REPUBLIC OF CYPRUS
MINISTRY OF COMMUNICATIONS AND WORKS
PUBLIC WORKS DEPARTMENT

NICOSIA
TRAFFIC MANAGEMENT
AND
PUBLIC TRANSPORT ENHANCEMENT STUDY

EXECUTIVE REPORT

SUBMITTED
BY
G.C.HADJICOSTAS CONSULTANCIES
IN COOPERATION WITH
AXIS INGENIEURLEISTUNGEN- AUSTRIA

TABLE OF CONTENTS

1.0 PREAMBLE

The Ministry of Communications and Works of the Cyprus Government, being concerned over the impact of traffic congestion on the quality of life of the people living, working or visiting the greater Nicosia Area and the adverse impact on the environment and the economy as a whole, has invited Cyprus Specialist Consultants in collaboration with Foreign Specialist Consultants to undertake a Study of Traffic Management in the Nicosia Urban Area and an Enhancement of Public Transport serving the area of Nicosia

G.C.Hadjicostas Consultancies of Cyprus in collaboration with the Austrian Firm of **AXIS Ingenieurleistungen,** Transport and Traffic Specialist Consultants, were awarded the assignment to carry out this Study, following public tenders.

The starting date of the Study was set as the 29th of January 2001 with closing date as the 15th of October 2001, which was extended to the end of March 2002, as to allow more time to review the Reports and discuss the Proposals of the Consultants before concluding the Study.

The Consultants feel the need to express sincere thanks to the Project Manager, the Members of the Steering Committee and all those Government and Municipality Officers who so willingly provided data and information that eased their task and enabled them to complete their study very close to the prescribed time.

Thanks and gratitude are also expressed to the Police Force, who so promptly and effectively provided safe working conditions to the members of the Study Team, when they were engaged on Count and Traffic Surveys on the Highways and City Streets.
The Consultants also wish to place on record their great appreciation for the support given to them by the Minister of Communications and Works and the Mayors of the five Municipalities included in the Study Area.

The Final Report concludes by stating that during the period of Study preparation a lot has been learned about Nicosia, its people, and the current traffic and public transport problems of the City.
The diagnostic process was very intensive and showed large deficiencies / problems encountered by the Public Transport and some problems of the road based traffic as well as deficiencies for the movement of pedestrians and cyclists.

The main conclusion that can be drawn at the end of this Study is the fact that only combined road, public transport and pedestrian/bicycle measures are able to improve Nicosia's traffic situation and the conditions of living for its inhabitants.

The proposed short-term measures should be implemented as soon as possible, as a first step to fight congestion and to stop the downfall of the existing public transport.

During the first years to come, certain measures should be tried to evaluate their acceptance by the people and to change the behaviour of road users.
The parking measures are extremely important to alleviate the congestion in Nicosia and to raise the acceptance of the public transport.

Important road infrastructure projects should be implemented as soon as possible. They should show respect for the environment and the necessary road space that needs to be divided between the car, the pedestrians and the cyclists. Two very important projects in this respect are the construction of the Northern and Southern Tangent of Strovolos (East-West traffic) that will enable the distribution of traffic in tangential direction and causing a relieve on the CBD area.
These roads will additionally help to develop a working public transport system in Nicosia and enable a west-east movement with new bus lines.

Altogether Nicosia is a very good place for living and the Consultants hope that the implementation of the measures described in this Study will make it even more attractive for the people and more conducive to economic activity.

The European Community has set out standards to assist reforms in the urban public transport requiring to plan for mobility and reduction of traffic congestion of urban areas and to guarantee the mobility and health rights of the citizens.

The reforms being undertaken **in Italy** concern the fields of:

- Administrative Decentralization
- Improvement of Companies Efficiency
- Separation of Roles of Government and Companies

In Barcelona Metropolitan region Government has instituted the Authority for the Metropolitan Transport (ATM) which is a voluntary inter- administrative Consortium assembling the public administrations running the public transport services of Barcelona. ATM in fact functions both as a Planning Authority and as a Control Monitoring authority.

Similarly Madrid coordinates with success the public and private Public Transport Operators through CRTM (Concorcio Regional de Trasporters de Madrid).

