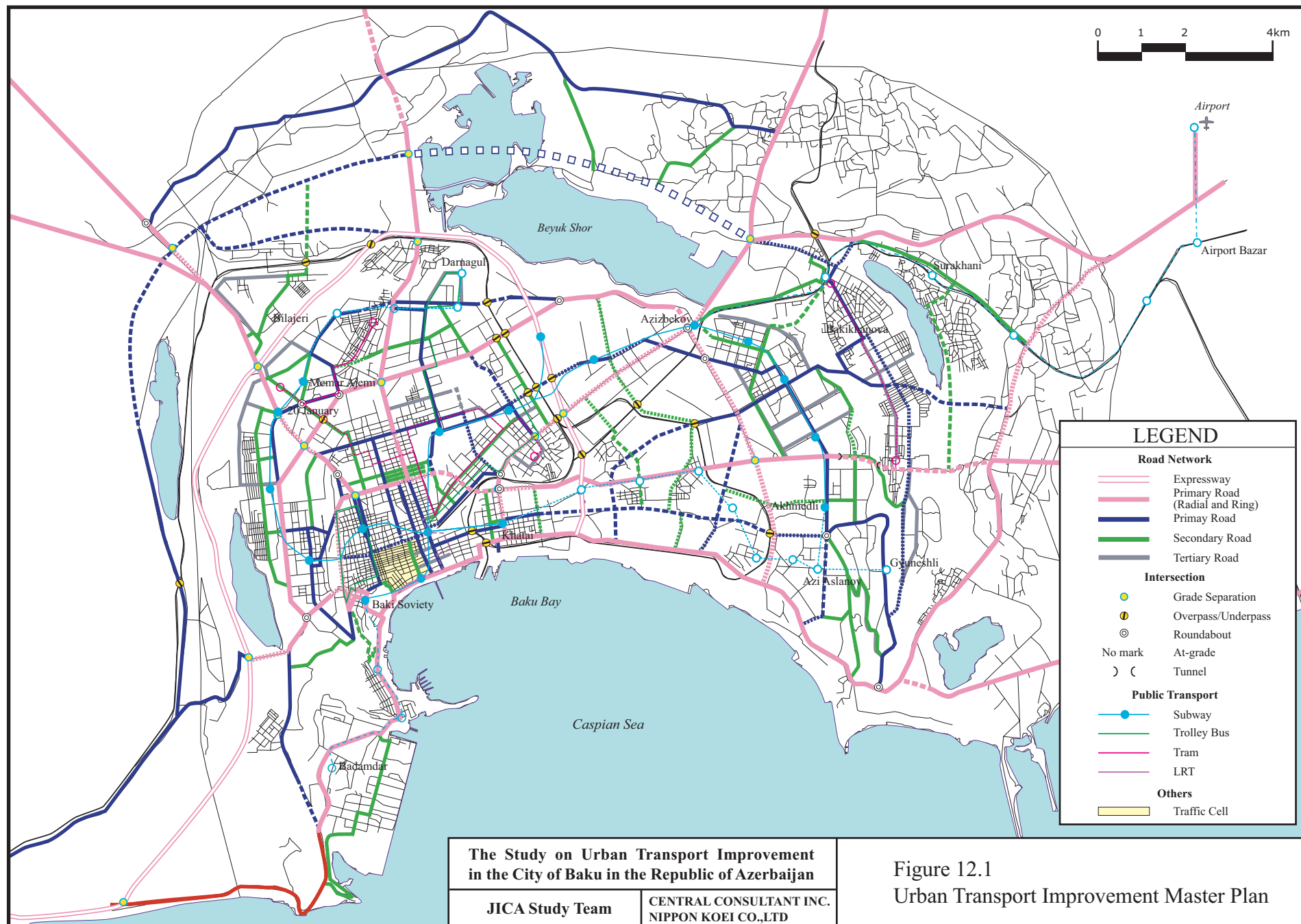
3) Effectiveness of Public Transport Improvement

The cases with smaller amount of public transport sector investment show relatively high EIRR. However those cases are rather problematic from the environmental viewpoint due to the expansion of total amount of vehicle trips.

