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JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)

MINISTRY OF INTERIOR
DAMASCUS GOVERNORATE
SYRIAN ARAB REPUBLIC

THE STUDY ON URBAN TRANSPORTATION PLANNING OF DAMASCUS CITY IN THE SYRIAN ARAB REPUBLIC

Final Report: Summary

July 1999

YACHIYO ENGINEERING CO., LTD.
KATAHIRA & ENGINEERS INTERNATIONAL

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Exchange Rate
US$1 = 42 Syrian Pounds
(December, 1998)

Preface

In response to a request from The Government of The Syrian Arab Republic, the Government of Japan decided to conduct master plan and feasibility studies on The Study on Urban Transportation Planning of Damascus City and entrusted the study to the Japan International Cooperation Agency (JICA).

JICA selected and dispatched a study team headed by Dr.Juro Kodera consisting of YACHIYO ENGINEERING CO.,LTD. and KATAHIRA & ENGINEERS INTERNATIONAL to Syria, four times between December 1997 and March 1999. In addition JICA set up an advisory committee headed by Prof.Dr.Mitsuyuki Asano, Waseda University during the same period, which examined the study from specialist and technical points of view.

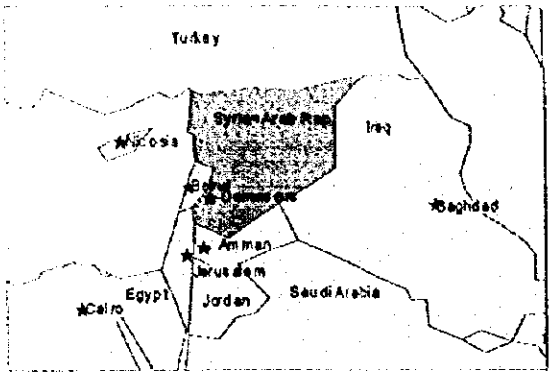
The team held discussions with the officials concerned of the Government of Syria and conducted field surveys in the study area. Upon returning to Japan, the team conducted further studies and prepared this final report.

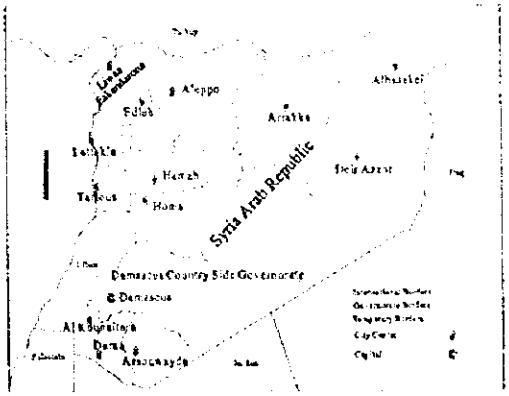
I hope that this report will contribute to the promotion of this project and to the enhancement of friendly relationship between our two countries.

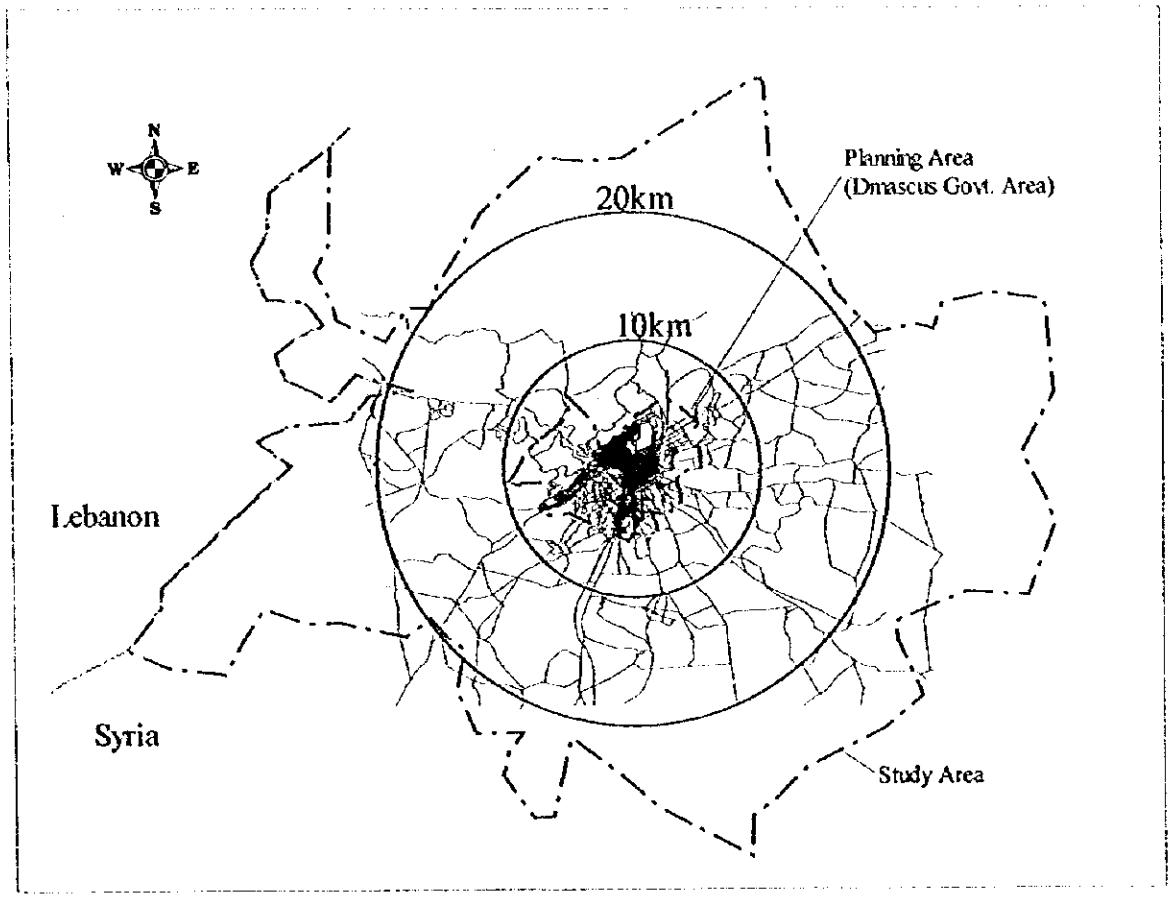
Finally, I wish to express my sincere appreciation to the officials concerned of the Government of Syria for their close cooperation extended to the team.

July 1999

Mr.Kimio Fujita
President
Japan International Cooperation Agency

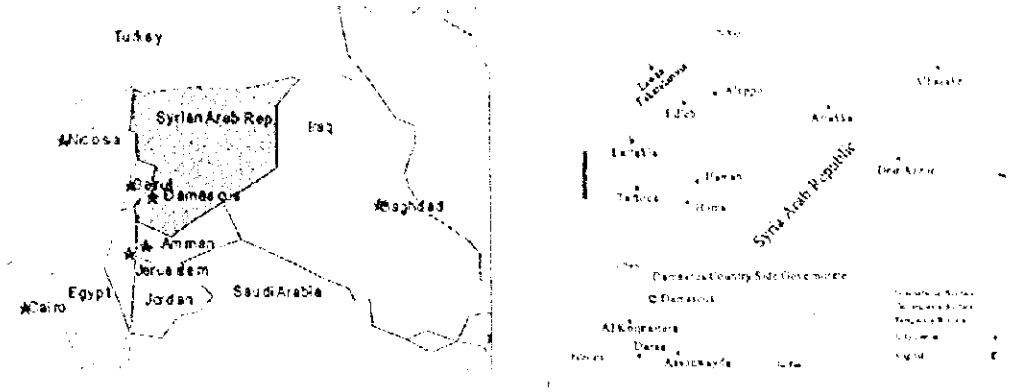


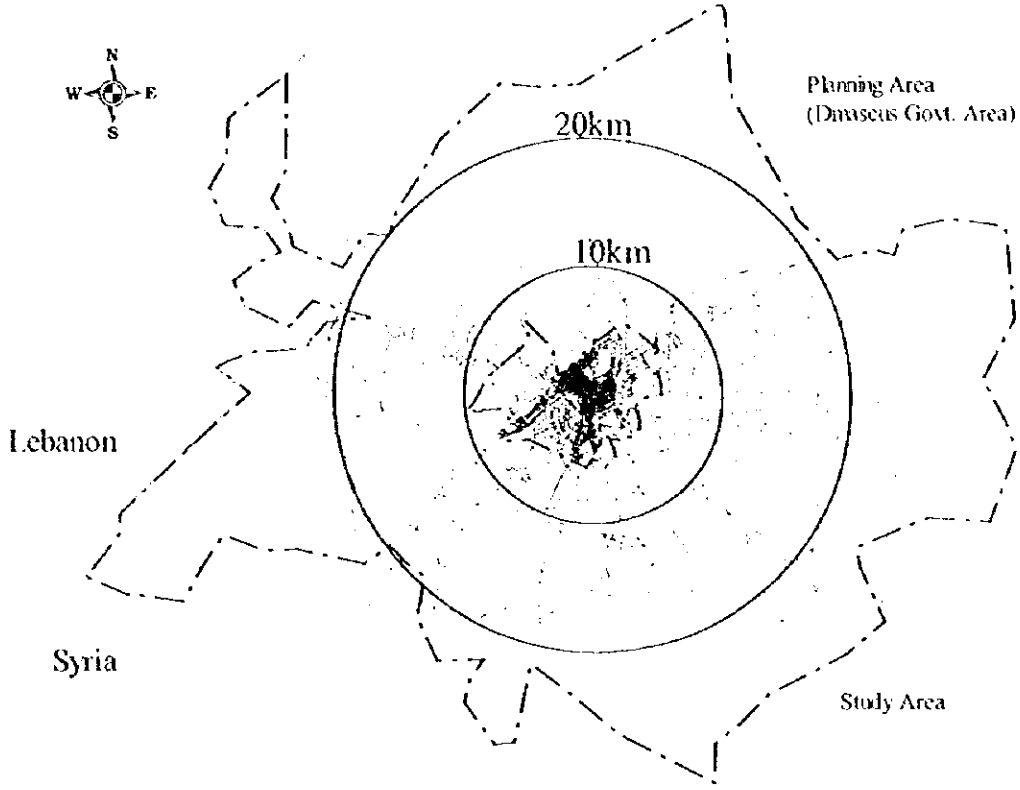




Study Area : Damascus Governorate Area and A Part of Damascus Countryside Governorate Area

Planning Area : Damascus Governorate Area





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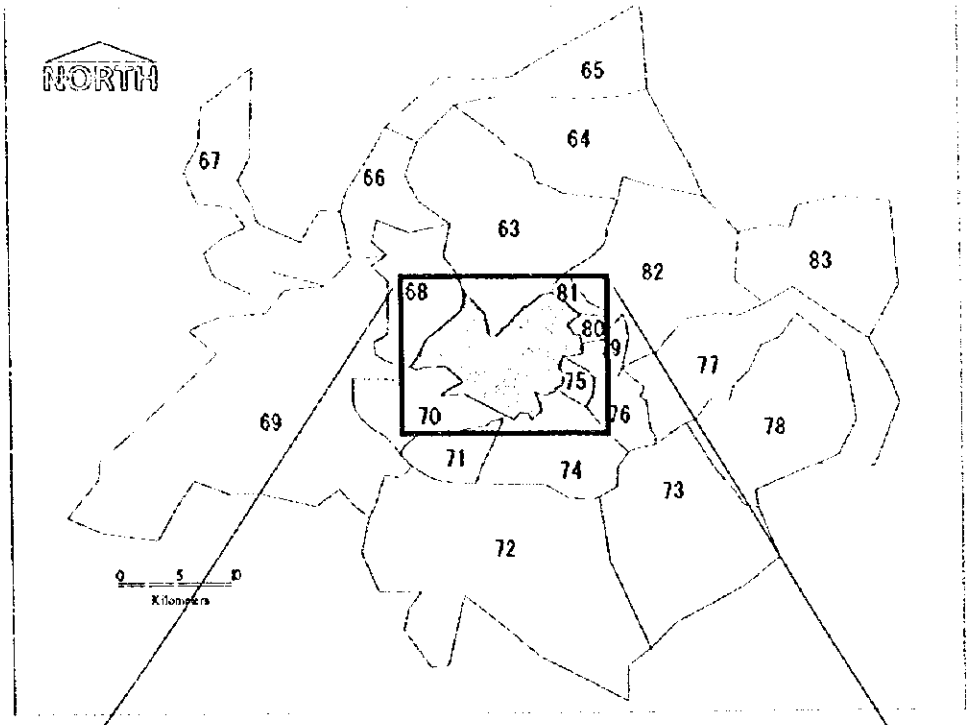
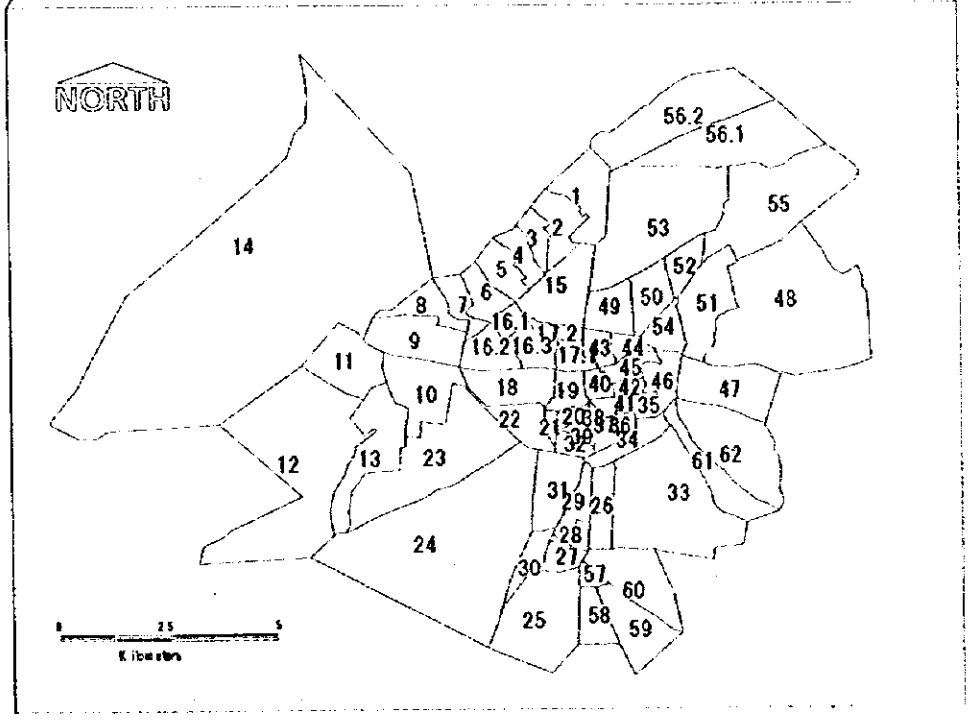


Traffic Zone of Study Area (Damascus Countryside)



Traffic Zone of Planning Area (Damascus Governorate Area)

Contents

1. Background of the Study

The most recent general plan of Damascus City was prepared by Eckoshar and Banshoya in 1968. The general plan was established for a population of 1.5 million. At present this population lives in Damascus City and the total population including the out-skirts of the City is 3.4 million. This present population exceeds by far the population considered in the general plan. Damascus Governorate requested the Japanese Government through the Syrian Government to prepare the study for the urban transportation master plan for the next twenty (20) years.

Objectives of the Study

The objectives of the Study were as follows:

1) To formulate a Master Plan (M/P) for urban transport of Damascus City with the target year of 2020.
2) To conduct a Feasibility Study (FS) for high priority projects with the target year of 2005.