In Germany Local Public Transport is controlled by a Municipality Transport Authorities which area set up for predefined Regional areas where they function as a co-ordinating body and issues the LPT Licences by Tender or directly to self–financed companies. In most areas though Public Transport Services still continue to be mostly Public Providers.

This Study makes some strong suggestions as to how the Proposals of the Study should be implemented and recommends a Steering Committee with an Ad- Hoc Implementation Authority.

2.0 THE EXECUTIVE REPORT

This Executive Report is based on the findings, conclusions, proposals, recommendations and comments which were discussed and agreed with the Employer and presented in the various Reports prepared for the Study.

The Executive Report is presented in a format which is somewhat different from other similar reports because in this case it will be used as a Decision Making and Implementation Tool by the Authorities on the matters investigated by the Study. This format will also be suitable for presentation to the Media and Local Authorities, which is a requirement of the Terms of Reference of the Study. This Report should be viewed as a Brief Summary of the Final Report.

The Consultants, realizing that the audience of such an Executive Report, invariably, would not be technocrats in the strict sense, but Government and Civic Affairs Directorates, decided to present it in a format which would provide deeper and more extensive information on the Project. This makes the Report longer than Executive Report should be. The presentation in self contained Subjects could make it a good Reference Report

Such a format will enable the Decision Makers, who will receive this Report, to acquaint themselves with basic facts and problems relating to each one of the generic subjects investigated by the Study and will have all the measures proposed for the solution or elimination of these problems, readily available for review, instead of having to search through the hundreds of pages of the many Reports prepared for this Study.

The Executive Report is the last Report of a bundle of eight Reports prepared and listed below, in the sequence shown in the T.O.R. These eight Reports present in detail and in self-standing state, all the subjects investigated by the Study and all the matters that have been reviewed in the Final and other Reports. The Reports are given in Table 1.

No.	Type of Report	Number of Pages
1	Inception Report	28 pages
2	Diagnostic/Interim Report	125 pages plus maps
3	Short-Term Measures Report	85 pages plus maps
4	Survey Report	410 pages plus maps
5	Public Transport Model and Option /Scenario Development Report	74 pages
6	Draft Final Report	244 pages plus maps
7	Final Report	558 pages plus maps
8	Executive Report	97 pages plus maps

Table 1: Submitted Reports

All the Reports listed were produced in English (the Executive Report also in Greek) and contained the findings, surveys, proposals and scenarios developed by the Consultants. Copies of all these Reports are to be found with the various Government Departments and the Municipalities who were issued these Reports by PWD at the time of their respective issue.

The Executive Report starts with a brief introduction on the subject-matter being dealt in each chapter. It then lists in a bullet point arrangement the relevant findings and observations, followed by a schedule of deficiencies and problems prevailing in the case of the specific subject. It then provides, again in a bullet point form, a list section of goals aimed at and ends-up with recommendations as to how these goals could be achieved.

In the present Study the Decision Makers are the Ministry of Communication and Works (who commissioned this Study), as well as the Municipality and Community Authorities whose citizens will enjoy the benefits to be derived from the implementation of the many proposals and recommendations included in the Study.

All proposals and recommendations have been reached after a very comprehensive investigation of the currently prevailing conditions, and a thorough analysis of the surveys undertaken and the data collected by the Consultants.
The Study can only be assessed as a success if the Authorities concerned decide to put into effect the majority of the Recommendations included in it, through a well planned but aggressive Implementation Program of a short term horizon.
The Consultants consider that for the implementation of such a project there is need to create an **Ad-Hoc Coordinating Agency** which will function as the co-ordinating the executive arm of the Decision Makers for planning the various phases of the Project, and implementing most of them within the next 4 to 5 years form the submission of the Final Report.

Content of the Report:

The Report describes very briefly the methodology used by the Consultants to identify issues. It refers to the Surveys undertaken and the way the various issues were analysed and the strategy and management proposals and recommendations were reached.
The specific chapters being included in the Report are shown in detail in the Table of Contents and briefly refer to the following main sections of the Study:

- Preamble
- The Executive Report
- Consultants
- Scope and Goals
    - The Methodology used for the preparation of the Study
    - Problem Analysis, Surveys, Goals and Measures
    - The Study Area and the Town Structure
    - The Nicosia Pedestrians and Cyclists System
    - Public Transport
    - Private Transport
    - Parking
    - Proposed Activities for an effective Implementation
    - Costs: Public Transport Operating
    - Infrastructure Measures
    - Parking Measures

As to enable those readers who wish to examine a subject in a greater depth, we include here in - after the Table of Contents of the Final Report for easy reference.