4) Selection of Alternative Case

Evaluation of mobility and environmental load was comprehensively made. The alternative comprising concept oriented road network, parking restriction in the central area of Baku and public transport network including two subway line construction corresponding to the congested road section was selected as the base for the urban transport improvement plan in this Study.

Urban transport improvement plan was elaborated based on the selected alternative shown below. Detailed road plan including traffic management plan, and public transport plans are proposed in the following chapters.



13. Road Sector Improvement Plan

(1) Improvement Direction

1) Capacity Improvement

Proposed roads will expand the traffic capacity of east-west corridor to sufficient level. For the southwest corridor the geological condition will still constrain the capacity in the future and a new rail transit is proposed to cope with the expanding future traffic demand.

In the urban transport improvement plan, the parking constraint measure to reduce the total vehicle trips is proposed. It also moderates the excessive road construction investment.

2) Accessibility Improvement

Accessibility will be much improved by the proposed network in the urban transport improvement plan that comprises construction of radial and circular roads including missing linkages. The radial and circular network pattern is also adopted as the base for the rail transit system in the Study Area. Radial and circular network road network will improve the accessibility in the Planning Area together with rail transit system.

3) Traffic Restraining

Traffic management in the central area of Baku is to regulate vehicle traffic through parking and parking facility policy and to moderate traffic for pedestrians by adoption of one-way system.

4) Traffic Environment Improvement

The main items expected by implementation of the Master Plan are as follows.

- a) Mitigation of air pollution in the Planning Area
- b) Reduction of noise and vibration in the central area
- c) Improvement of risk management framework
- d) Improvement of traffic safety

(2) Road Projects

The basic road network is composed of 6 radial and 4 ring arteries including Ring Road accessing Baku Port to form Great Silk Road. Three primary roads are proposed to link central area of Baku and eastern residential areas.

This study identified 16 project packages and grouped them into four development groups.

This study considered three types of pedestrian route to form the pedestrian network as follows:

- Greenery network (connection of greenery areas and parks)
- Sidewalk network (connection of sidewalks on the major road)
- Transit mall network (coexistence of pedestrians and public transport)

Mill-and-replace in earlier period was proved to be the best method for road rehabilitation by using the HDM-IV (computer suits developed by World Bank). Road rehabilitation plan was formulated after the evaluation of each road section by existing road condition, traffic volume and utilization by large bus.

Table 13.1 Project Package

Code	Development group	Project package	Code
A	Corridor development	Silk Road Corridor	RA1
		Southwest Corridor	RA2
		Airport Corridor	RA3
		East-west Corridor	RA4
		Sumgayit Corridor	RA5
B	Formation of the urban structure	Urban Ring Road	RB1
		Inner Ring Road	RB2
		Rural arterial	RB3
C	Area development	Industrial area development	RC1
		Bilajali area development	RC2
		East residential area development	RC3
		Micro Regions development	RC4
		City center development	RC5
		Montino area development	RC6
D	Network improvement	Bottleneck improvement	RD1
		Road rehabilitation	RD2

(3) Traffic Management Plan

Following TDM(Traffic demand management) measures are proposed to restrain the total vehicle trips. And also TSM(Traffic System Management including zone system and direction control) measures are proposed to make maximum use of existing transport facilities.

1) One-way System

As a TSM measure without extensive improvement of transport infrastructure for the realization of smooth traffic, the one-way system will be introduced.

- Bul-Bul Pros. into north-bound traffic road
- Husi Hajiyeve St. and Istiglaliyat St. into two-way traffic road
- Zagarpalan St. (from Nigar Rafibeyli St. to Istiglaliyat St.) into south-bound traffic road

2) Parking Restriction

As a TDM measure together with the control of traffic demand to the central area of Baku, parking restriction on the main roads in north-south direction, where traffic congestion is observed, will be implemented. However, the roads in east-west direction basically provide for parking demand of residents.

3) Parking Facility Arrangement

Fringe parking spaces will be arranged as a TDM measure. Though the latent parking demand in 2020 was estimated at 3,800 vehicles, possible parking space for 1,000 vehicles will be provided. Other vehicle trips overloading the parking capacity will be diverted to trips by public transport modes.