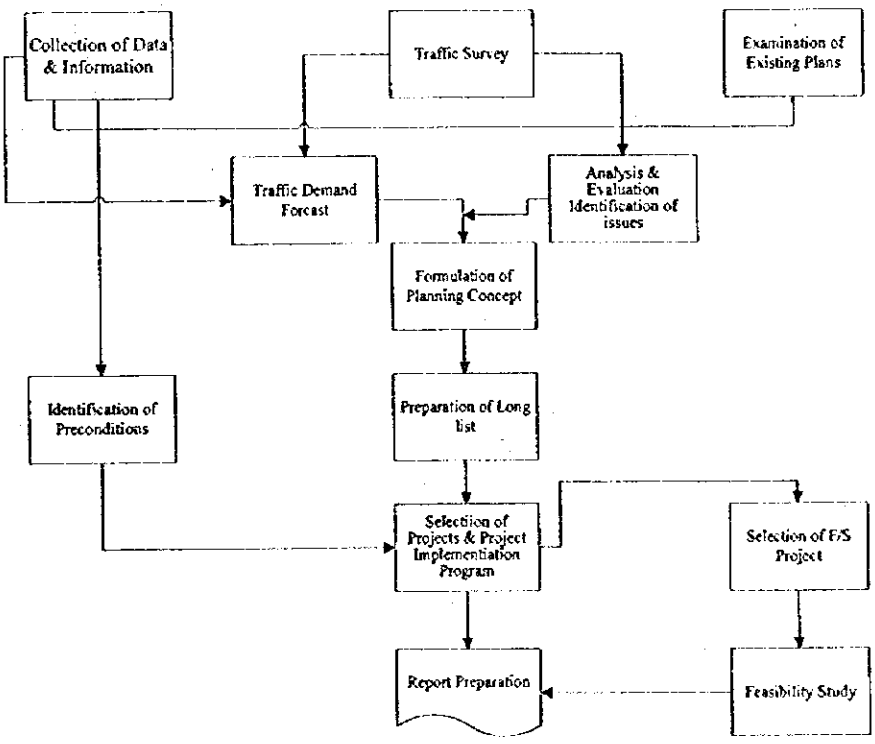
Fundamental Planning Concept

The major fundamental planning policies adopted in this Study were as follows:

1) To maintain the present urban transport service level of Damascus City during the planning period (2000 – 2020),
2) To develop the transport network while maintaining continuity of previous plans, and
3) To control the scale of the M/P within the range of the road network development budget of Damascus City up to the year 2020.

Study Program

The study was divided into three phases, namely, Field Surveys, Master Plan Formulation, and Feasibility Studies on high priority projects. The Study had was conducted over 20 months from December 1997 to July 1999.



Study Flow

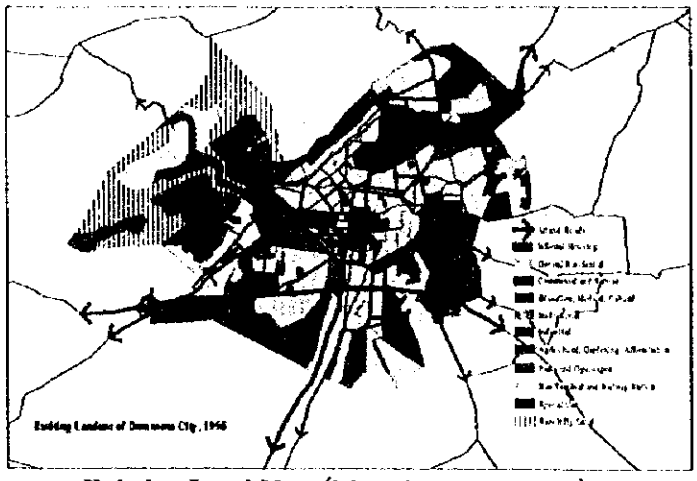
2. City Structure (1998 and 2020)

City Plan

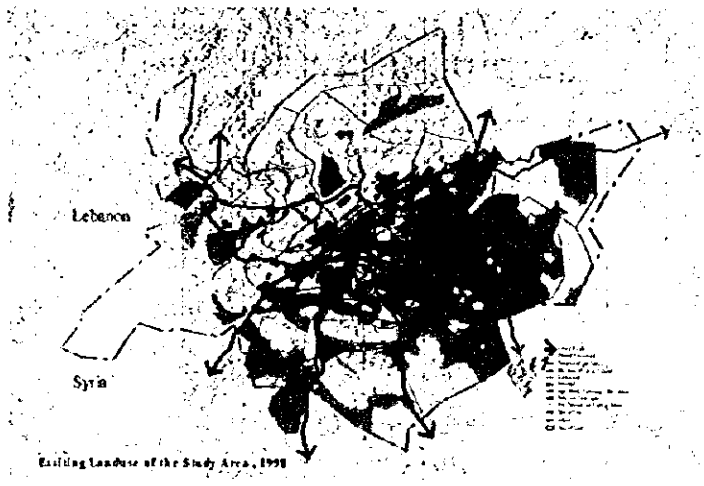
The historical development of Damascus was based on expansion in areas surrounding its Old City which is located in the central area of the city.

The present frame of Damascus City was designed by Danger and Eckoshar in 1938. The plan was renewed by Eckoshar and Banshoya in 1968, as the official General Plan of the city development.

The road network linked by rotary intersections is observed in the central part of the city. It was established in accordance with the 1968 General Plan. Construction of informal housing in many parts of the city started in the early fifties.



Existing Land Use (Planning Area, 1998)



Existing Land Use (Study Area, 1998)

Land Use

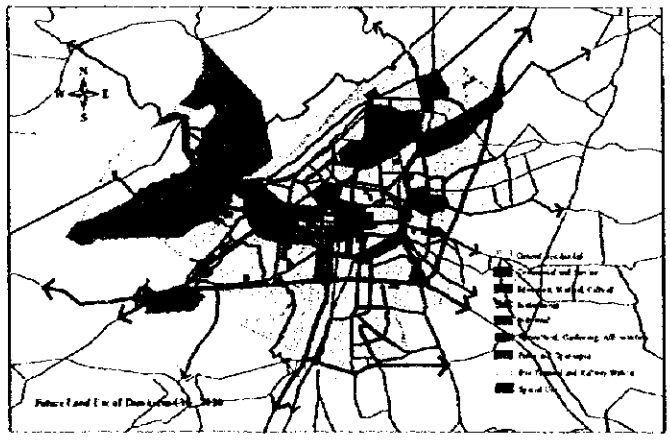
The land in Damascus city has been highly developed and there is room for development only in such areas as Kafr Sussah, Dummar, Lowan and to a little extent in Bab Sharqi.

Urbanization around Damascus City is proceeding in all directions. Industrial zones are located along the highways to Da'ra and Adra. On the other hand, agriculture is prospering in agrarian lands spreading to the south and east directions. Considerable areas in the city are maintained as security zones.

Scheme of Land Use Plan

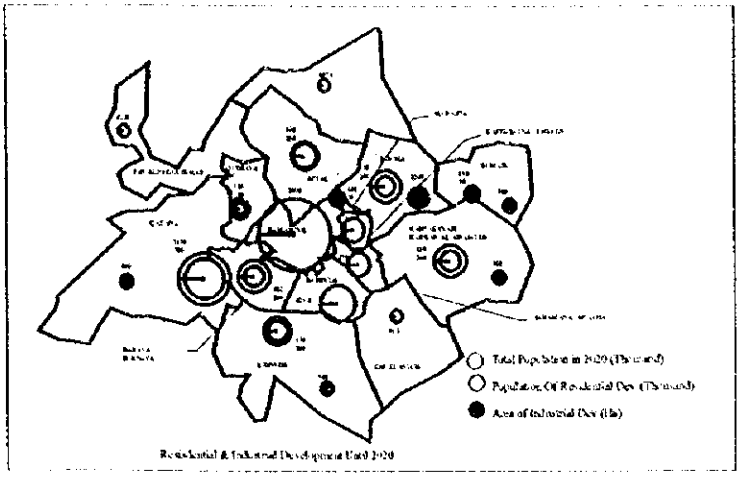
The Syrian government is presently preparing a Land Use Plan up to 2020. The land use plan applied in this Study to develop the transport network was prepared based on several discussions with local agencies in charge of the land use plan establishment.

The 2020 population of Damascus City is forecast to be 2 million. In the land use plan green areas were protected as much as possible to provide breathing spaces for the centre and commercial zones. New residential areas were located in Kafr Sussah, Dummar, Lowan and Bob Sharqi.

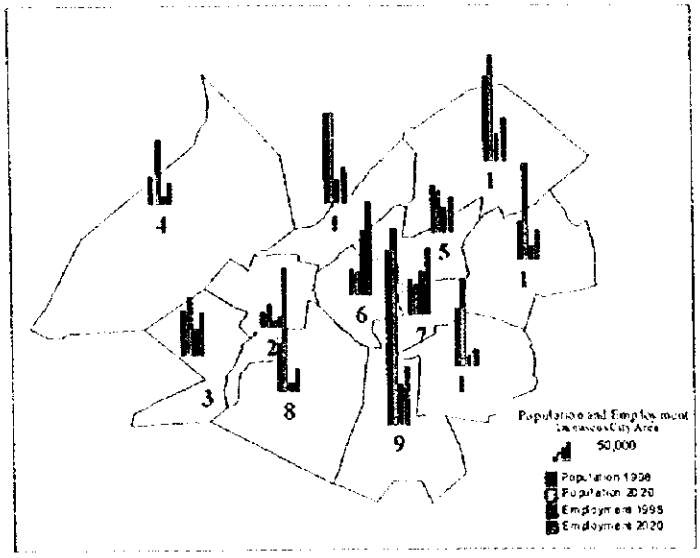


Future Land Use (Planning Area, 2020)

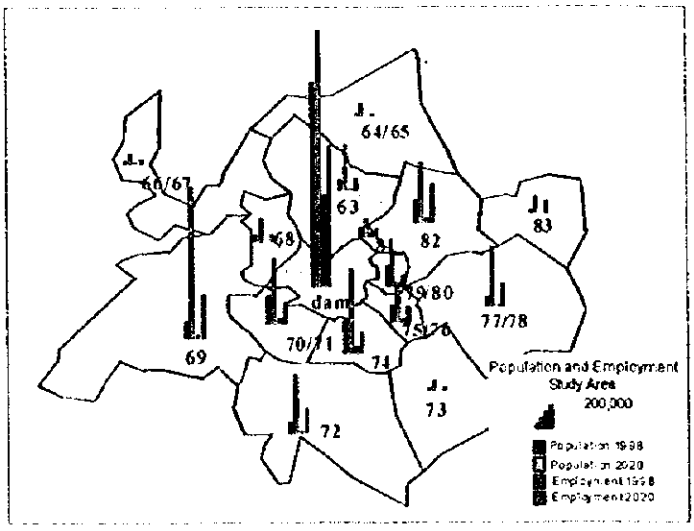
Based on discussions with the Syrian side the population of the area outside Damascus City was forecast to reach 5.1 million in 2020. The land use plan preserved agricultural land and green areas as much as possible through planning of urbanization zones outside such areas. In concrete terms, development of industrial estates is planned in the areas of Kusweh, Qatana, Nashabyyah, Douma and Dummair, while residential sites are planned in Tar, Qudsaya, Qatana, Daraya, Suhnaya, Kusweh, Al-Aumeed, Harasta, Douma and Dumair.



Industrial Estate and Residential Area Development (Study Area, 2020)



Population and Employment (Planning Area, 1998 & 2020)



Population and Employment (Study Area, 1998 & 2020)

Population and Employment

The forecast two million population in Damascus City and 5.1 million in Damascus Countryside Governorate were distributed in each respectively taking into consideration population densities and new residential and urban development projects. The number of workers by residence area base was determined based on the results of the Home Interview survey and the population distribution, while the employment volume was determined based on the number of workers and land use characteristics.

The present 3.08 million population in the study area (Damascus City and Damascus Countryside) is expected to increase to 7.10 million (2.3 times) in the year 2020.

The present 1.49 million population in Damascus City will increase to 2.00 million (1.3 times) in the year 2020.

In terms of employment, the present 1.10 million employed people in the study area will increase to 1.90 million (1.7 times) in the year 2020.

Within Damascus City the present 0.67 million employed will increase to 1.03 million (1.5 times) in the year 2020.

3. Present Transport Issues

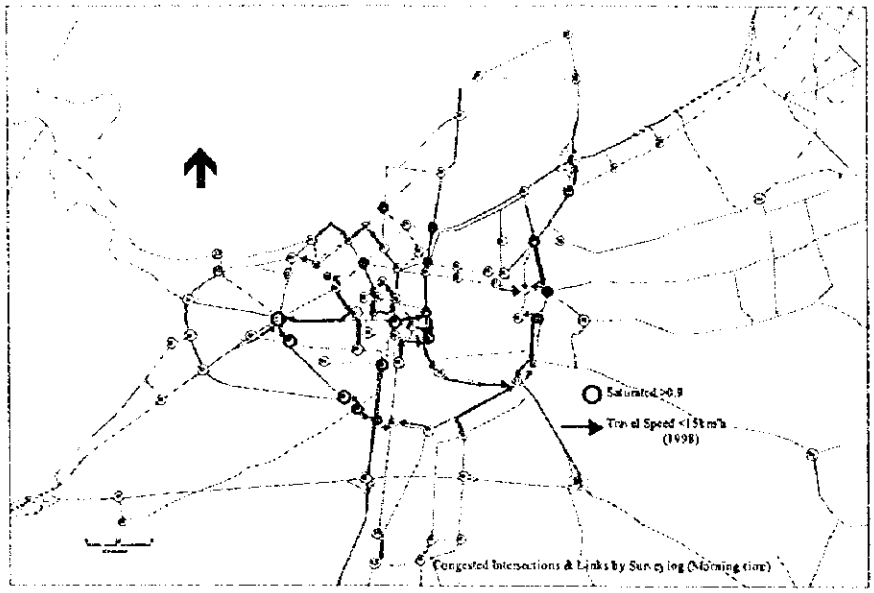
Causes of the Congestion

The road network in Damascus City is in a good condition with a high road area ratio. Traffic congestion only occurs locally. Causes of congestion are as follows;

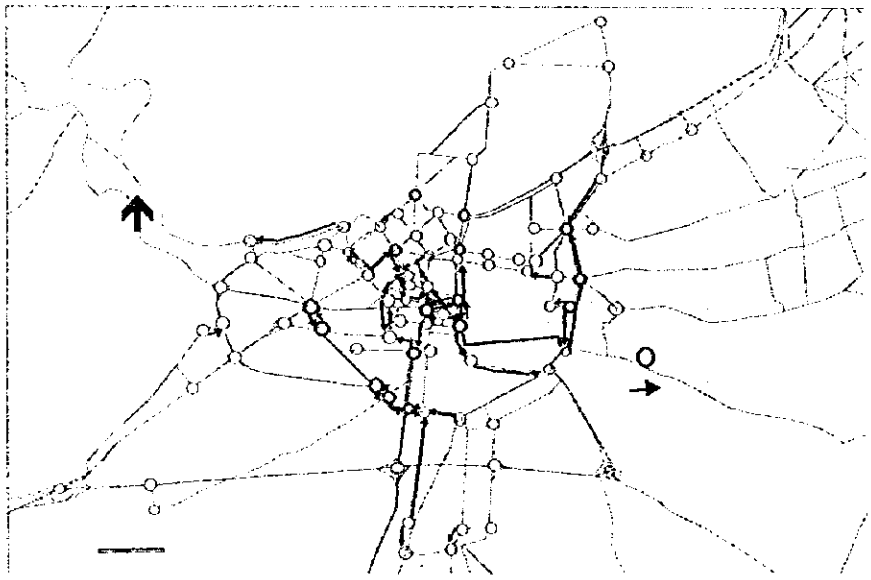
a) Shortage of capacity at intersections,
b) Shortage of capacity along roads with on-street parking, and
c) Decrease of the road capacity due to microbus passengers boarding and alighting on high concentration routes.

Intersections

Congested intersections with a saturation degree of more than 0.9 and low travel speed at inbound sections were selected as candidates of improvement schemes. Most intersections at which traffic volumes exceed capacities are rotary intersections. These intersections are operated with traffic signals under fixed-time phasing control system. During peak hours, these intersections are controlled manually by policemen.