Table of Content of Final Report - By Chapter

3.0 THE CONSULTANTS

The members of the Consultant's Team, who contributed to this Study, are shown in the Organogram provided below, indicating also the respective speciality of each of them.

Personnel assigned to Traffic Management and Public Transport Study

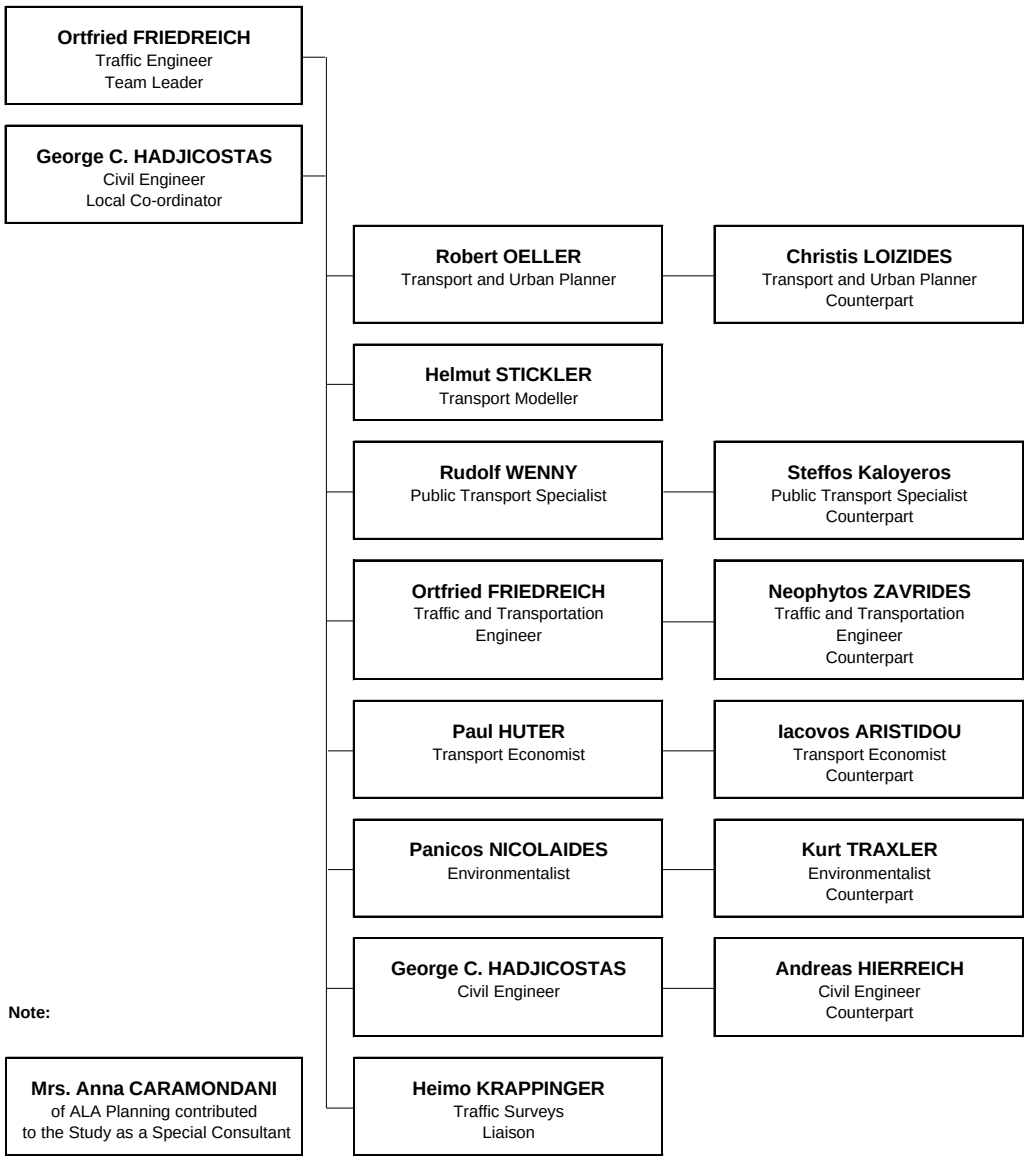


Chart 1: Personnel assigned to the Study

4.0 THE SCOPE AND GOALS OF THE STUDY

The Study was a two-pronged task, which resulted in proposals on Traffic Management and Private and Public Transport Organizational and Management Policies including Parking, which would help improve mobility and alleviation of traffic congestion and so reduce travel time, with a 10-year time horizon in mind. It equally provides proposals and measures for the enhancement and development of Public Transport and Rideshare systems for the Nicosia urban area, that would upgrade these services and meet transportation needs and levels in a co-ordinated, integrated, efficient and effective manner.

5.0 METHODOLOGY USED FOR THE PREPARATION OF THE STUDY