4) Traffic Signal Improvement

Revision of signal phase corresponding to the actual traffic will be carried out for smooth and efficient traffic flow. Especially, introduction of full red time, multi-stage signal will be implemented. Synchronization will be installed in the following main road segments. This system constitutes the central traffic control system (H.Hajiyev St., Samed Vurgun St., Rashid Behbudov St., Azadlig Ave., Moskva Ave., and Babek St.).

Present large-size car restriction area and time zone will be maintained.

5) Traffic Safety Facility Improvement

Measures for the traffic safety of pedestrians, and for the reduction of nighttime accidents will be made. Illumination, curve mirrors, zebra crossings, guard rails, etc. will be provided on the roads with more than 25 accidents a year (ex. Moskva Ave.).

6) ITS System Introduction

Following measures are proposed.

- Traffic control center
- Parking lot guidance system
- Public transport priority system

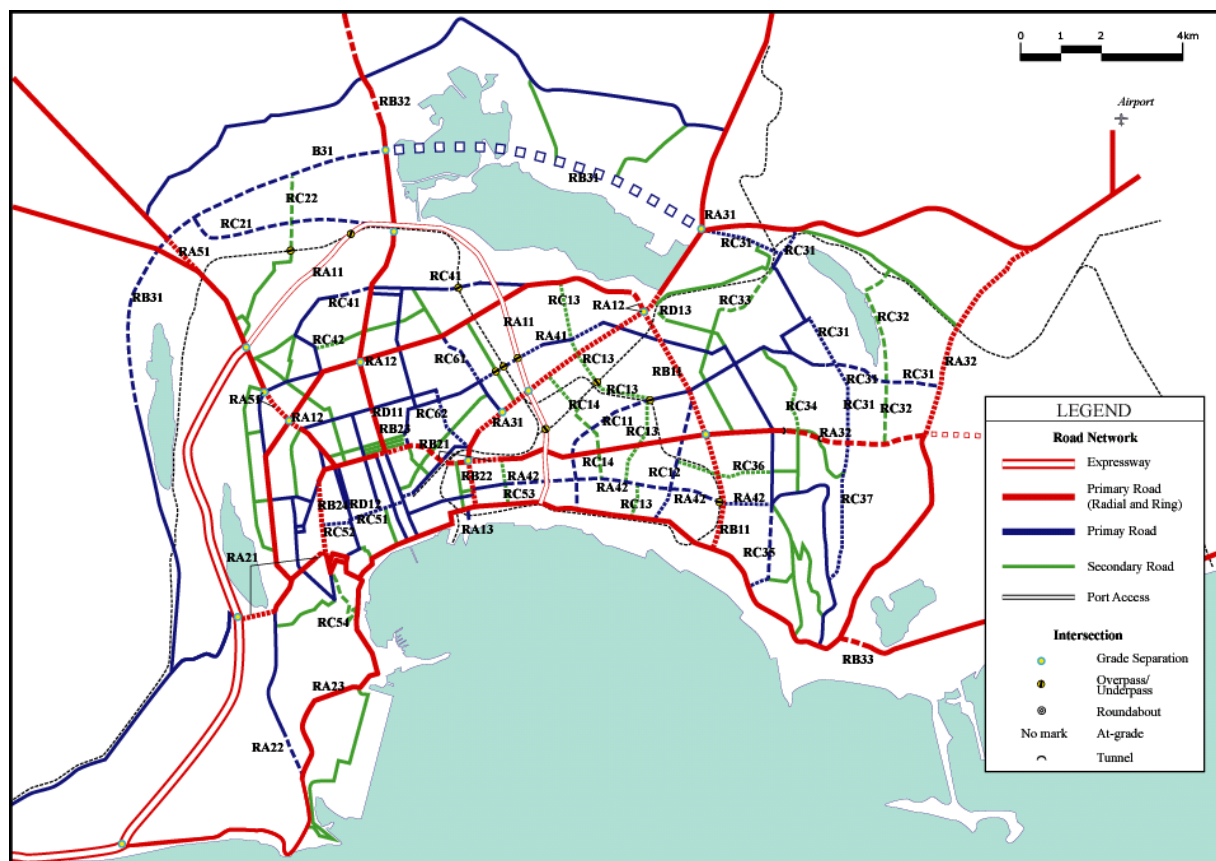


Figure 13.1 Location Map of Road Projects

14. Public Transport Improvement Plan

(1) Improvement Direction

The following two procedures are necessary to improve capacity of public transport:

- a) Increasing operation frequencies through reducing headway time to meet the peak time demand on existing routes.
- b) Construction and expansion of network

Accessibility improvement is designed to maintain everyday activities of people without car ownership who rely on public transport and transport the mass including disabled by providing public transport service.