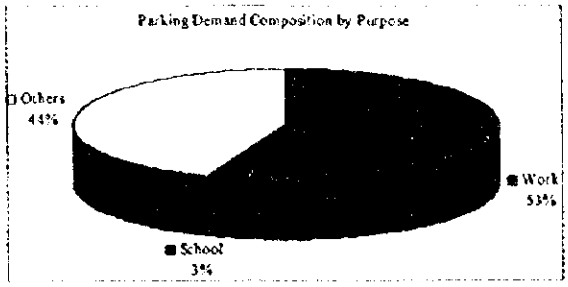
Congestion Points (Morning Time) (Study Area, 1998)



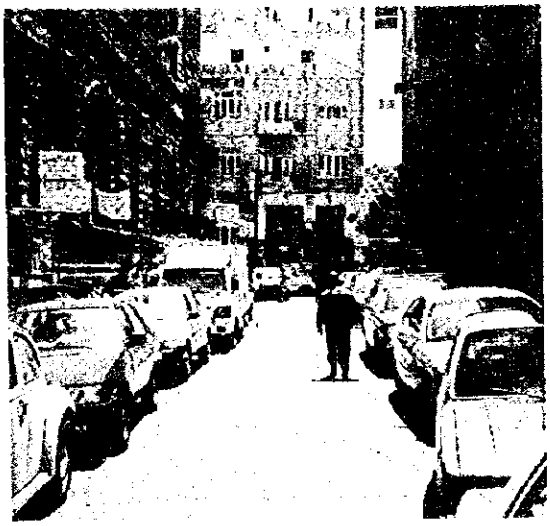
Congestion Points (Daytime) (Study Area, 1998)

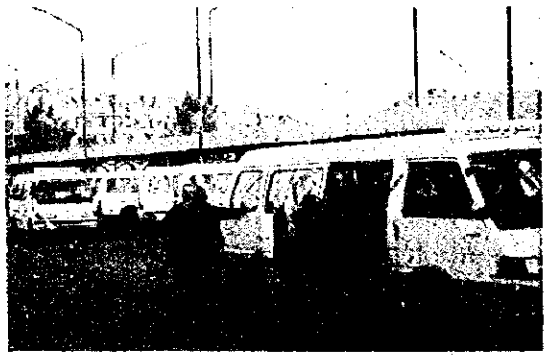
On-street Parking

The central area of Damascus City suffers severe shortage of parking facilities because its basic structure was established long before motorization took hold. As a result a large extent of on-street car parking is observed which decreases to a great extent road traffic capacities. The majority (53% excluding "return home" trips) of trip purpose of the parked cars is "to work" and parking duration is for a long time.



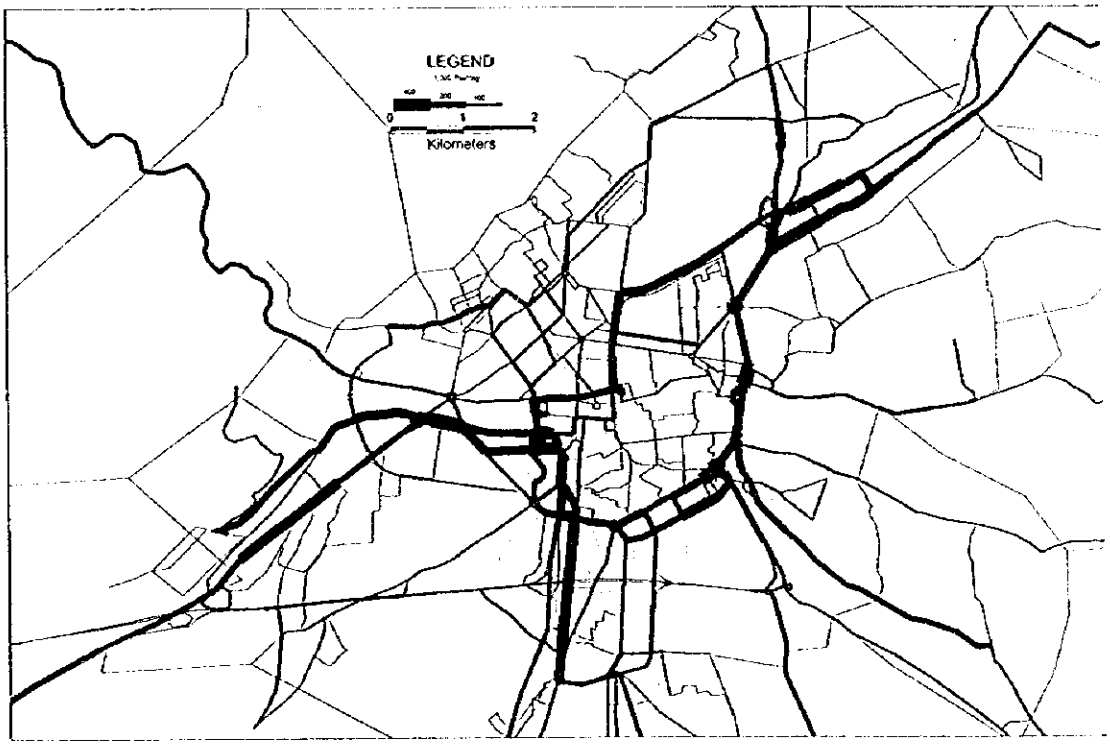
Parking Demand Composition by Purpose





Concentration of Microbuses

The majority of public transport service is shouldered by microbuses. Congestion due to microbus passengers boarding and alighting is significant at areas where the demand is concentrated.



Bus Passenger Flow (Planning Area, 1998)

4. Characteristics of Person trips

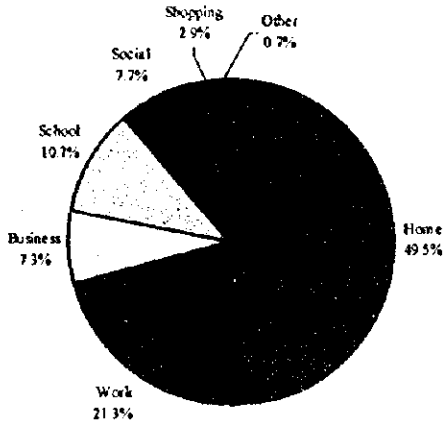
Number of Trips

The population of 6 years old and over in the study area, which was 2.67 million in 1998, produced 4.22 million trips per day. The average number of trips produced by each person is 1.58 trips a day. With an out-going rate of 65%, the average number of trips by persons who actually produce trips is 2.44 trips per day.

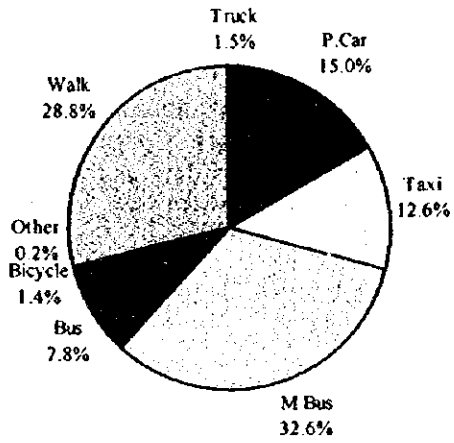
Total Number of Trips

Trip Purpose and Transport Modes

Trips with the purpose of "go to work" are 21.3%, "go to school" 10.7%, and "return home" 49.5% respectively. The highest share in transport modes belongs to microbuses (32.6%), followed by walking (28.8%), passenger cars (15.0%) and taxi (12.6%).



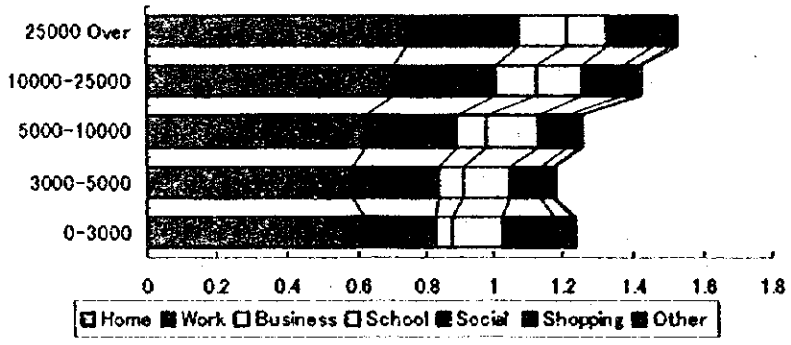
Trip Composition by Purpose



Trip Composition by Mode

Trip Production by Household Income Level

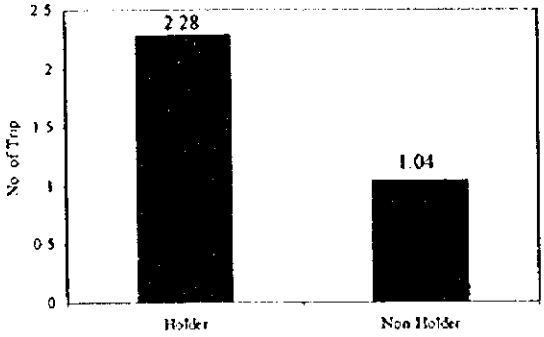
Trip production rate corresponds to household income level. People with higher incomes produce more "to work" and "to business" trips.



Trip Production Rate by Income and Purpose

Trip Production by Driving License Holders

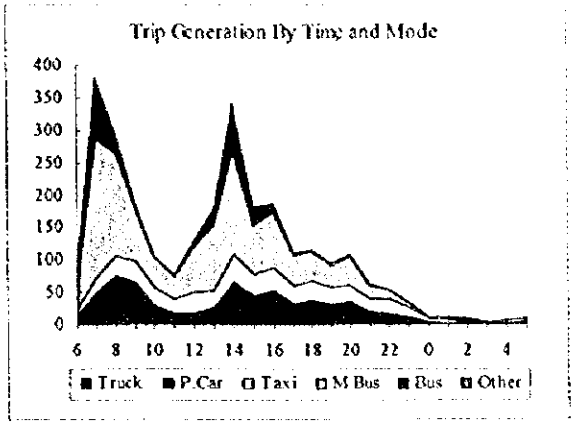
The daily trip production rate of driving license holders is 2.28 trips while that for non-holders is 1.04 trips. The reason why having a driving license strongly influences trip production rate, is that a reasonable volume of passenger car trips are done by car-users and not by car-owners.



Trip Production Rate by Driving License Holder

Hourly Fluctuation of Trips

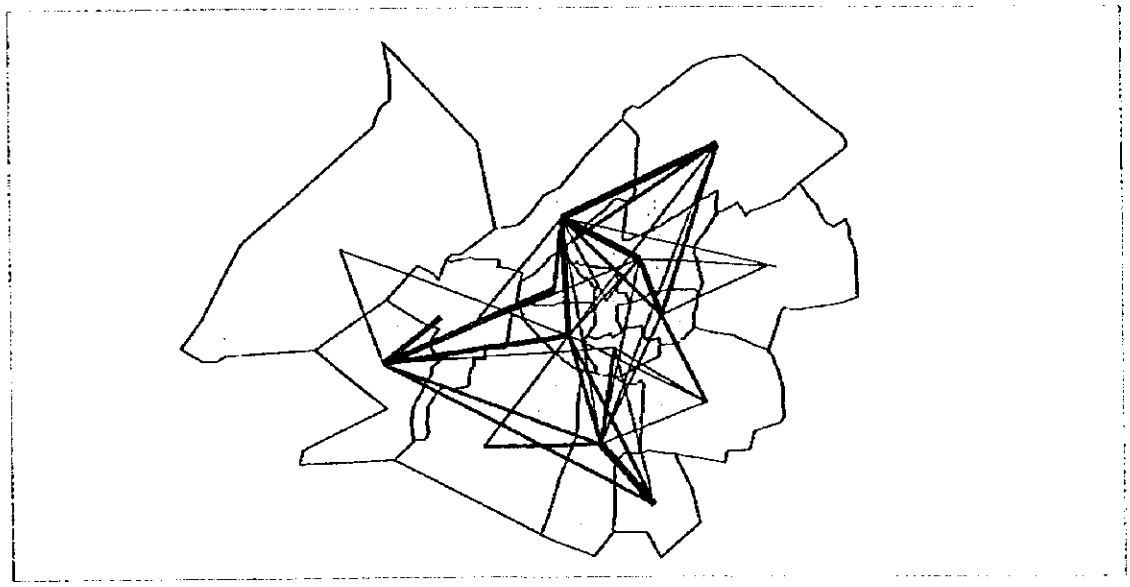
The morning peak for trips is within the time zone of 7:00 -- 8:00, mainly with the purposes of "go to work" and "go to school". The afternoon peak (14:00 – 15:00) is about 60% of the morning peak.



Trip Generation by Time and Purpose

Characteristic of Inter-Zonal Trips

Based on the results of the 23 integrated zones of the total 83 zones of Damascus City, about 40% of all trips generated in the City are intra-zonal trips. For inter-zonal trips inside the City, no significant connections between specific zones is observed. The considerably strong traffic flow is noted on each of the directions to the south, east and west from the northern part of the city.



Present Desire Lines (All Purpose, All Modes) (Planning, Area, 1998)

5. Traffic Demand in the Year 2020

Increase of Trips

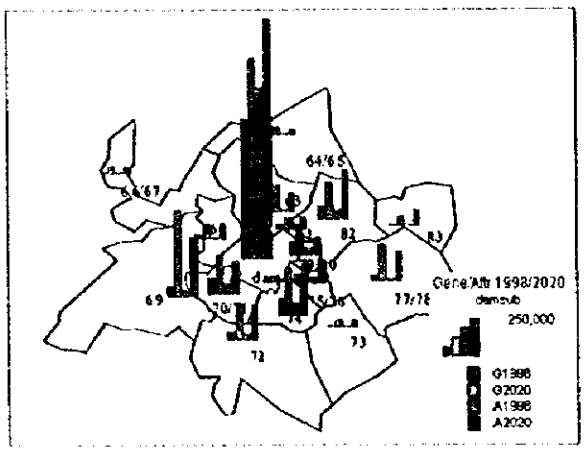
The number of daily trips, which was 4.26 million in 1998, is forecast to increase to 9.83 million trips in the year 2020. The amount of increase in trips is significant in the area outside of Damascus City.

Trip Indicators

	1998	2020	Remarks
Population	3,078,190	7,100,000	
Damascus City	1,488,124	2,000,000	
Damascus Countryside	1,590,066	5,100,000	
GDP/Capita	45,692	81,868	Syrian Pounds (1996)
Car Ownership by Household	32,256	113,498	Estimated by Person Trip Survey (1998)
Car Driving License Holders	91,209	200,342	Estimated by Person Trip Survey (1998)
Number of Trips	4,255,517	9,829,003	With walking trips

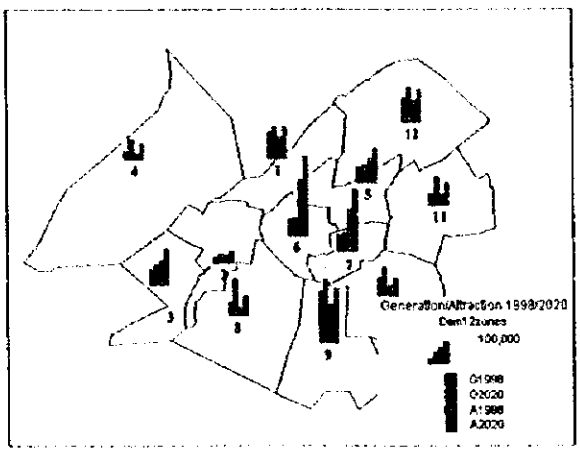
OD Structure

Population increase is significant in the area outside of Damascus City. Due to this population increase outside the City, of all trips of the study area the share of trips completed in Damascus City will decrease from 34% in 1998 to 15% in 2020. Furthermore the trips from outside Damascus City to the center of the City will increase from 26% in 1998 to 28% in 2020. The change that should be noted is that the trips completed outside of Damascus City will increase from 21% in 1998 to 35% in 2020.