A Study of this nature should have a strong foundation and basis. External parties must be able to understand the process through which the conclusions and judgments were reached. In order to achieve the targets set-up by the TOR, the Consultants designed a scheme that was tuned to the investigation of the specific needs and requirements of the five Municipalities in the Nicosia study area. This scheme is shown in Chart 2.

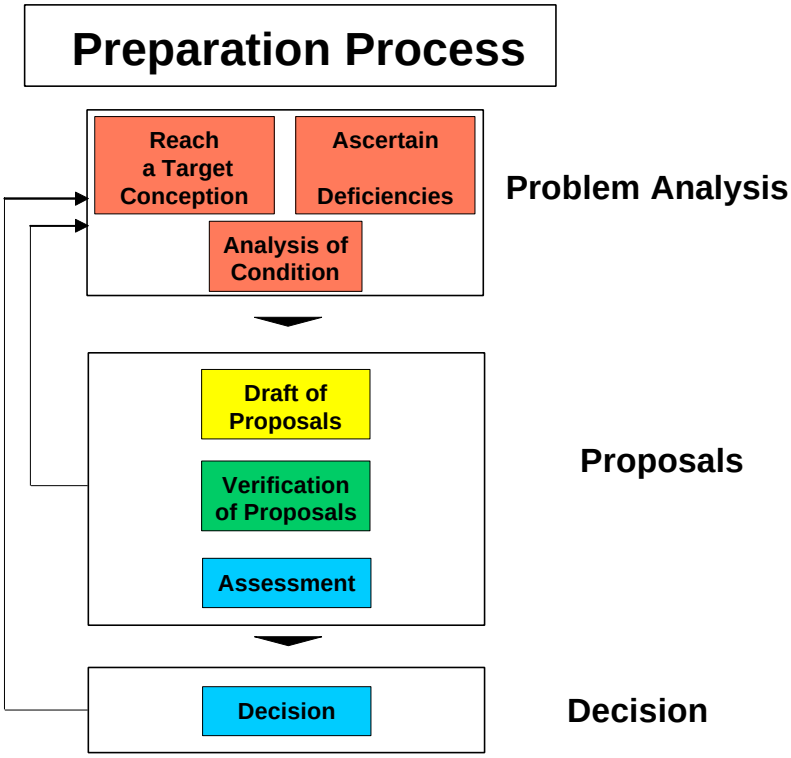


Chart 2: Preparation Process

Based on the general methodology described, here in above, this Study was carried out through four interrelated and interacting stages as below:

Stage I - Examination of the Design Scope and Definition of the Survey Details

Stage II - Data Collection and Private Consultations with relevant Departments/ Agencies/ Authorities

Stage III - Problem Analysis and Target Analysis

Stage IV - Proposal of Solutions and Actions

The model of action used by the Consultants for the Traffic and Transport Studies is shown as a Flow – Chart below:

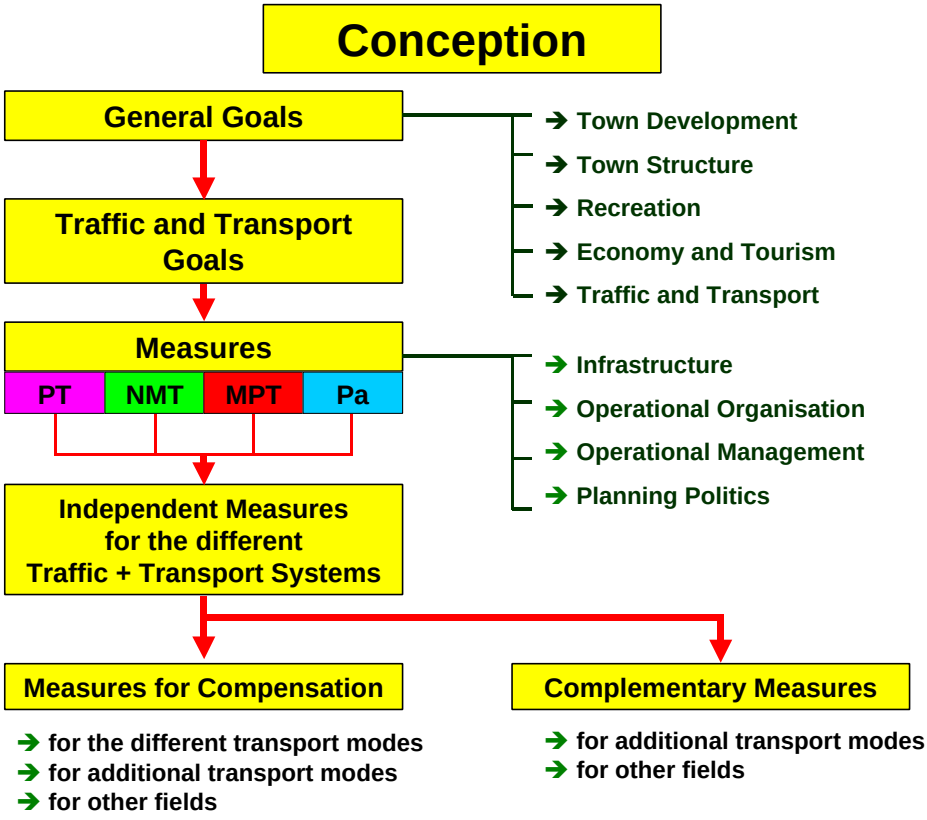


Chart 3: Goals and Measures

PT: Public Transport **NMT:** Non-Motorized Transport **MPT:** Motorized Public Transport **Pa:** Parking

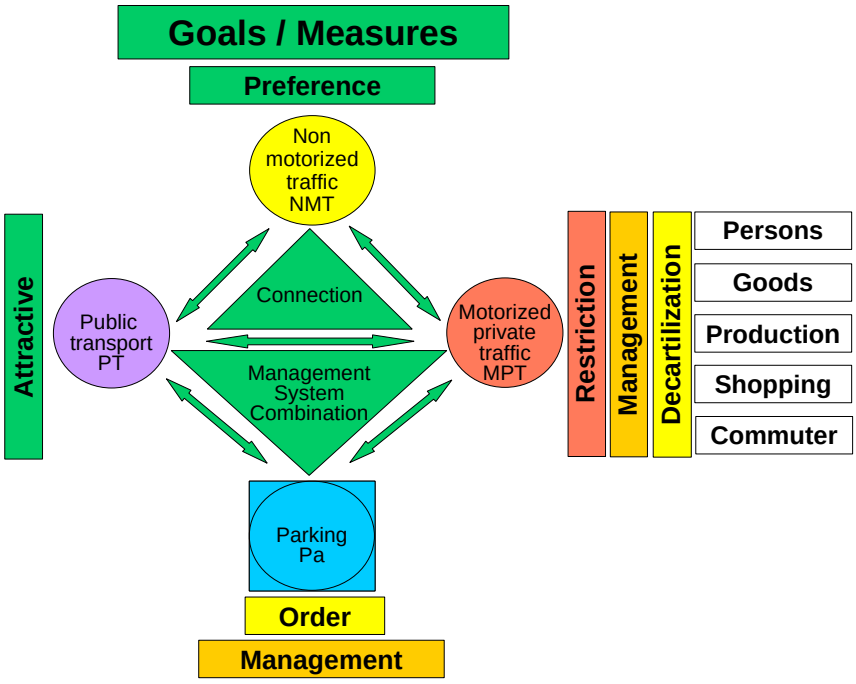


Chart 4: Goals and Measures

The Consultants' concept for a coherent set of consistent and coordinated measures, resulting in two groups of goals: Primary, which are the main goals of the concept and General.