- 1) To expand the mass rail transit network in order to provide high demand areas with trunk public transport services
- 2) To utilize and rehabilitate existing suburban railways to serve not only the urbanized areas but also the suburban areas in the Apsheron peninsular
- 3) To provide better access to the central area with public transport
- 4) To renovate existing tram system and utilize existing trolley bus system as much as possible
- 5) For the short-term plan, reorganization of minibus routes and introduction of large capacity buses to reduce traffic congestion

(2) Public Transport Projects

In order to attract passengers from private passenger cars and to meet the future traffic demand in terms of quantity and service quality, the followings measures were proposed.

1) Expansion of mass rapid rail transit network

Mass rapid rail transit network will be expanded to provide trunk public transport service in the area where large transport demand is expected. Realization of subway extension including existing plans by Baku Subway and new plans in this Study are proposed.

- 1) Extension of subway to Hazi Aslanov (1.46 km) (construction of Hazi Aslanov St. will be completed by the beginning of 2003 with the funding assistance by EC.)
- 2) Extension of subway to Darnagyul (4.1 km)
- 3) Construction of east-west route (S.I.Khatai – Gyuneshli: 10.2 km)
- 4) Construction of Hazi Aslanov – Gyuneshli – Bakikhanov Line (4.9 km)
- 5) Extension of subway from Baki Soveti to southwest (“Baki Soveti” to the residential area of “Badamdar”: about 5.7 km)
- 6) Formation of access linkage from “Azizbekov” subway station to Bina Airport

2) Improvement/ rehabilitation of Existing Suburban Railways

Existing suburban railways should be utilized as much as possible for the improvement of public transport service not only for the built-up area of Baku but also for the suburban area.

Existing suburban railways will be rehabilitated by increasing operation frequency and increasing speed to the major directions, such as to Sumgayit, Azizbekov and Sabunchu regions.

Feeder services by new type tram to Bakikhanov station is considered as one of the alternatives.

3) Improvement of Public Transport in the Central Area

The reinforcement of public transport is necessary in order to attract more people to the central area, to the existing pedestrian streets and to Old City so that they can enjoy shopping and walking without driving cars to the central area. For this purpose, introduction of an attractive and comfortable new type of tram which is superior to the traditional trams in terms of reliability and capacity deserves consideration. A recommended route is to connect 28 May central station with an entrance to a pedestrian mall near Old City.

4) Tram Rehabilitation and Utilization of Trolley Buses

In general, tram is superior to minibus in terms of capacity and its construction cost is lower than a subway. In addition, it is superior to other petrol consuming vehicles from the aspect of environmental impact (air pollution emission). Therefore, it is recommended to renovate existing tram system gradually introducing the new, high quality type of tram, such as LRT.

It is recommended that trolley buses for access to the central areas be maintained and utilized in the future in consideration of the advantageous environmental effects.

5) Bus Operation Plan

In the short term, rerouting of minibuses and introduction of large buses are proposed to cope with traffic congestion. Based on the present and future demand structure, the following planning policies are established:

- The privately operated minibuses will be maintained for the convenience of public transport passengers, for efficient operation of public transport by the private sector and to secure job opportunities for minibus operators.
- On the routes where traffic congestion is forecast due to operation of a large number of small-size minibuses or routes with large demand for minibuses to accommodate commuters at peak hours, the larger size buses shall be introduced to reduce the large number of small size buses.
- Considering future passenger demand, however, it is necessary to relocate or reorganize the bus network and to introduce large size buses on trunk routes to mitigate excessive concentration of minibuses in the central area.

(3) Improvement of Inter-modal Facilities

28 May Square, 20 January intersection, and Azizbekov intersection are regarded as major inter-modal facilities. These square and intersections will be improved as a multi-modal terminal. 20 January intersection, the transfer point to Sumgayit will be improved as an intersection at grade with rerouting of bus routes. Rearrangement of bus stops, improvement of pedestrian environment, improvement of connection among intra-city, regional and international bus terminals are proposed.