Note: G: Generation A: Attraction

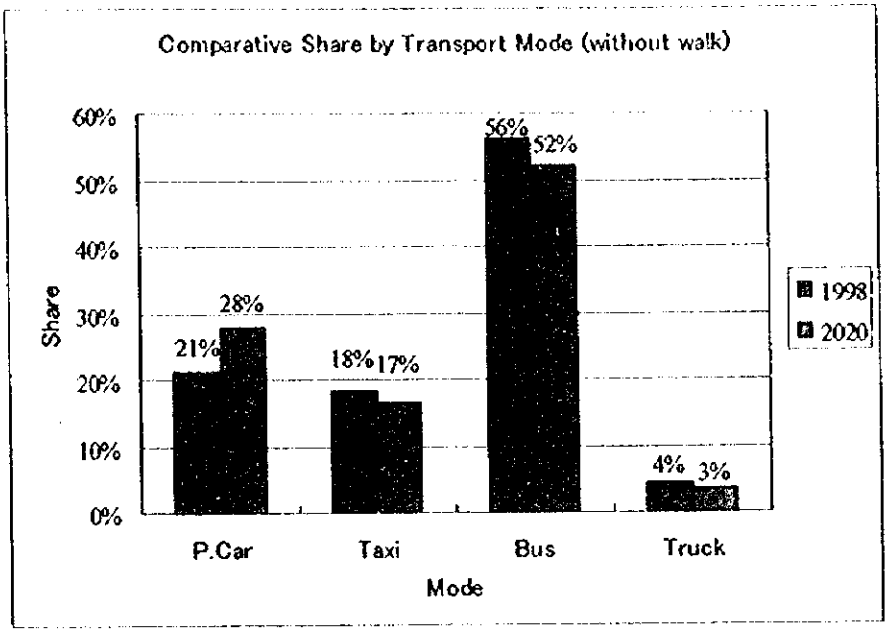
Trip Generation/Attraction (Study Area, 1998, 2020)



Trip Generation (Planning Area, 1998, 2020)

Change of Transport Modes

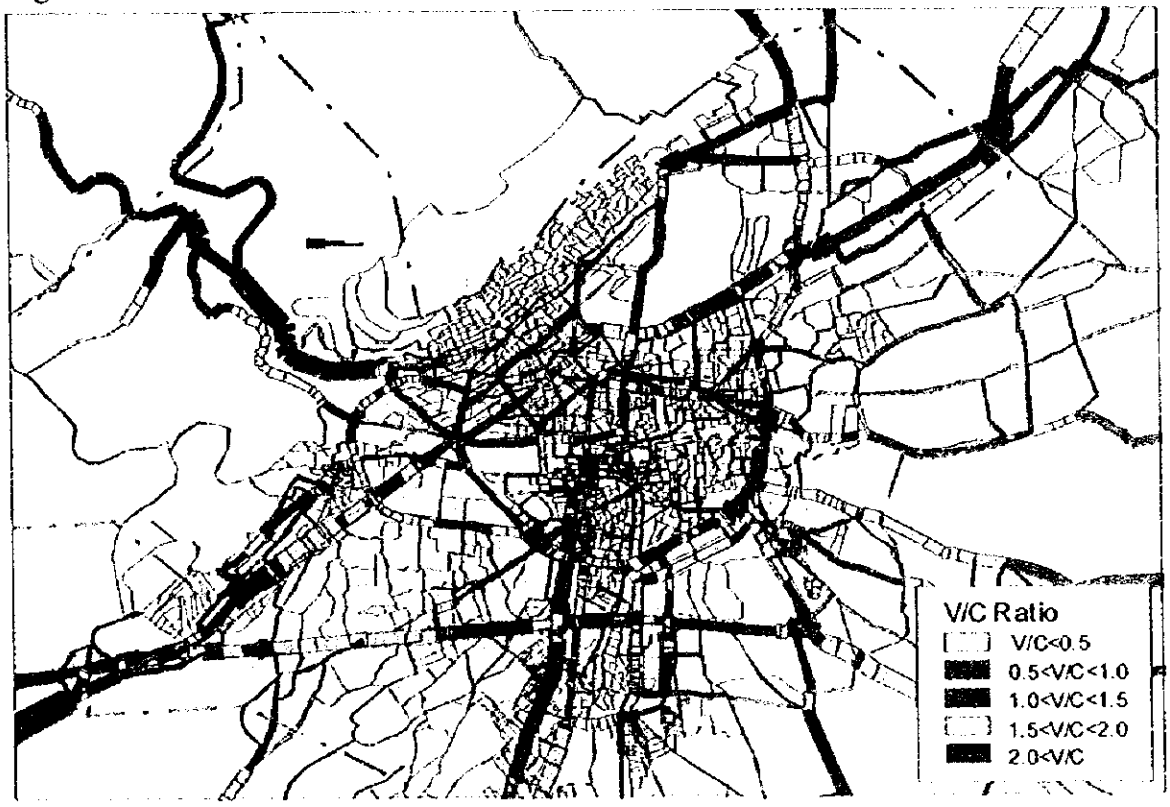
The share of passenger car trips is expected to increase from 21% in 1998 to 28% in 2020. On the other hand, trips by taxis and buses will decrease from 18% to 17% and from 56% to 52%, respectively.



Comparative Share by Transport Mode (without walk)

Do Nothing Case in 2020

In the case of implementing no improvements on the road network and public transport, which is the "Do Nothing Case", in the year 2020 radial arterial and ring roads will be congested to the extent of more than 1.5 times the road capacity.



Do Nothing Case in 2020

6. Master Plan Formulation Policy

Master Plan Components

The Master Plan is composed of three functional plans; the Road Plan, Public Transport Plan and Traffic Management Plan.

Planning Period

The Master Plan is divided into three-term plans, namely the Short-Term Plan with the target year of 2005, Middle-Term Plan with the target year of 2010 and Long-Term Plan with the target year of 2020. Accordingly, the planning schedule is divided into Phase 1 (2000-2005), Phase 2 (2006-2010) and Phase 3 (2011-2020).

Resources of the Projects

In setting the master plan financing plan it was agreed with the Syrian side that the Road Budget of Damascus Governorate shall be used as the financing source for the road and traffic management projects. On the other hand, private investments are used for the Public Transport Projects.

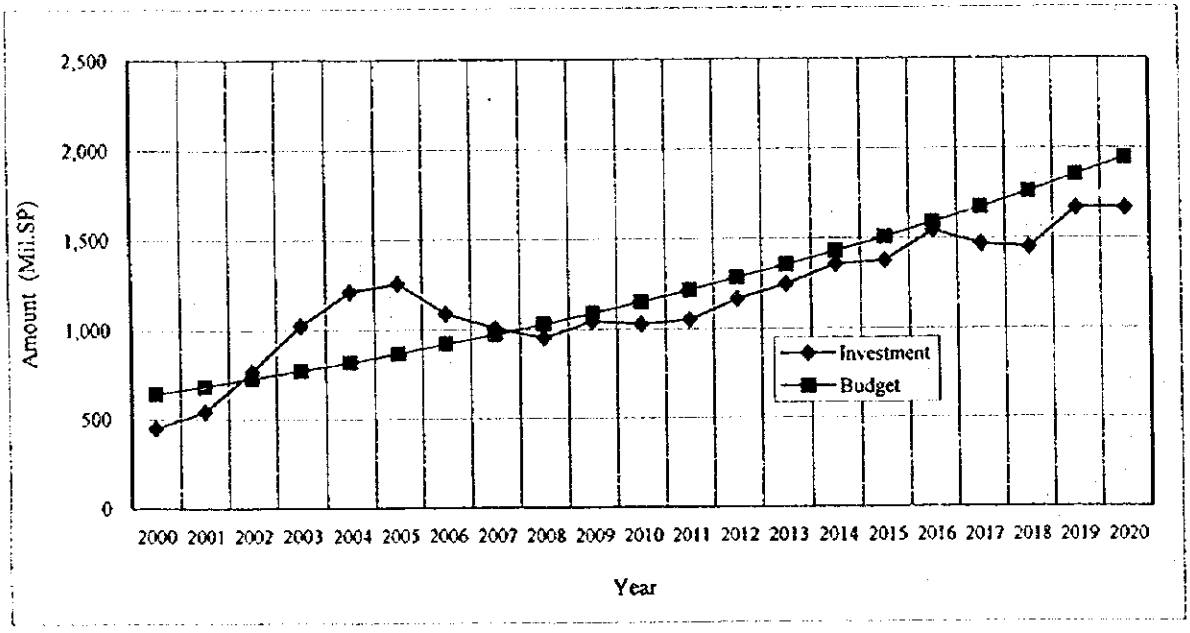
Basic Policy

The basic policies adopted for the Master Plan formulation were as follows;

1. To formulate a self sustaining transport network development plan maintaining
2. To formulate a master plan that makes effective use of existing facilities.
3. To establish a public transport plan securing profitability for bus operators with the present fare levels in order to induce private capital investment in the public transport sector
4. To introduce the BOT concept for promising projects
5. To conserve historical areas, buildings and antiquities

Road Network

Damascus City has a road pattern composed of radial arterial and ring roads. The network shall consist of 3 ring roads (one ring road at present) and the existing 11 arterial roads. Two arterial roads from north to south and east to west divide the central part of the city into four divisions surrounded by the inner ring road. The main objective of the master plan is to strengthen the road network composed of these arterial and ring roads.



Annual Investment (Road Projects)

Public Transport

In terms of modal share 47% of all trips excluding walking trips, on person base will be by microbus, while the taxi will handle 18%. The microbus transport service is cheap and convenient it creates congestion at boarding and alighting points. The M/P proposes introducing larger size buses on routes where heavy traffic demands are anticipated. The M/P financing plan calls for renewal/reinforcement of bus fleet to be financed by investments from the private sector.

In connection with enforcing parking control in the city center, conversion of a part of passenger-car use trips to taxi use trips is urgently required because trip conversion from passenger car to bus is not anticipated in the near future. A new taxi service with good quality vehicles shall therefore be introduced. Consequently, there will be two classes of service for taxi; one comparatively expensive and with good quality cars, and the second offering cheaper fares as the present.

As for introduction of railway commuting system, this is examined after the year 2010 because the demand before that will not justify the high investment costs incurred in this project.

Traffic Management

The road network of Damascus City enjoys a high road capacity ratio. Large buildings located along arterial roads, complicate widening or new construction of roads. On the other hand, traffic load to rotary intersections is much higher than loads to usual four-leg intersections. Most traffic congestion occurs at rotary intersections. Therefore, improvement of intersections will have a large effect on increasing the road network in the city center. Improvement of intersection control was considered in two steps, the first by installation of traffic signal system. In cases where the traffic signal system was evaluated as insufficient, then as a second step grade-separation was examined.

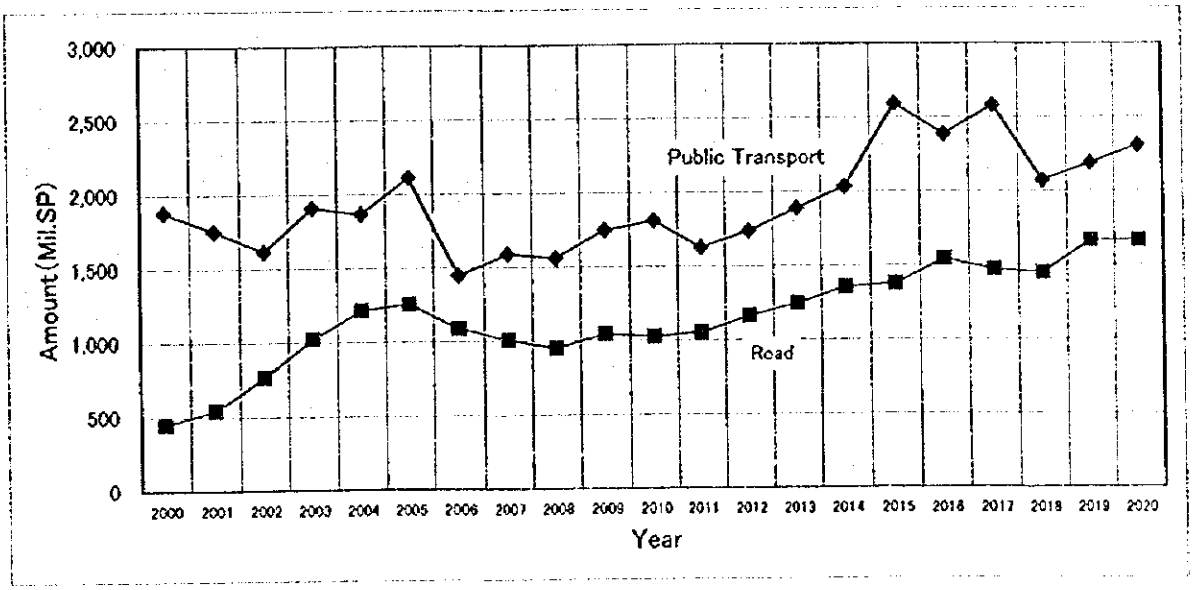
Decrease of the road capacity due to the on-street parking in the city center is a pressing issue. On-street parking control shall be enforced in the central area coupled with the construction of off-street parking facilities. The M/P considers BOT schemes for the construction of such facilities.

Budget and Investment Scale

The road budget of Damascus Governorate shall be used for financing both Road and Traffic Management Projects of the M/P. Estimated budget amount is 9.01 billion SP in the first 5 years including repair and maintenance costs, 10.3 billion SP in the second 5 years and 31.2 billion SP for the last 10 years.

Private capital shall be used for Public Transport Projects. Required investments are 10.5 billion SP in the first 5 years, 8.1 billion SP the second 5 years and 21.5 billion SP for the last 10 years.

The M/P considered the construction of five multi-storey parking facilities in the City center utilising BOT schemes. The amount of investments is 0.5 billion SP in the first 5 years and 0.2 billion SP for the second 5 years.



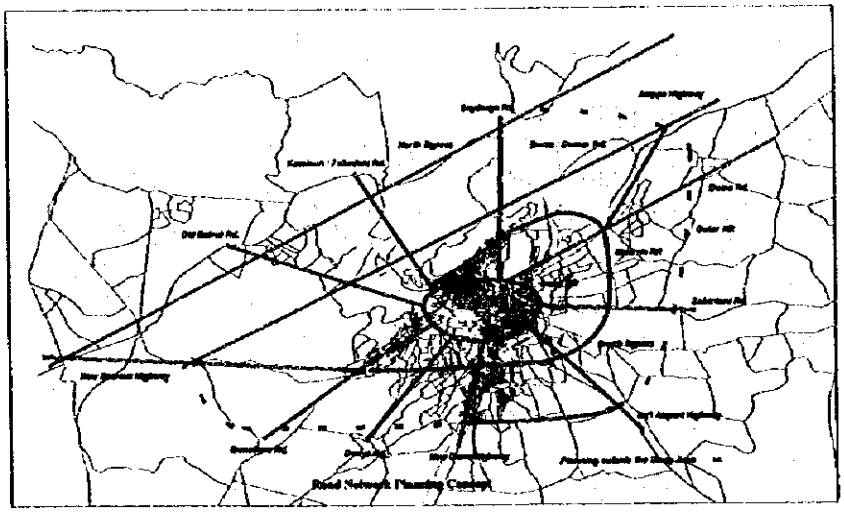
Annual Investment

7. Road Plan

Basic Planning Policy

The basic policy to formulate the master plan of road network development is summarized as follows;

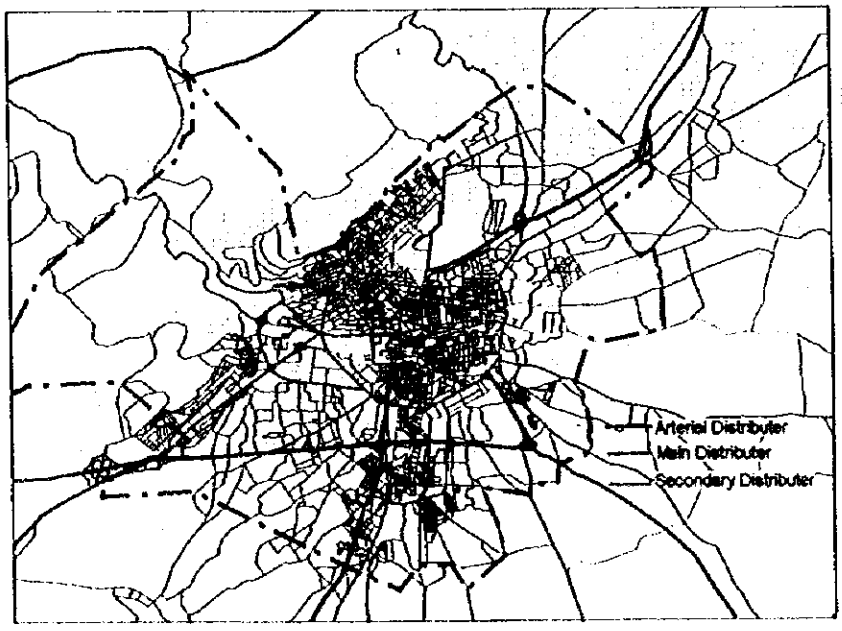
1) To complete the skeletal structure of the road pattern.
2) To minimize construction works in urbanized areas by applying traffic management techniques for solving transport issues.
3) To improve efficiency of existing facilities.
4) To support improvements for increasing efficiencies of public transport systems.
5) To develop road infrastructures in coordination with the land use plan.