1) New Proposed Bus Terminal

After the evaluation of road condition and usable space, five (5) points near the subway station in the suburb are selected as a feeder service terminal for convenient transfers.

2) Proposal for Existing Bus Terminals

Following improvements of existing terminals were proposed.

a) Multi-modal terminal

- Intersection between Azadlig Ave. and Fizuli St.
- Narimanov subway station plaza
- Azizbekov station plaza

b) Bus and bus ride terminal

Gyanjilik subway station square where many bus route termini concentrate will be improved as a bus and bus ride terminal. This square has a rotary intersection in the center, therefore it is necessary for the plan to include the rotary intersection improvement.

c) Fringe bus terminal

Five (5) points near city center with required space are selected as a fringe terminal. The improvement plan of the large rotary intersection between Niyazi St. and M. Useynov Ave. connecting Neftchilar Ave., and rotary intersection H. Hajieyev St. and Fizuli St. with complicated traffic flow shall include the intersection improvement.

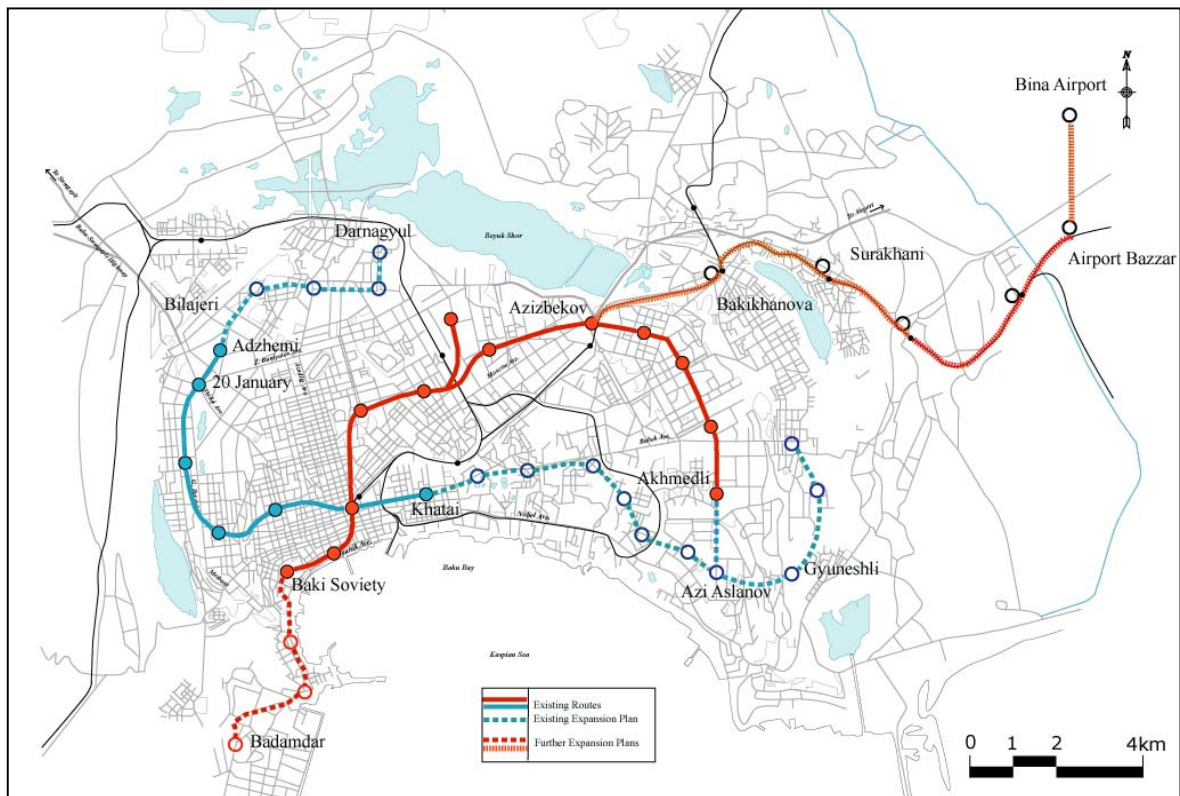


Figure 14.1 Subway Improvement Plan

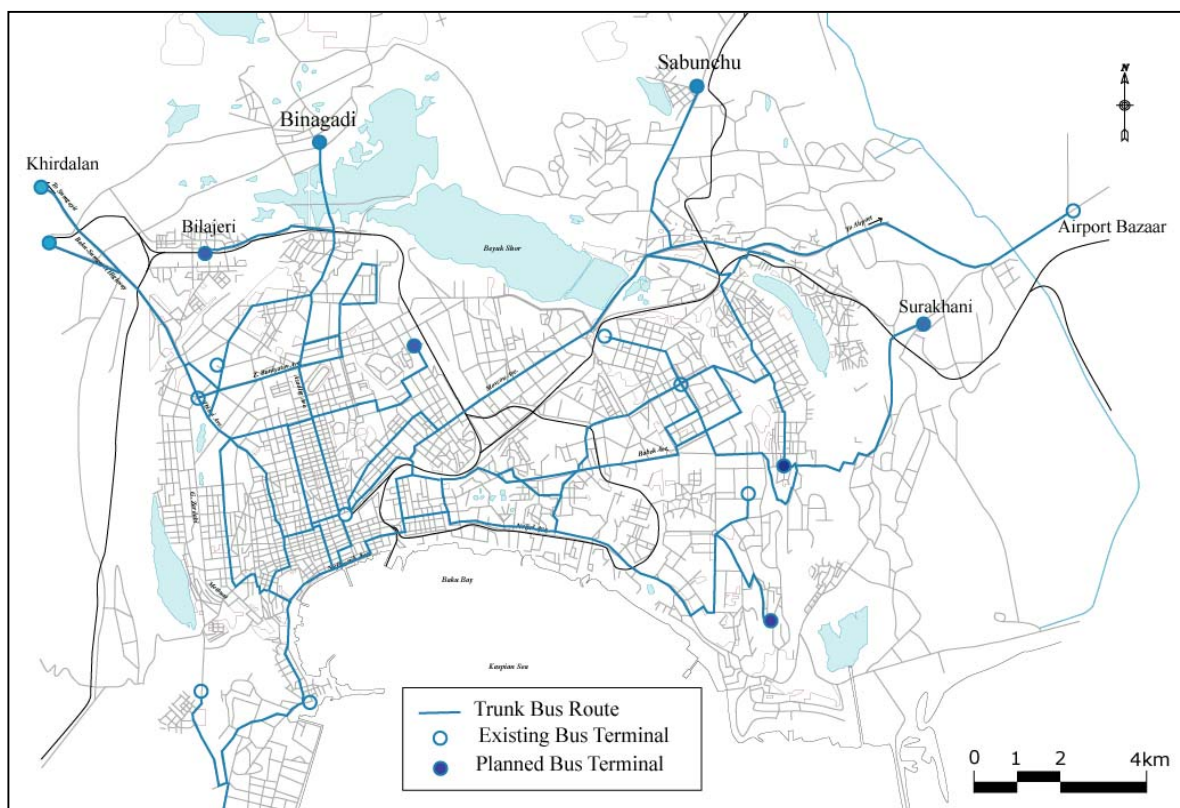


Figure 14.2 Proposed Trunk Bus Routes

15. Action Plan

(1) Financial Resource Plan

It is natural for Baku Subway to take care of the cost for project implementation, maintenance and operation of subway, and for the Department of Transport, Baku Municipality those of bus, tram and trolley bus. However both organizations have not enough funds for those activities. Financial resource plan of those organizations is summarized below.

1) Own Funds

It is desirable that project implementation entities prepare the capital investment cost and the operation cost from their own money from revenue. However, it is quite difficult to obtain necessary funds for this investment requirement.

2) Subsidy

Notably, the subway or tram construction usually requires a huge amount of money, and central government subsidies are indispensable. Therefore, it is very important that the central government support the urban rail transit projects through subsidies to cover some 20% (domestic portion) of these costs.

3) Loans

Generally loans are available from domestic banks, international funding institutions such as World Bank, bilateral, and multilateral lending agencies. It is recommended to borrow soft loans from international funding institutions or bilateral/multilateral funding agencies for the foreign portion of the project cost under the central government warranty.