Road Patterns (Planning Area)

Road Classification

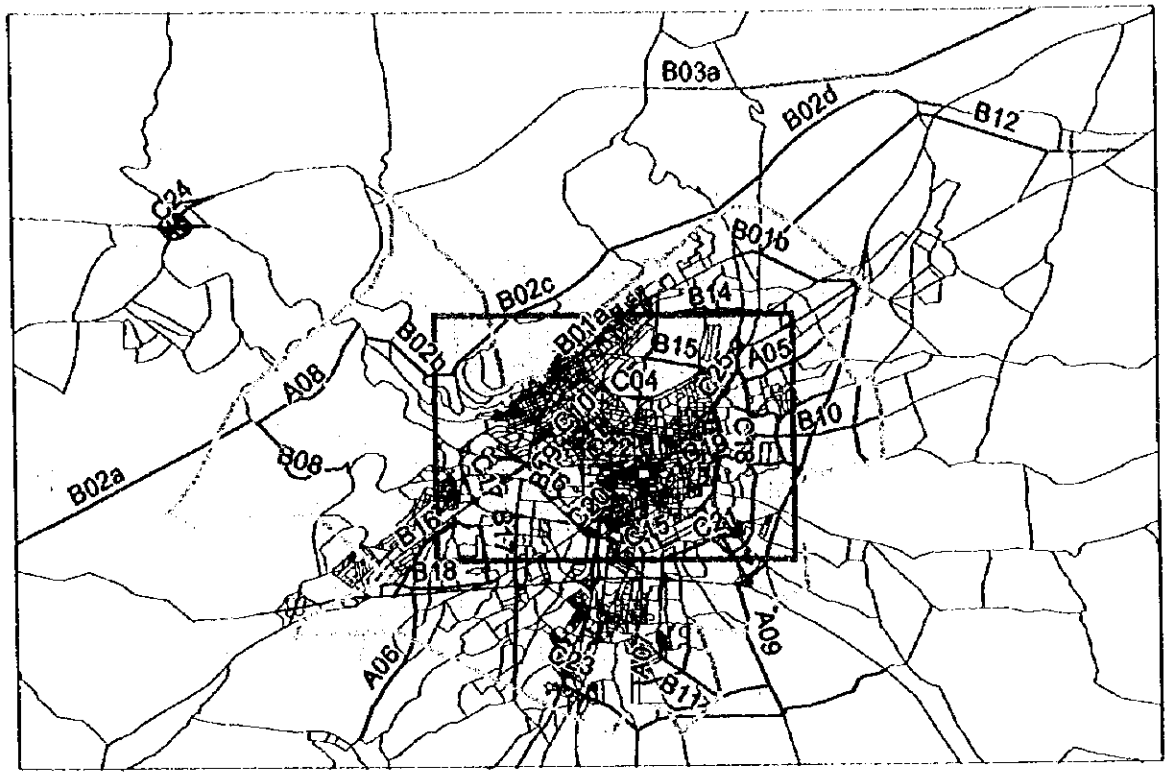
Roads are classified into arterial, auxiliary arterial, main distributor and secondary distributor.



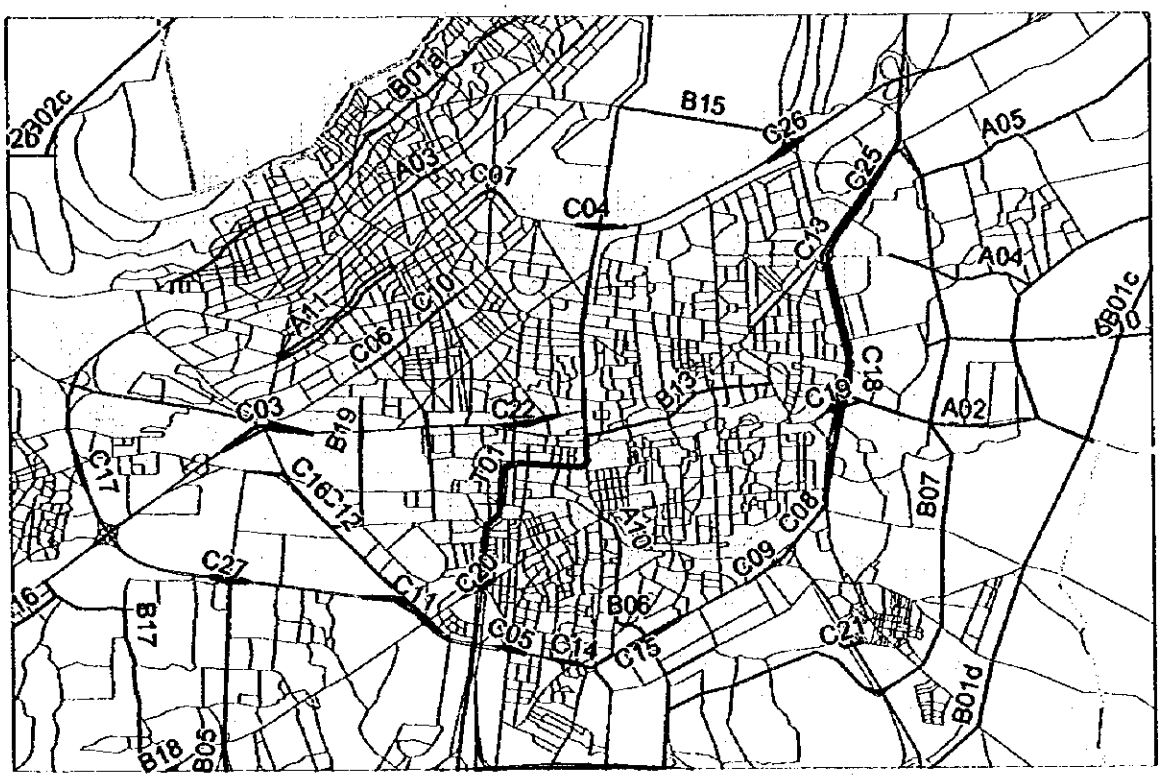
Road Classification

Road and Structure Project

Out of a total of 59 projects considered in a long list of projects, 50 projects were adopted as master plan projects.



Locations of Road Projects

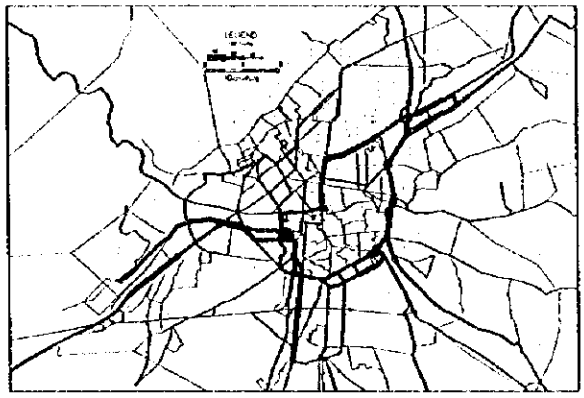


Locations of Road Projects (Central Part of Damascus)

8. Public Transport Plan

Passenger Flow

The flows of bus passengers in 1998 and in 2020 are shown on the bus network of 1998. The two patterns are similar but the flow of the passengers in the south west to north east direction will heavily increase.

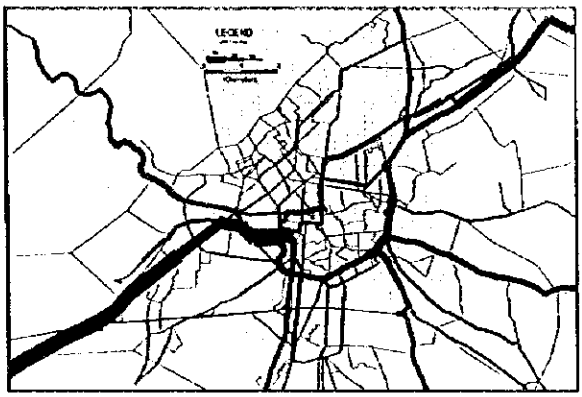


Bus Passenger Flow (1998)

Basic Planning Policy

The basic planing policy to formulate the public transport M/P is summarized as follows:

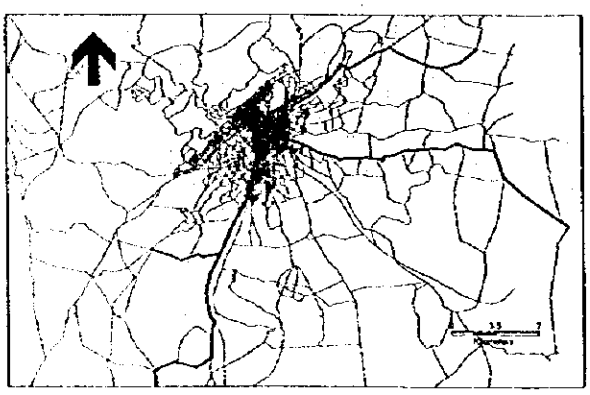
1) Private bus operation shall be maintained with more efficient operation.
2) Larger size buses shall be introduced on routes where congestion due to large number of small buses exists or is forecast. On a limited number of such routes trunk bus system will be introduced.
3) Bus terminals located within the inner ring road shall serve as transfer terminals.
4) Railway shall be the basic mass transport mode in the future through modernization of the existing railway network.



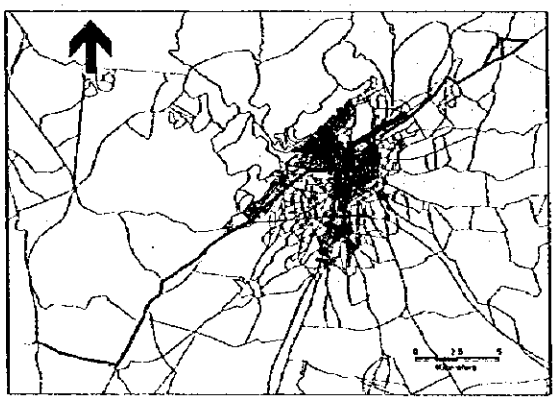
Bus Passenger Flow (2020)
(Bus Network (1998))

Lager-Size Bus

Lager-Size Buses shall be introduced in correspondence to the increase in number of passengers. Buses of 105 passengers capacity shall be operated on 3 routes, 50 passengers capacity buses on 9 routes and 25 passengers capacity buses on 10 routes until 2020.



Bus Routes with 105 Passenger Buses (2020)



Bus Routes with 50 Passenger Buses (2020)

Transfer Terminal

Bus rerouting scheme has been designed to classify existing routes into trunk lines and feeder lines. There will be three transfer terminals to serve passengers connecting between trunk and feeder lines, namely, President Assad Bridge Transfer Terminal, Kabuon Transfer Terminal and Mezzeh Transfer Terminal. The public-transport modes from Baramkeh Terminal and Abbas Terminal shall converge into Assad Bridge Transfer Terminal which is conveniently located to serve traffic entering Damascus City from the south and the west. This terminal shall be considered as the central terminal of Damascus City and will accommodate the largest number of transfer passengers. Kabuon Transfer Terminal shall serve as the city's eastern entrance, while Mezzeh Transfer Terminal the western entrance.

The reinforcement of the bus fleet and the construction/operation of the terminals is expected to be managed by the private sector.

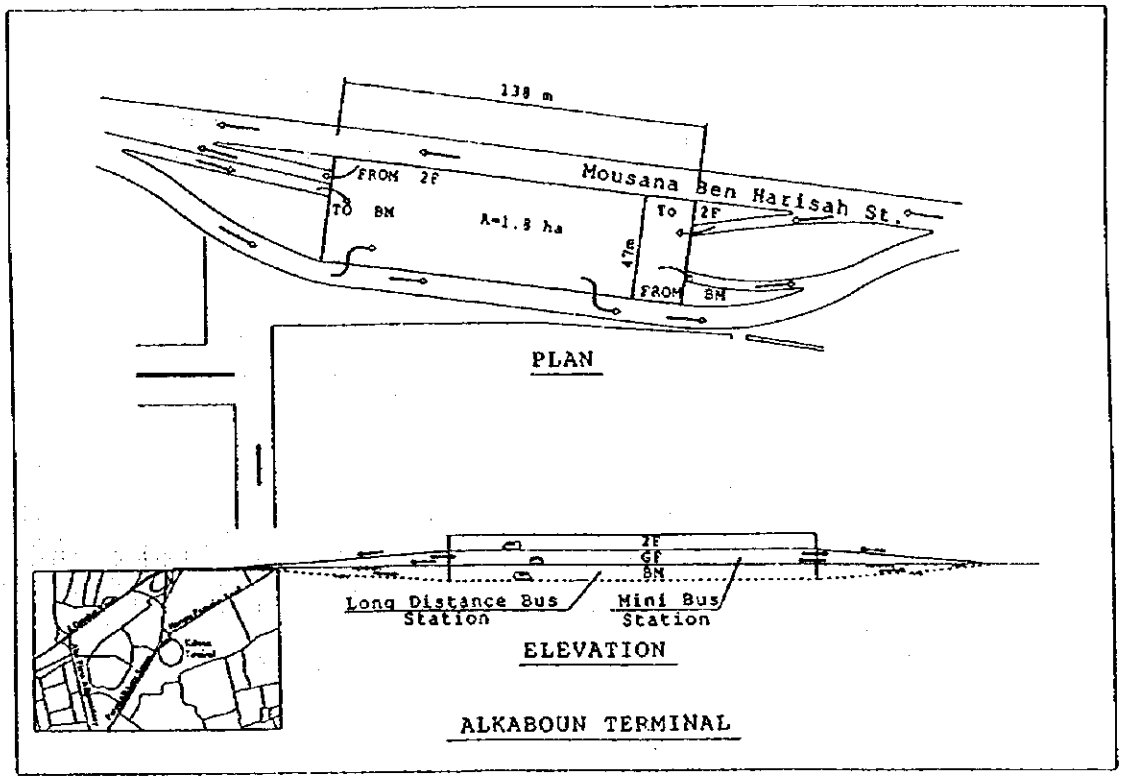
Construction and operation by the private sector is feasible with changes in fare system from the present fixed fare to distance base fare.

Taxi

Taxi is expected to be the only feasible means to induce conversion from passenger car users to public transport use. To realise this objective, a higher quality taxi service with different fare system shall be introduced. Accordingly, two different taxi fares shall coexist.

Railway

According to the forecast of public-transport demand and budgetary limitations, the modernization of the existing railways shall be necessary around 2020. Detailed studies for modernization of the existing railway and introduction of commuting railway systems should start around 2010 in coordination with the development of Damascus Metropolitan Area.



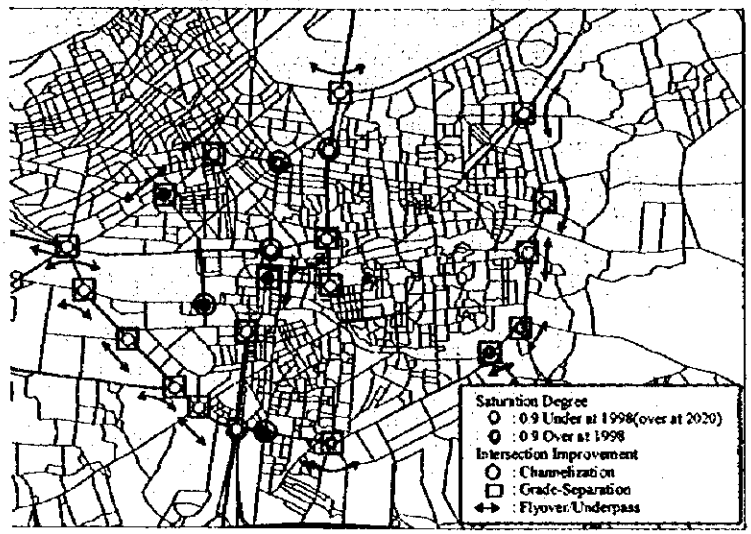
Kaboun Bus Terminal

9. Traffic Control Plan

Intersections

The crowded intersections are observed along
1) the north-to-south corridor which connects the south entrance road and Ath Thawra, and
2) the Inner Ring Road.

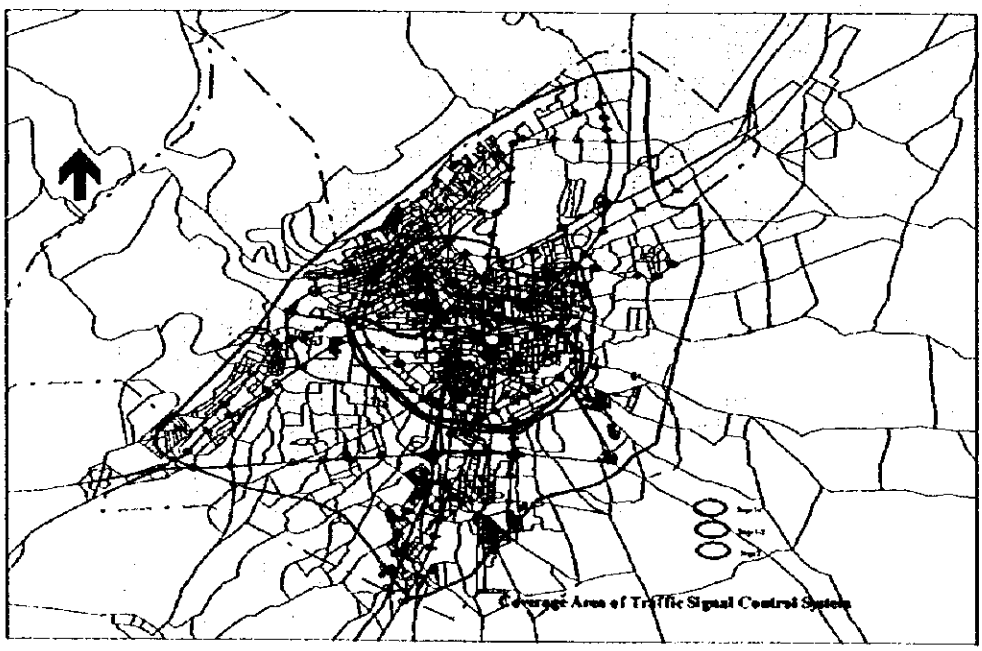
Improvement of the congested intersections are planned in two phases as follows:
1) improvement of traffic signal system, and
2) construction of underpass when traffic signal improvement is not sufficient to solve the traffic congestion.



Improvement of Intersections

Area Traffic Control (ATC)

Traffic signals on and inside the Inner Ring Road are systematically controlled by segment operation under an ATC system at the first stage improvement project. After completion of the first stage, it is planned to expand the ATC system to cover all the signals in Damascus City, under stage 2 improvement project.

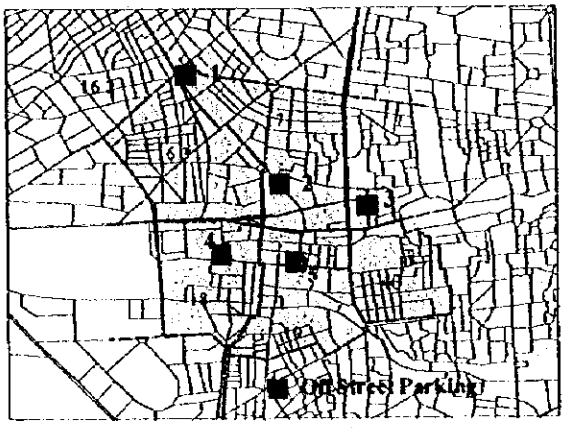


Improvement of Traffic Signals

Parking Control

Parking control shall be enforced in the central area of the city in areas where the demand far exceeds the supply. The construction of off-street parking facilities in this area is given high priority and a charge system for on street parking shall be established before enforcement of parking control. Parking control is valid only during day time considering that most of the residences in the area do not have parking facilities.

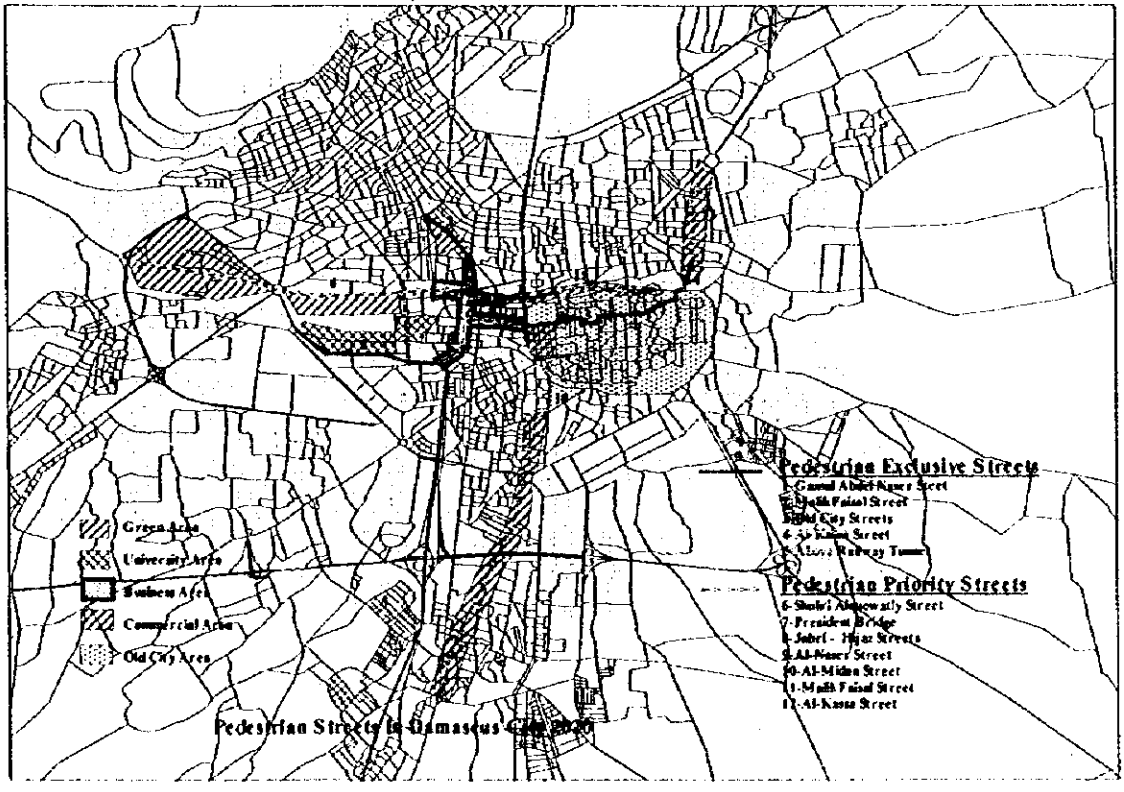
Peak Hour Parking Supply Demand Balance (1998)



Off-Street Parking Facilities Locations in 2020

Pedestrian Road

Pedestrian roads of exclusive use or priority use are planned to be extended to the south, north and west directions from the Old Damascus area.



Pedestrian Streets

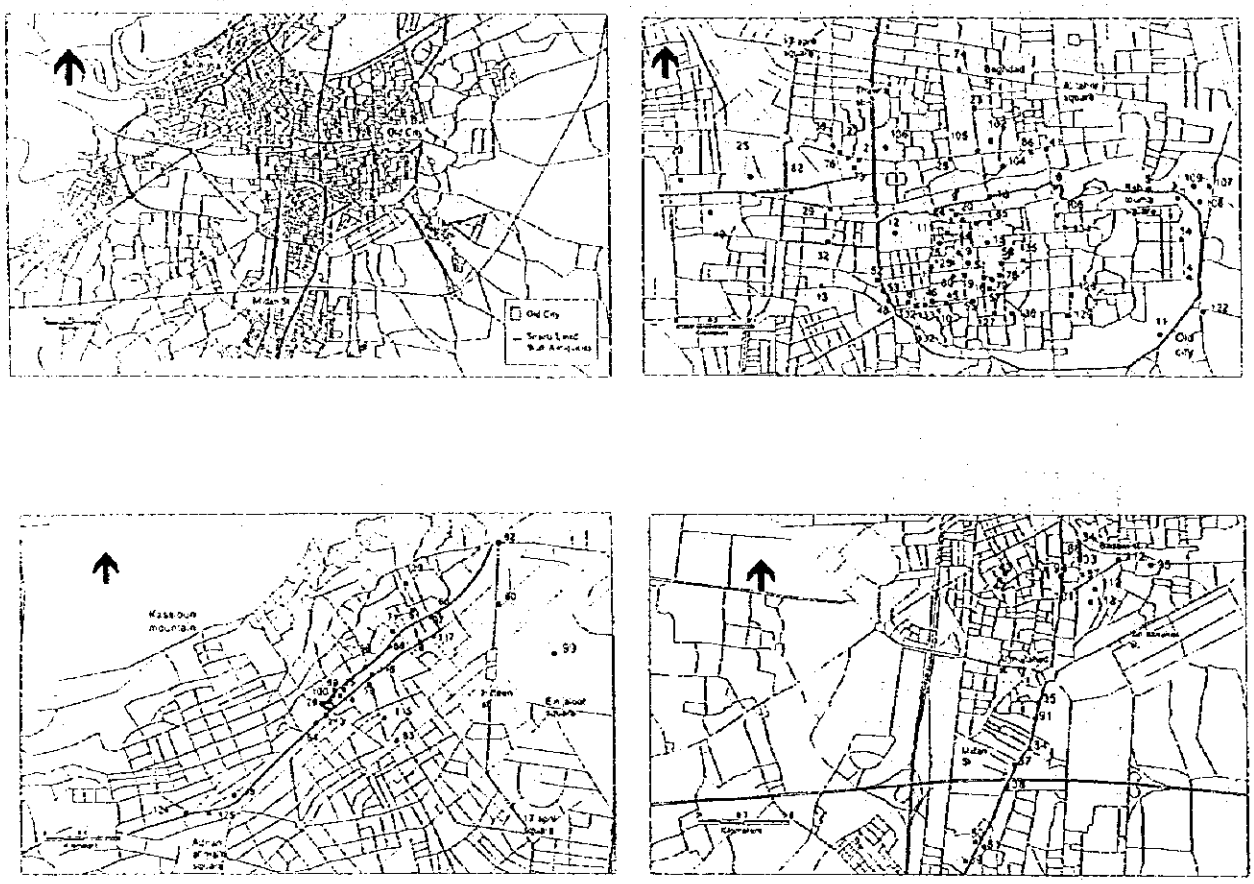
10. Environment

Preservation of Antiquities

Locations of antiquities were surveyed and construction works are planned to avoid areas near the antiquities.

Resettlement

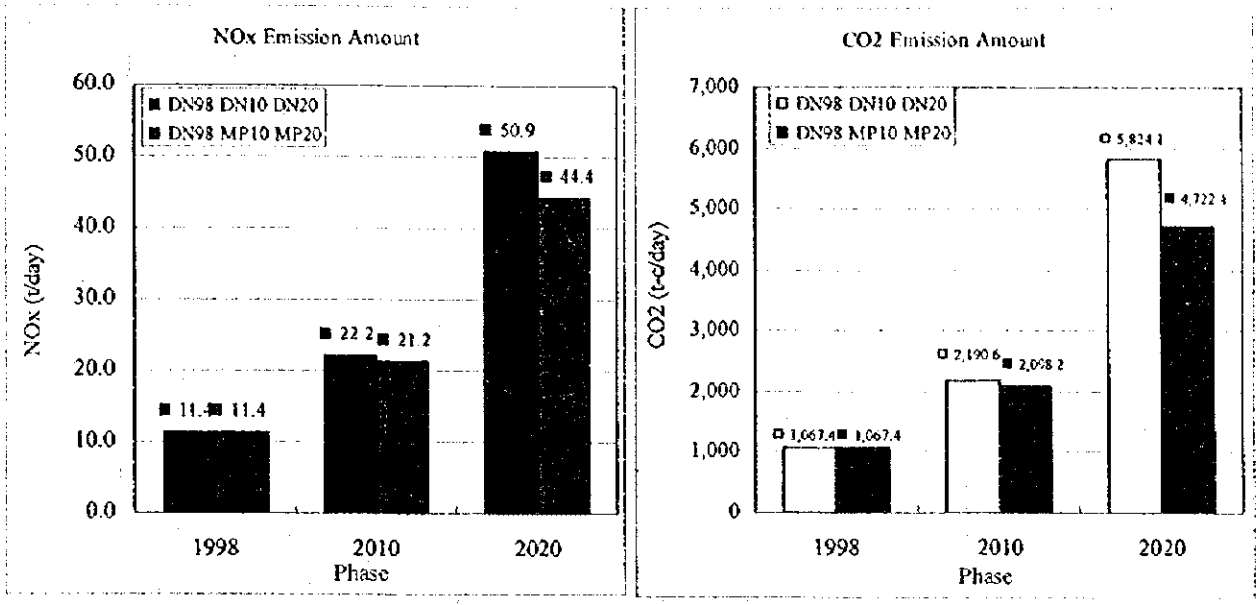
It is planned to maintain resettlement of inhabitants to the minimum. Most of the projects which require resettlement are arranged to be in the second half of the planning period to give Damascus Governorate enough time for completion of the usually lengthy resettlement process.



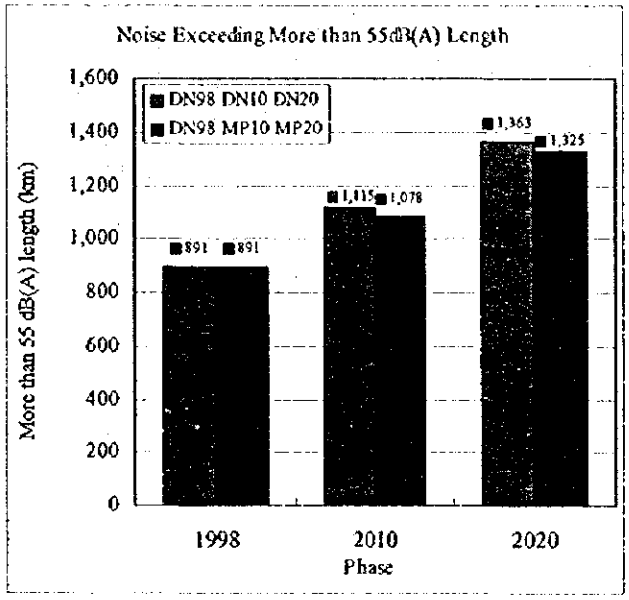
Locations of Cultural Heritage

NOx, CO_2 ,dB(A)

Increase of pollutant emissions due to increase in vehicle-km in the future is unavoidable. Implementation of the M/P, can however ease this situation. Estimation of emission amounts shows that NOx and CO_2 emission in the "With M/P" case are reduced to 12.8% and 18.9% respectively when compared to "Without M/P" case in 2020. In case of noise pollution, total length of roads with more than 55dB(A) is also reduced by 2.8% in the "With M/P" case in 2020.