4) Introduction of New Taxes

Earmarked taxes are based on “beneficiary-pay-principle”, which means that beneficiaries should pay for their benefit according to the amount of obtained benefit. Therefore, it is recommended that Azerbaijan introduce some type of earmarked taxes, such as fuel tax, vehicle tonnage tax, and land improvement tax. Imposing a small tax surcharge on the fuel or the property is preferable for the transport infrastructure improvement.

5) Use of Private Sector Funds

Recently, private sector funds are being utilized for the improvement of the infrastructure in most countries. Both BOT and PFI are infrastructure improvement methods by introducing private technology, funds, and know-how under the private initiative against the fund shortage of government. However, at this moment, for projects like the construction of parking buildings, it is considered to be relatively easier to use BOT rather than PFI for Azerbaijan. PFI takes much longer to arrange the legal framework because the Government must pay for the funds long term after the purchase of public services.

(2) Operation and Management Plan

1) Subway

In order to avoid the operation to be in the red in a yearly revenue expenditure balance, the following procedures are necessary;

- To increase subsidy

- To raise fare level

However, measures for the transportation poor (those belonging to the lowest income group) should be established to enhance mobility from civil minimum viewpoint.

2) Surface public transport

It is also helpful to increase the fare level or subsidy. In case of the municipal bus, the operation balance can accept such measures. However, in the other two cases (tram and trolley bus), their operations can not raise sufficient revenue to cover their operating costs. It is possible to supplement the deficit by profits from the bus operation. It should be accepted that the public sector should supply the subsidy into the operation of public transport, because the subsidy is considered a kind of compensation to the public transport users who give up using their own private cars.

Strict application of beneficiary-pay principle for the costs for operation, management and investment is rather unrealistic in Azerbaijan where public transport fares have been politically restrained. The determination of the portion from governmental general fund is not easy because it depends on the household's capability of expenditure and social welfare policy at the time. Appropriate balance should be politically and economically pursued for each of the transport services.

(3) Institutional Reform Plan

The following reforms are necessary to provide better public transport services.

- To urgently improve services
- To provide public transport services in the competitive transport market
- To maintain Baku Subway and Department of Transport as a public sector organization in consideration of providing public transport service to transport the poor, maintaining unprofitable routes, and countermeasures for environmental problems.
- To establish independent body from Baku Municipality for the consistent surface public transport services
- To improve the transparency of financial situation
- To reform the organization to compete with private public transport operators

In the sort term, following new units are required.

- Customer Service Units (reflection of customers opinion)
- Inspection Units (improvement of management)
- Coordination Unit (preparation for integrated public transport system)

Establishment of Coordinating Committee composed of various organizations involved in the urban transport is recommended. This Committee is expected to exchange and adjust the opinions on transport policies, plans and operation among relevant organizations.

16. Evaluation of Urban Transport Improvement Plan

(1) Economic Evaluation

The EIRR of proposed urban transport improvement master plan is 20%.

The economic evaluation of each project is also carried out. Major projects show favorable economic feasibility.

In the economic evaluation, economic cost was estimated by deducting tax portion as a transfer item from financial cost. Reduction of vehicle operation cost and savings in the time cost were considered as a benefit.

Table 16.1 Economic Evaluation of Urban Transport Improvement Plan

Projects	IRR (%)	B/C	NPV (million USD)
Silk Road Corridor Development	19.4%	1.61	20,547
Intersection Improvement 20 January	28.3%	1.84	133
Intersection improvement Azizbekov	22.5%	1.77	875
ITS system	16.3%	1.55	691
Extension of subway from Baki Soveti	6.2%	0.61	7,974
Construction of LRT in the city center	10.2%	1.02	1,624
20 January terminal improvement	19.7%	1.69	93
Azizbekov terminal improvement	16.6%	1.62	7

(2) Environmental Evaluation

It became clear that the load of CO₂ would decrease by 440 thousand tons a year, compared with that in the Do-nothing case in 2020. The environmental benefit by the decrease of CO₂ emission will be approximately 9 million dollars in 2020.