Estimation of NOx and CO_2 Emissions

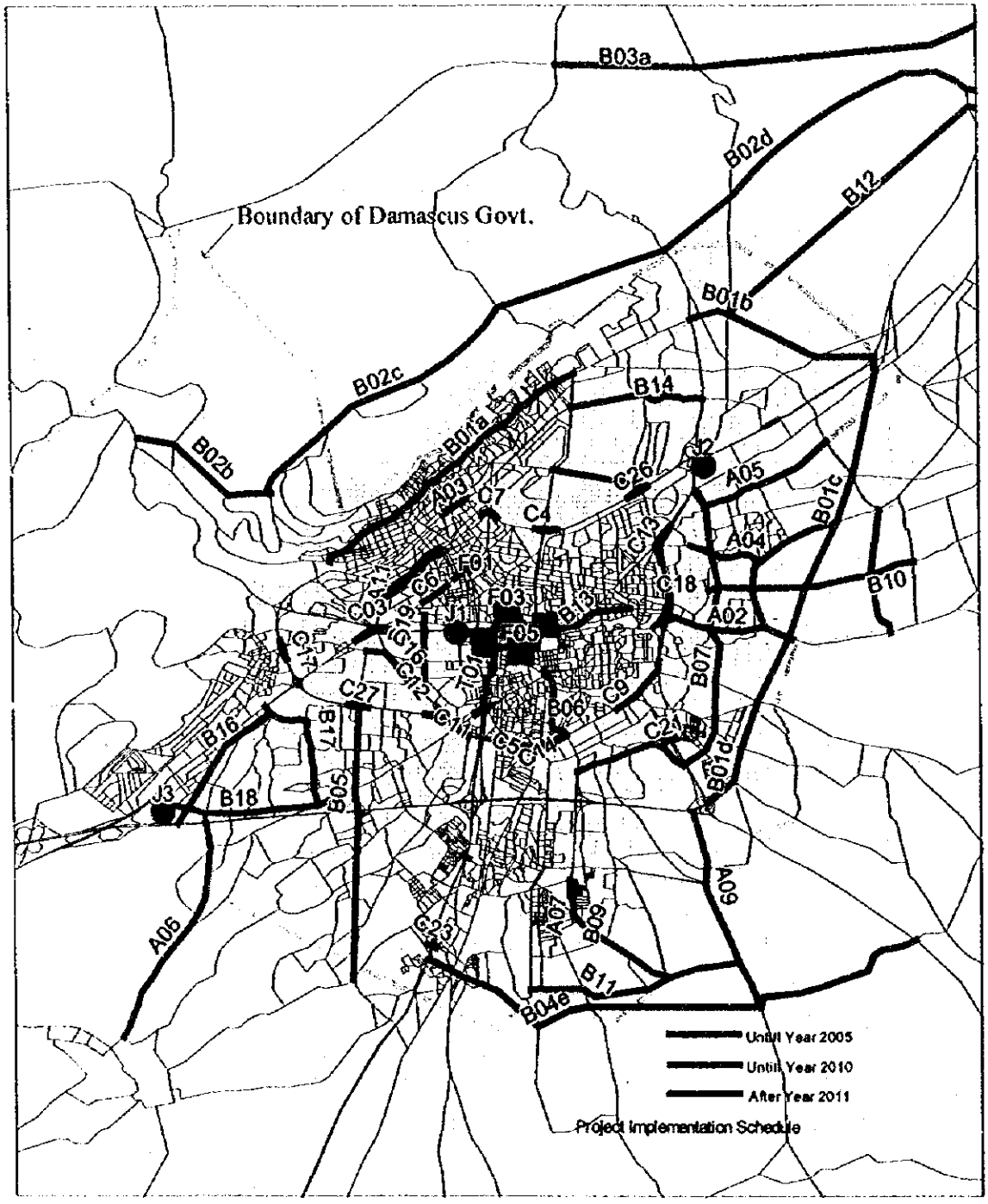


Total Length of Roads with more than 55dB Noise Level

11. Master Plan

Road Network Development

Road improvement projects including widening and new construction of roads and structures as well as the traffic control projects shall be implemented by the budget of Damascus City. These projects specified by the Master Plan are all within the ceiling of the estimated budget scale. The Economic Internal Rate of Return (EIRR) of the Master Plan is calculated as 52%.



Master Plan Project

Public Transport and Parking Buildings

Investment from the private sector is expected for renewal/increase of bus/taxi fleet, and the construction of bus terminals and off-street parking facilities. Changing the fare system from the present flat fare system to a distance based fare can cover the necessary investment costs. The Net

Present Value (12% of the discount rates) of total public sector activities until 2020 is estimated as 5.95 billion SP. BOT scheme for operation of the off-street parking facilities is also a credible option.

Project		Length (m)	Cost ('000)	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
A		Widening Project																						
A02		1,700	43,578																					
A03		350	87,972																					
A04		1,900	92,009																					
A05		1,800	349,432																					
A06		3,000	345,392																					
A07		4,000	460,523																					
A09		2,000	266,574																					
A10		350	126,114																					
A11		1,000	26,111																					
B		New Road Construction Projects																						
B01	a	3,000	1,103,055																					
	b	4,200	1,052,879																					
	c	4,000	688,052																					
	d	3,000	908,128																					
B02	a	5,000	441,081																					
	b	2,000	280,216																					
	c	3,000	333,838																					
	d	4,000	387,459																					
B03	a	4,000	387,459																					
	b	5,000	268,108																					
B04	c	6,000	2,397,432																					
B05		4,000	2,338,652																					
B06		700	341,171																					
B07		6,400	2,092,068																					
B10		1,200	382,341																					
B11		3,400	656,491																					
B12		5,000	793,483																					
B13		1,500	960,068																					
B14		2,000	1,033,095																					
B15		1,100	568,202																					
B16		2,000	542,087																					
B17		1,100	298,148																					
B18		1,500	406,566																					
B19		1,400	397,160																					
C		Structure Projects																						
C01		2,120	1,247,400																					
C03		940	646,800																					
C04		250	184,800																					
C05		210	155,232																					
C06		210	77,616																					
C07		200	73,920																					
C08		300	110,880																					
C09		225	83,160																					
C10		300	110,880																					
C11		450	332,640																					
C12		200	73,920																					
C13		270	199,584																					
C14		600	337,501																					
C16		250	92,400																					
C17		300	221,760																					
C18		450	332,640																					
C19		400	147,840																					
C20		50	36,960																					
C21		150	110,880																					
C22		100	73,920																					
C23		300	110,880																					
C24		1,000	184,800																					
C26		200	147,840																					
C27		200	147,840																					
D		ATC System																						
D01		28 int	328,500																					
D02		39 int	291,700																					
D03		63 int	524,000																					
E		On Street Parking Facility																						
E01		1,500 m	64,000																					
F		Off Street Parking Facility																						
F01		500 lots	308,920																					
F02		200 lots	87,000																					
F03		200 lots	375,000																					
F04		320 lots	140,000																					
F05		240 lots	105,000																					
G		Pedestrian Exclusive Streets																						
G01		650 m	16,250																					
G02		400 m	10,000																					
G03		1,400 m	35,000																					
G04		200 m	5,000																					
G05		1,200m	30,000																					
H		Pedestrian Priority Streets																						
H06		3,000 m	30,000																					
H07		800 m	8,000																					
H08		500 m	5,000																					
H09		500 m	5,000																					
H10		2,800 m	28,000																					
H11		1,100 m	11,000																					
H12		750 m	7,500																					
I		Pedestrian Crossing Facilities																						
I01		5 sites	50,000																					
I02		85 sites	25,000																					
J		Bus Fleet Reinforcement																						
J01		Bus Fleet	28,104,000																					
J02		Assad Bridge	390,000																					
J03		Kaboun	134,000																					
J04		Mezzeh	204,000																					
Grand Total (Million SP)			57,102	2,092	2,531	2,509	2,859	2,531	2,988	2,695	2,778	2,576	2,758	3,581	3,400	3,510	3,395	2,709	1,854	1,908	1,942	1,956	2,147	2,142

Master Plan Investment Schedule

12. FS Projects

In order to meet the urgent requirements for the alleviation of traffic congestion on high traffic volume streets and squares, and for the provision of off-street parking facilities to correct the present insufficiency, the following projects were selected for feasibility studies, based on the established multi-criteria prioritisation procedure.

(1) Instalment of ATC (Area Traffic Control) System

The ATC System Instalment Project includes two (2) stage implementation of which Stage 1 covers the Inner Ring Road and central areas within it, and Stage 2 covers the remaining signals in the city. Feasibility study was executed for Stage 1.

(2) Improvement of Intersections and Construction of Tunnel Road

Three grade-separation projects were selected at Umawyeen Square, Al Yarmouk Square as well as the construction of Hejaz Tunnel. For the Hejaz Tunnel two alternative alignments are proposed: one alternative away from Damascus Citadel to avoid the possibility of unearthing antiquities (Tunnel A), and the other is adjacent to the Citadel (Tunnel B).

(3) Construction of Off-Street Parking Facility

This project includes the construction of an underground parking facility in Arnous square

Implementation Schedule of FS Projects

Project Name	Investment Cost (Million SP)	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
ATC System Installment	Stage 1-1 328.5 Stage 1-2 291.7										
Umawyeen Sq. Underpass	646.8										
Al Yarmouk Sq. Underpass	337.5										
Hijaz Tunnel Plan A	1,247.4										
(Hijaz Tunnel Plan B)	308.9										
Arnous Parking Facility	218.0										
1US$ = 42SP											

Intersection Traffic Improvement Project Package

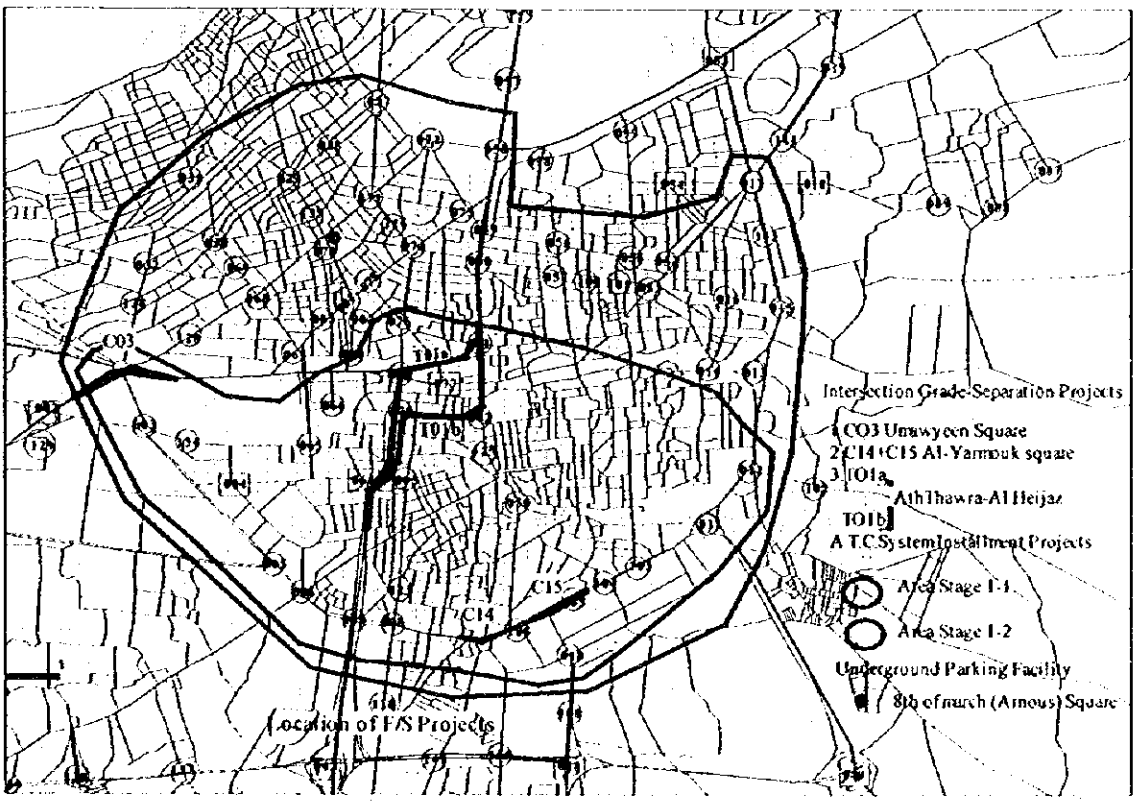
Among the proposed FS projects, the instalment of ATC system, projects for improvement of intersections and construction of the Hejaz tunnel are integrated as one project package, which will be implemented by public investment for the alleviation of traffic congestion at intersections and in the city center.

BOT (Build, Operate and Transfer) System for Construction of Parking Facility

The construction of off-street parking facility shall be implemented by BOT scheme, in which the Governorate will provide public lands while the private sector will construct and operate the facility during the contracted period, and then transfer it to the Governorate. Two alternative cases were studied; one to construct an underground parking area only (Case 1), and the other to construct a commercial building with the facility (Case 2).

The investment period of FS projects is scheduled to be ten years from 2000 to 2009. The amounts of public investment for the package of instalment of ATC system, improvement of intersections and construction of Hejaz tunnel will be 2,852 million SP in Tunnel A Case and 2,462 million SP in Tunnel B Case. The private sector investments for the off-street parking facility will amount to 309 million SP in Case 1 and 525 million SP in Case 2.

The EIRR (Economic Internal Rate of Return) of the public investment for the project package is about 12% (no significant difference is recognized between Tunnel A Case and Tunnel B Case). This figure means that the project package is feasible for implementation. The FIRR on equity of the private sector investment is 18% (increase in construction cost in Case 2 is assumed to be paid by the building owner). It is necessary to study in more detail tax exemption possibilities, period of BOT contract as well as other incentives



Locations of FS Projects

13. Intersection Traffic Improvement Project Package

Grade-separation of Umawyeen Square

Grade-separation of Umawyeen Square will be implemented as the first project for the improvement of the east-west transport corridor to be directly followed by other planned projects along the same corridor. Five alternative schemes were studied and one scheme was selected. The selected scheme shall provide a grade separation structure in which a 2-way underpass is proposed to connect Shoukry Al Qouwatly street, on the city center side, with Faez Mansour motorway, to the west of the city, with two lanes in each direction. In addition, this scheme has one branch for the underpass to handle traffic in one direction from Shoukry Al Qouwatly street to Jawaher Lal Nehru street for the direction of Dummar.

If the alignment of Barada river can be shifted, the underpass length will be 740 meters, 200 meters shorter than in the case of keeping the river as it is. After discussions with the Syrian side, however it was realized that shifting the river alignment will be socially disputable, and was therefore avoided.

The construction period is scheduled for 4 years from 2001 to 2004, and the investment amount is estimated as 646.8 million SP.

The grade-separation of Al Yarmouk Square

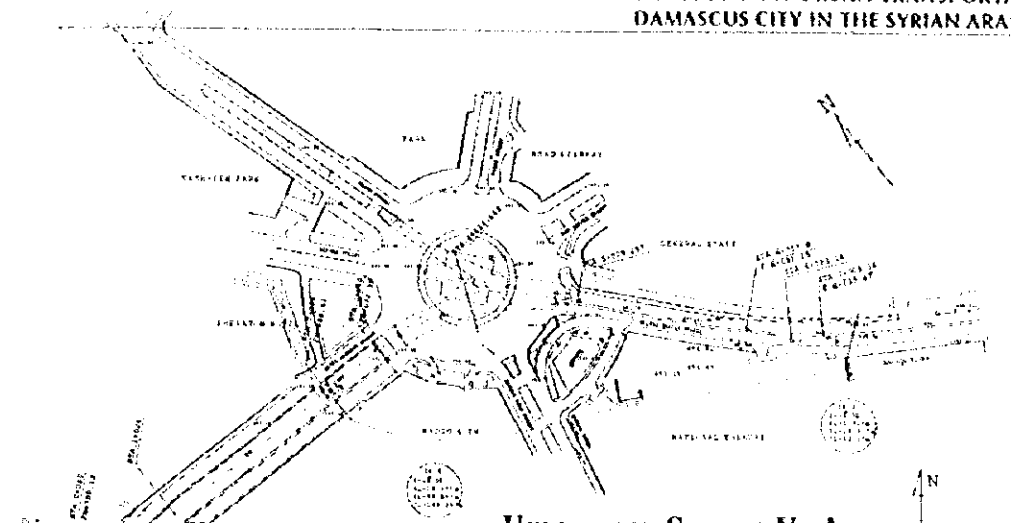
The grade-separation of Al Yarmouk Square will be implemented as one of the traffic improvement projects on the Inner Ring Road. Four alternative schemes were studied and one was selected. The selected scheme is to construct a 600 meter 2-way underpass with two lanes in each direction, under both of Al-Yarmouk Square and the intersection with Al Quds Street.

The construction period is scheduled for 4 years from 2001 to 2004, and the investment amount is estimated at 337.4 million SP.