Table 16.2 Estimation of Loads of CO and NOx from Automobiles in 2020

Network	CO (ton/year)	NOx (ton/year)	Total running distance (pcu km)
Do-nothing case	44,600	10,400	16,280,924
Master Plan	29,100	8,700	15,471,296

Table 16.3 Estimation of Loads of CO₂ and Environmental Benefit in 2020

Network	Emission Amount of CO ₂ (ton/year)	Decreasing Amount of CO ₂ (ton/year)	Environmental Benefit (dollar)
Do-nothing Case	1,385,630	-	-
Master Plan	945,103	440,527	8,810,545

Source of Unit Cost : Guidelines for the Evaluation of Road Investment Projects (2000)

(3) Social Evaluation

Other main benefits expected by the implementation of the Master Plan are as follows:

- Social and economic activities in the central area of Baku will be activated.
- Attractiveness of public transport will be promoted.
- Mobility of transport poor will be improved.
- Traffic accidents will be decreased.

- e) Accessibility to public transport will be improved.
- f) Redevelopment of damaged area is expected.

(4) Priority Project

1) Implementation Program

Implementation program for the efficient attainment of goals was formulated with due consideration of budgetary constraints.

2) Selection of Priority Projects

Priority projects are those to be further studied among the proposed projects, commencement of which is expected within a few years after this Study. The process taken for the selection is stated below.

- i) Projects are selected among projects, commencement of which is scheduled in the first period of planning horizon (-2020).
- ii) Projects that were already studied at pre-feasibility or feasibility level is excluded.
- iii) Each project is examined whether it meets the following strategically important conditions:
 - Does the project contribute to the reduction of total vehicle traffic volume?
 - Does the project match the proposed urban structure from the perspective strategy?
 - Does the project match the public transport improvement?
 - Does the project address matters at national level?

On the other hand, solving existing transport congestion is also adopted evaluation of projects for priority.

The projects urgently needed to solve present traffic problem are prioritized.

Lastly, expected effect as a pilot project, environmental effect, economic and financial feasibility are taken into account and comprehensively judged in the selection of priority projects.

As a result of evaluation, the following projects are selected as priority projects.

- a. Large bus introduction (PB1)
- b. Bottleneck improvement (RD1)
- c. Tram rehabilitation (PT1, PL1)
- d. ITS (Central traffic control) system installment (TM5)
- e. Improvement of 20 January (RE1, PI2)
- f. Improvement of Azizbekov (RE2, PI3)

Code	Project Name	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
* Priority project																	
RA1	Silk Road corridor development																
RA2	Southwest corridor development																
RA3	Airport corridor development																
RA4	East-west corridor development																
RA5	Sumgayit corridor development																
RB1	Urban Ring Road Construction																
RB2	Inner Ring Road Construction																
RB3	Rural arterial development																
RC1	Development for industrial area																
RC2	Development for Bilajali area																
RC3	Development for east residential area																
RC4	Development for Micro Regions																
RC5	Development for city center																
RC6	Development for Montino area																
RD1*	Bottleneck improvement																
RD2	Road rehabilitation																
RE1*	Intersection improvement 20 January																
RE2*	Intersection improvement Azizbekov																
RE3	Grade separation improvement																
RE4	Other type intersection improvement																
RF1	Underground passage improvement																
RF2	Pedestrian environment improvement																
TM1	Improvement of one-way system																
TM2	Parking restriction and facility improvement																
TM3*	Traffic signal improvement																
TM4	Traffic safety improvement																
TM5*	ITS system																
RG1	Truck terminal construction																
RG2	Street environment improvement																
PS1	Extension of subway to Hazi Aslanov																
PS2	Extension of subway to Darnagyul																
PS3	Construction of east-west route																
PS4	Extension of subway from Baki Soveti																
PT1*	Tram rehabilitation																
PB1*	Large bus introduction																
PR1	Railway improvement project																
PL1	Construction of LRT in the center																
PL2	Construction of LRT in residential area																
PI1	28 May Square improvement																
PI2*	20 January terminal improvement																
PI3*	Azizbekov terminal improvement																
PI4	Fringe terminal improvement																
PI5	Feeder service terminal improvement																
PI6	B&B terminal improvement																
IA1	Establishment of cording organization																

Figure 16.1 Implementation Program