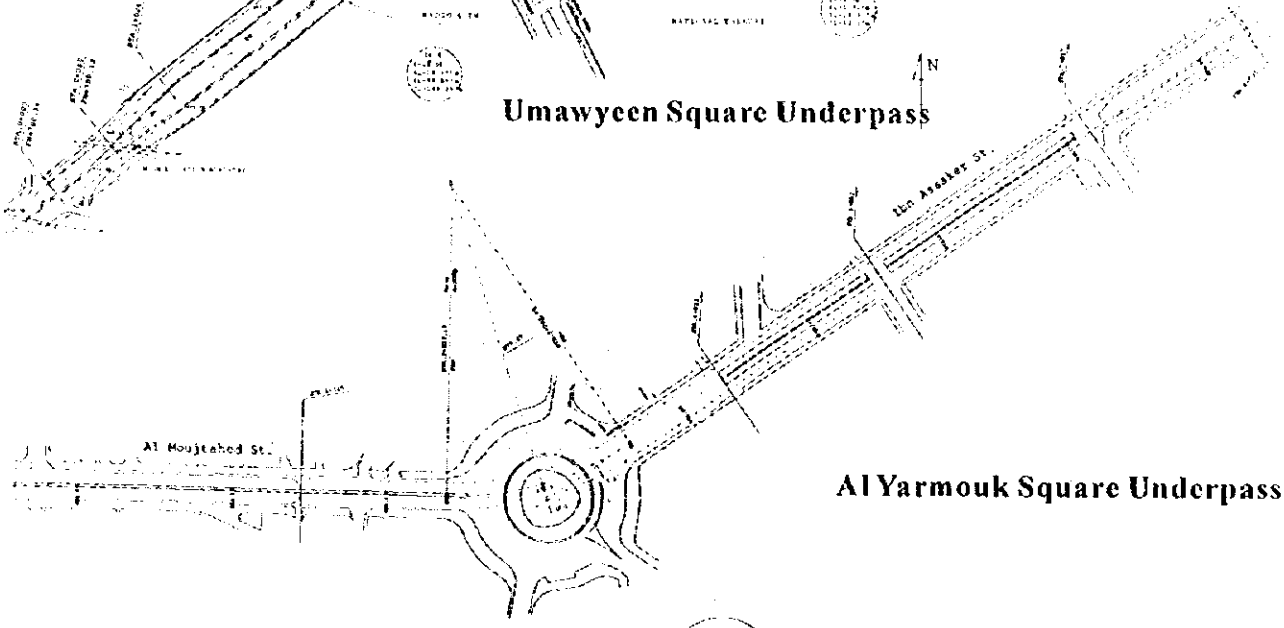
Construction of Hejaz Tunnel

Hejaz Tunnel is intended to complete the north-south transport corridor connecting Ath Thawra street and Othman Ibn Afaan street, and will alleviate the present traffic congestion around Hejaz Station area. Seven alternative schemes were studied and have been narrowed down to two schemes. The first is to construct a long tunnel of 1,180 meters away from Damascus Citadel (Tunnel A), and the second is a shorter tunnel of 740 meters adjacent to the citadel (Tunnel B).

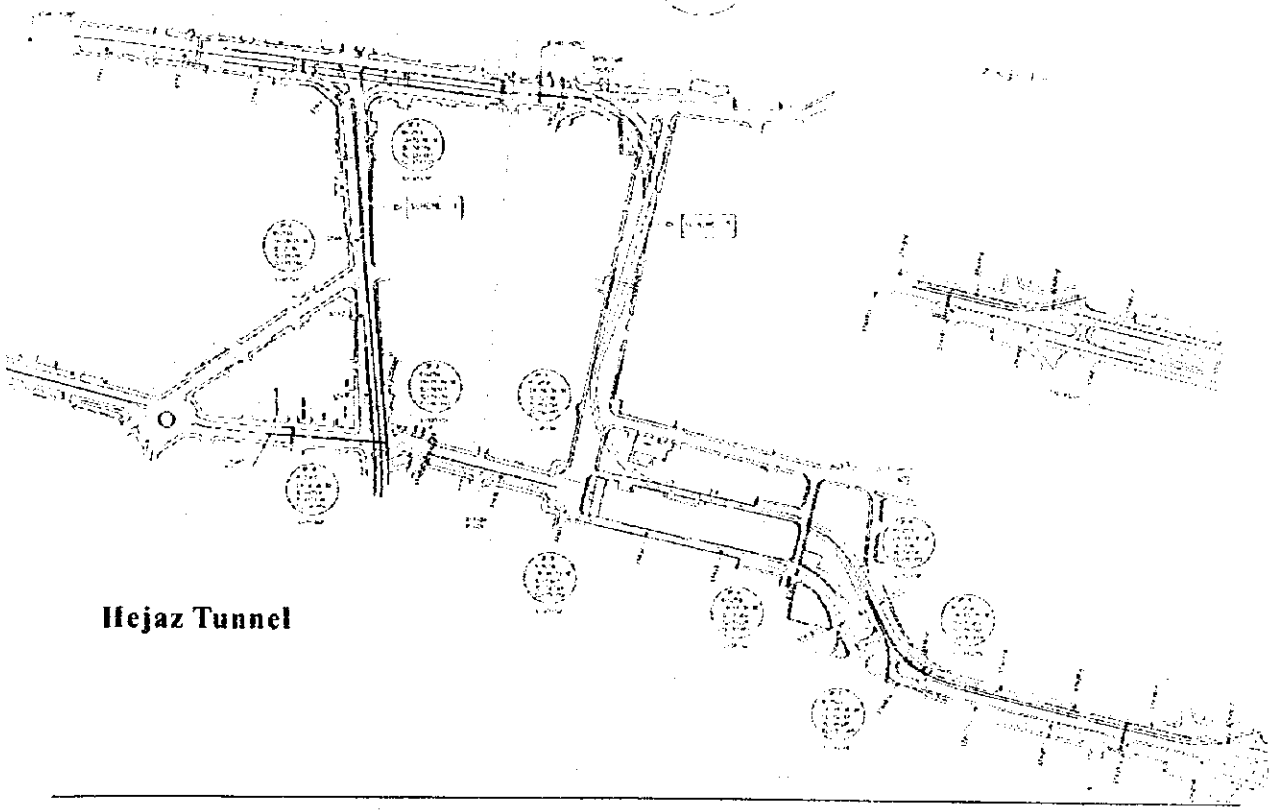
The construction period is scheduled for 5 years from 2005 to 2009, and the investment amounts are estimated at 1,247.4 million SP for Tunnel A and 857.5 million SP for Tunnel B. Although Tunnel B is less expensive, acquisition of private properties will be required and antiquities could be discovered due to the route alignment adjacent to the Citadel.



Umawyeen Square Underpass



Al Yarmouk Square Underpass



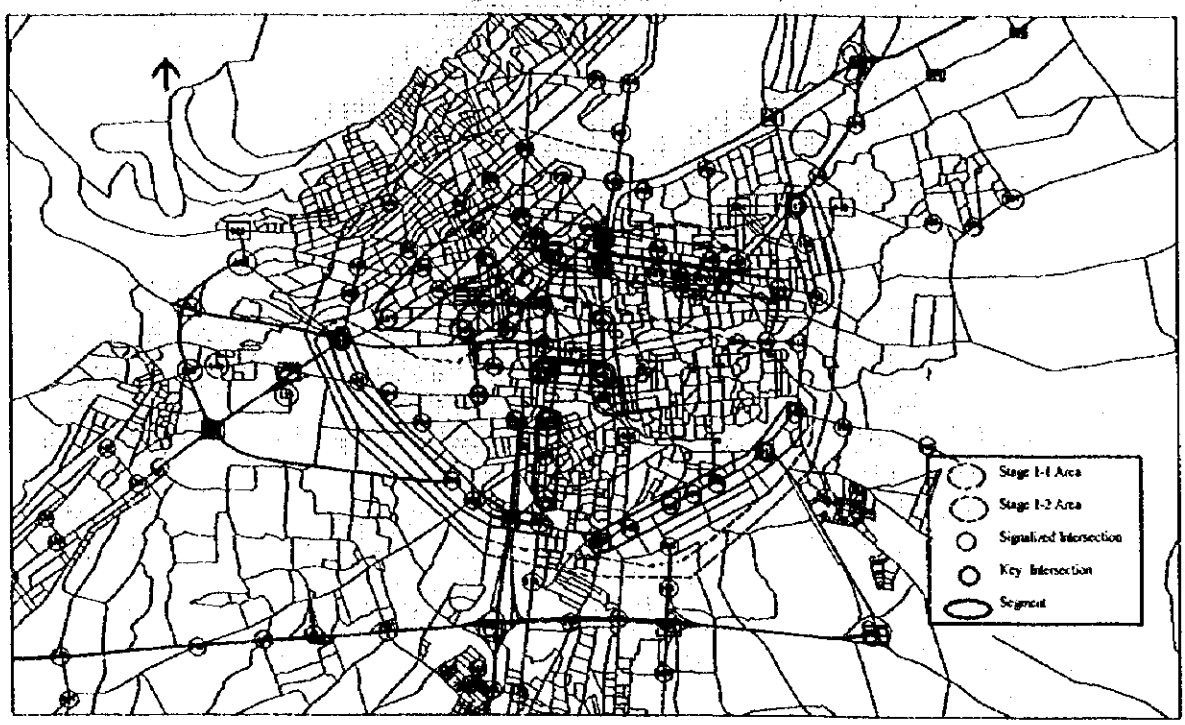
Hejaz Tunnel

14. Installment of ATC System

Stage 1 of the ATC system project will be implemented in two steps. The first step, Stage 1-1 will be implemented between 2000 and 2001, covering 28 intersections on the Inner Ring Road and the southern part of the central area. The second step, Stage 1-2 is scheduled from 2001 to 2002, covering 39 intersections at the northern part of the central area. The control center will be located within the executing agency.

The investment amounts are 328.5 million SP for the Stage 1-1 and 291.7 million SP for the Stage 1-2, totaling to 620.2 million SP.

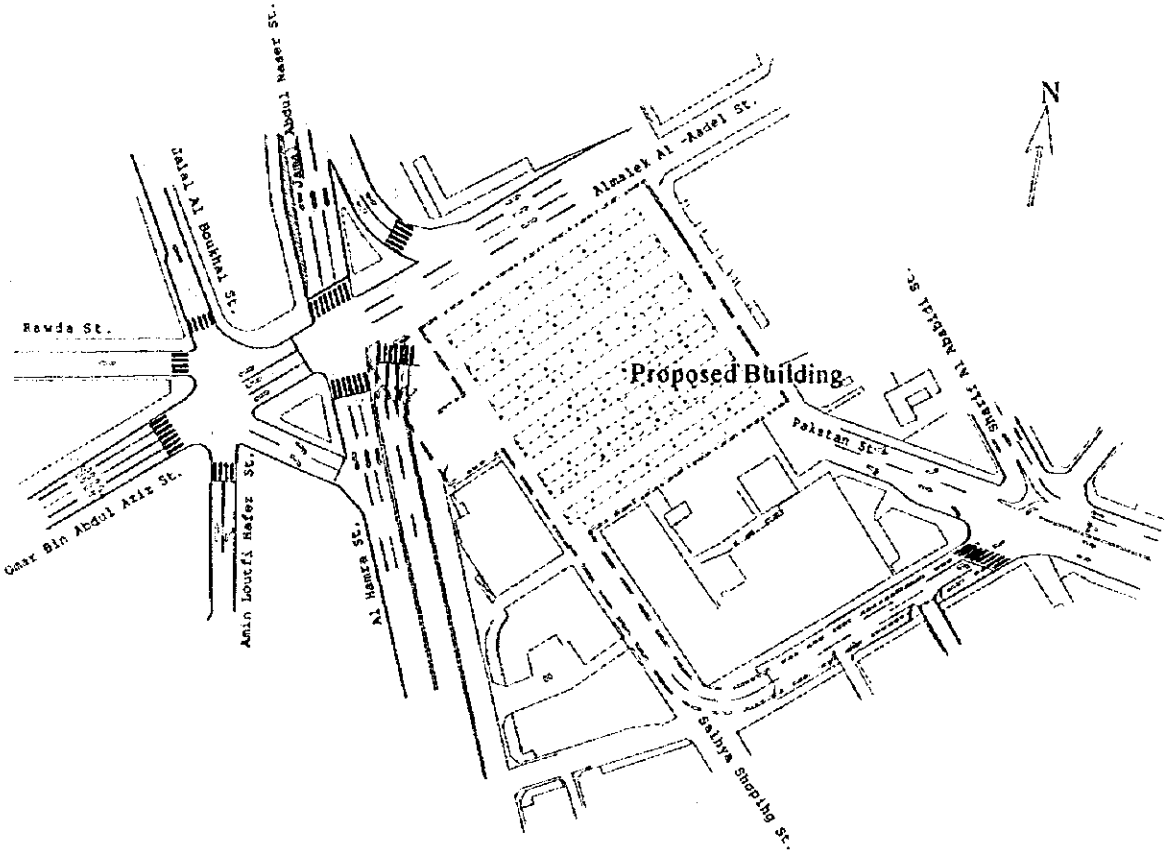
This project is expected to contribute to savings of about 13% in total running hours on the covered roads and intersections in comparison with "Do Nothing Case".



Locations of ATC Segments

15. Arnous Underground Parking Area Construction Project

Arnous underground parking area will be implemented as the first one of five off-street parking facility projects proposed in the M/P. This public parking facility will be constructed under Arnous Square, with 500 parking lots. There is a plan to construct a public-facility building belonging to Damascus Governorate on Arnous Square. If the building is constructed, the costs of the underground parking area will be increased. This project is scheduled in 2000, and the initial investment cost is estimated at 309 million SP for Case 1 (parking facility only) and 525 million SP for Case 2 (parking facility and building).



Arnous Underground Parking Area

16. Concluding Remarks

Early Implementation of the Master Plan

The M/P financial feasibility has been confirmed, and the necessity for its implementation is clear. Execution based on the implementation program proposed in the M/P is strongly recommended.

Implementation of FS Projects on Schedule

The north-south corridor and Inner ring road compose fundamental links of the road network and serve heavy traffic during the whole planning period. The FS projects target these roads. Though road budget balances show a slight shortage of the budget at present for the execution of the FS projects, execution of these projects by loans, either external or domestic, is considered reasonable because the balance of the budget during all planning period is assured.

Importance of Public Transport Development

Share of trips by public transport based on the Person Trip Survey result, 1998, excluding walk, dominates 74% of total trips in the study area. This indicates that improvement of public transport is second to none in importance. In this regard, Damascus Governorate should take positive measures to deal with public transport development as proposed in the M/P.

Necessity of an Organization for Urban Transport Planning in Damascus Capital Region

The establishment of an organization responsible for transport planning of Damascus Capital Region, incorporating Damascus City and Damascus Countryside Governorate is necessary.

The three major issues which require coordination work among the two separate municipal authorities are as follows;

1) The route of the Outer Ring Road passes mostly through Damascus Countryside Governorate area. Coordination on matters such as construction funding and land acquisition is required for the timely completion of this Ring Road project.
2) There is a city development project of 1 million population scale in Qatana which greatly influences the trunk bus project and other road projects in the M/P. Coordination on development scheduling and provision of required transport to the city are important.
3) Many bus operators serve routes to bridge between the City and surrounding rural areas and more investments from private sector are expected to accommodate growing demands. It is necessary to coordinate a fare system applicable to buses licensed in either municipality order to induce new investments.

Establishment of Rolling Plan Review System

This M/P has been formulated to cover transport demand for the time period from 2000 to 2020. However, occurrences having high impact on the economic development of Syria may take place, such as development of the open door policy, conclusion of peace treaty in the middle east and success of exploring of oil resources. In corresponding to these possibilities, changes in different socio-economic parameters including softening of the control policy on car import may be expected. Such changes will surely have an impact on the traffic conditions of Damascus.

There are other factors to be considered such as the influence of land use plan of Damascus Capital Region which is not yet finalized and the possibilities of delay of execution of the M/P due to unforeseeable reasons. The study team recommends establishing a rolling plan review system and, as a first execution of that rolling system, reviewing this M/P after 10 years. At that occasion, the following tasks should be included in the scope of the work.

1. Change of Planning Area (From Damascus City to Damascus Capital Region)
2. Revision of Land Use Plan of Damascus Capital Region
3. Reinforcement of Existing Railway System

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