6.0 THE STUDY AREA

The Terms of Reference specified the study area as the Lefkosia Municipality and the four Municipalities listed in Table 2 below, which also present some demographic data from the 1992 population census.
The Consultants extended the area of their investigations and included the Municipalities of Lakatameia, Latsia and the Region of Geri.

Study Area			Additional Investigation Area		
Municipality	**Households**	**Population**	**Municipality**	**Households**	**Population**
Nicosia	16,327	46,634	Lakatamia	5,843	20,860
Strovolos	15,712	51,290	Anthoupolis.I.B.	1,011	3,860
Aglantzia	4,981	16,780	Latsia	2,869	9,972
Ay. Dometios	3,956	12,104	Geri District	1,317	4,971
Engomi	3,043	9,836			
Totals	44,019	136,644	Total	11,040	39,189
Total of whole Investigation Area				**55,069**	**175, 833**

Table 2: Investigation Area

The Population and Employment Projections for the years 2000, 2004 and 2010 are shown in Chart 5and Chart 6 respectively below:

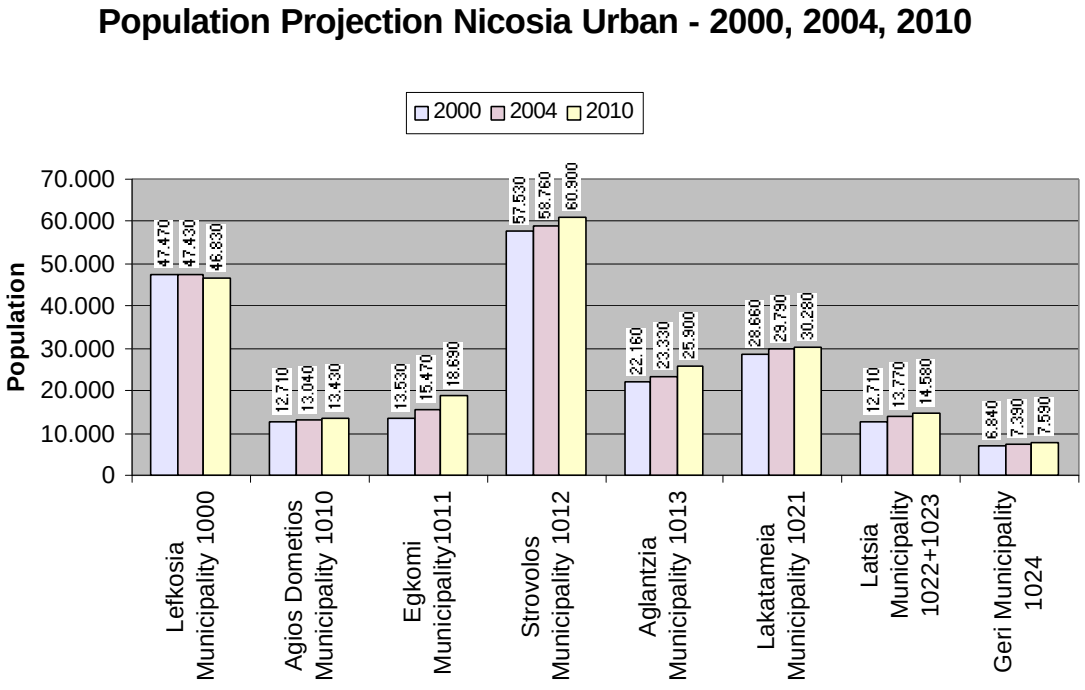


Chart 5: Population Projection 2000, 2004 and 2010

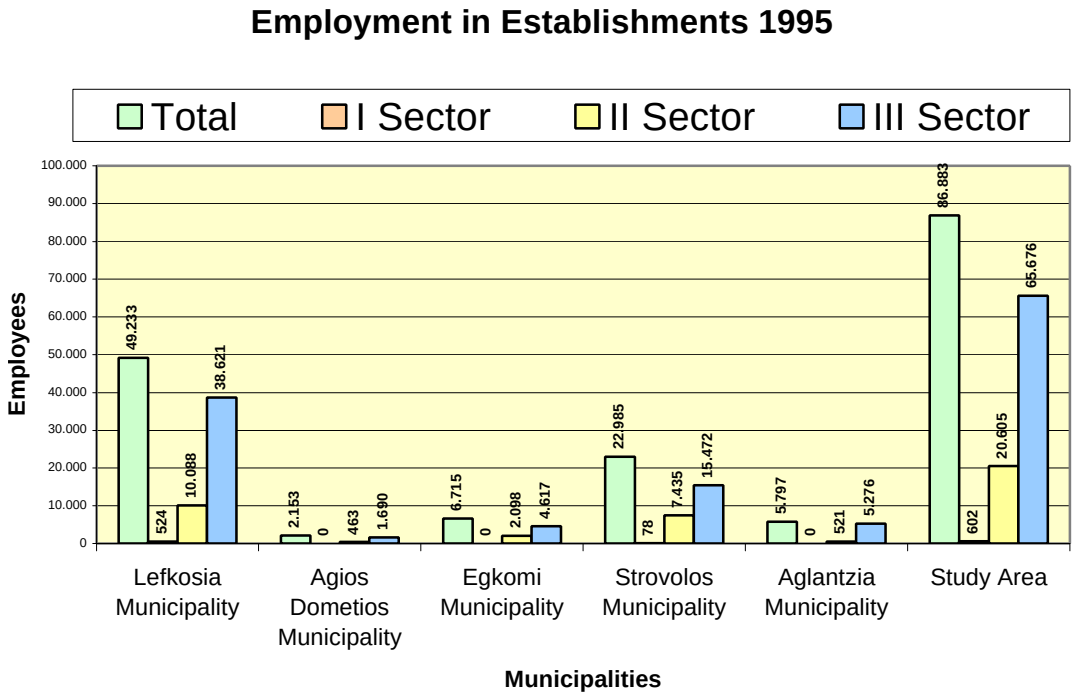
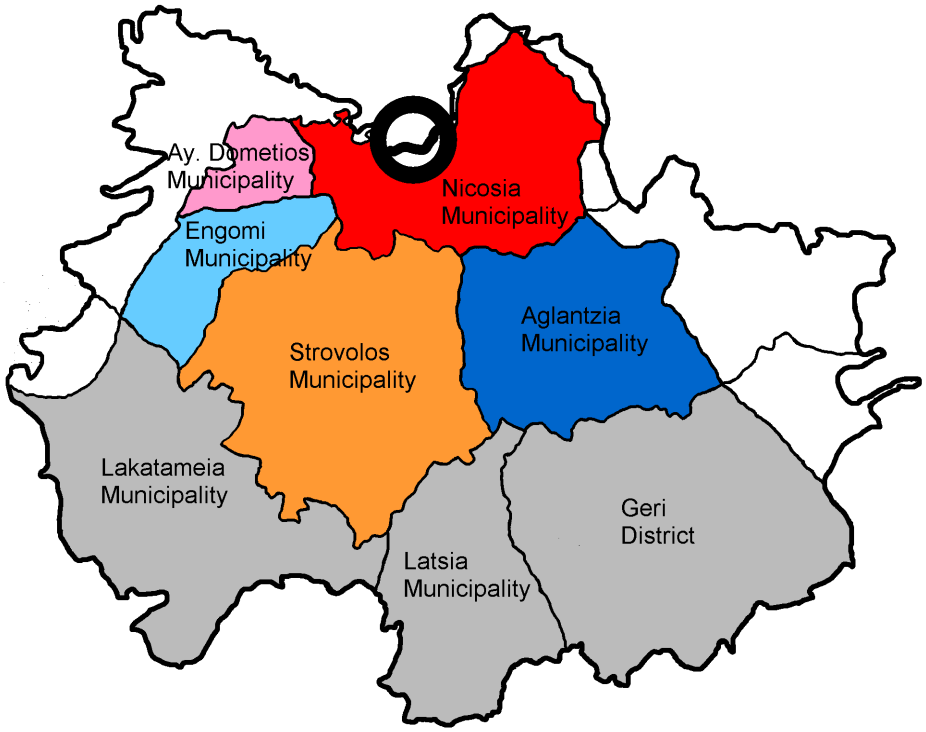


Chart 6: Employment in Establishments 1995

The Study Area covers 98 sq. km, while the Investigation Area extends to 173 sq. km, covering the Greater Nicosia Urban Area, which is shown in Map 1 below:



Map 1: Study and Investigation Area

7.0 PROBLEM ANALYSIS, SURVEYS, GOALS AND MEASURES

As to be able to analyse the prevailing situation, the Consultants carried out a full analysis of the large amount of data the Ministry provided to them. In addition they carried out a massive number of Surveys which are listed below:

- Pedestrian Surveys
- Public Transport Surveys
- Origin Destination Surveys of bus passengers
- Interview Surveys of bus passengers
- Bus Speed Surveys
- Taxi Origin Destination Surveys
- Parking Surveys
- Private Car Count Surveys
- Interview Surveys of Private Car Drivers and Passengers
- Speed Surveys of Private Cars
- Conflict Surveys at Road Junctions
- Vehicle Occupancy Surveys
- Private Consultations with Government and Municipal Officials
- Stated Preference Surveys
- Attitude Surveys

Each component of Nicosia's transport system, namely Traffic, Parking Management and Public Transport Enhancement has been examined and each mode was considered against a model of an ideal system of defined primary and general goals, as referred to in the Methodology Chapter here-in- above.

The Consultants highlighted the deficiencies in the existing situation and proposed new modal specific goals and measures. The measures as aspired are collective, so they must be taken together. One without the others would not produce the expected result.

The Traffic and Transportation system of Nicosia, which is explained in the following Chapters, today consists of:

- Pedestrians and Bicyclists
- Public Transport (Buses)
- Private Transport (taxis, motorcycles, light vans and few heavy vehicles)
- Parking

Whereas an important factor is the town structure and the urban environment as shown in the Chapter that follows.

7.1 The Town Structure of the City of Nicosia and the Urban Environment

Travel by vehicle in Nicosia is an essential part of daily life. People travel to work, to school, to shop and for leisure using mostly their private cars. The Public Transport of Nicosia consisting of an aged Bus fleet is used very little.

Today Nicosia consists of a heavy densely populated town centre with mixed structures that mainly consists of the Walled City and the Central Business District (CBD). Outside of the city centre a number of sub-centres were developed. These sub-centres today constitute the different urban centres making up Greater Nicosia.

At the same time there is a trend for more people to move out of the city and live in somewhat remote localities, with the result that more sub-centres will develop in the future. This will also tend to increase the number of cars per family, as to allow easy mobility to each individual member of a family. This social change is likely to cause increase in the number of trips towards and in Nicosia.

The Introduction to the Guidelines for Developing Urban Transport Strategies published by the Institution of Highways and Transportation _ UK in 1996 describes a global situation in the words that follow, which in no way is different from what has taken place in the Urban area of the City of Nicosia.

Towns and cities are continually changing. Greater number of people lives and works in urban areas than ever before. It is not that towns and cities are getting bigger that is important; it is that they are changing structure too. In the past, as towns have grown, the outer suburbs have generally become the more desirable places to live and people have moved away from the inner areas. This outward migration of residents has been linked with an increasing demand for space in inner areas for shops, offices and commerce. As people have become wealthier they have bought cars and spent more on travelling, with the result that shopping centres, business parks and industrial estates have also grown. Outward migration has often spread to quite wide hinterlands around the main built – up in the outskirts of the established urban areas and beyond, leading to a decline in activity in activity in the traditional central areas.

Changes in the structure and size of urban areas mean that the transport systems need to evolve to meet the changing demands for and patterns of travel. The timescales over which the changes to the transport system are required will vary; some measures will be required in he short term while others may not be needed until some time into the future. Some schemes can be implemented quickly, while others require protracted periods for planning, approval, design and construction. In order to develop an urban transport system in a way, which best meets evolving demands, a strategy is required. That is, a " Master Plan" or "framework" into which the various improvements fit in an integrated and co-coordinated way.

The Consultants' analysis of the situation in Nicosia evidenced that a major source of he current Traffic and Transportation problems is the Structure of the Nicosia Urban Area.

The sub-centres stated above were originally isolated village or community regions that were gradually assimilated into the urban growth of Nicosia. They now represent the reference centres and have given their names to the municipalities in the greater urban area.

The circular core of the city centre has imposed a radial development of road systems over the years. Areas with an orthogonal grid are only to be found as isolated islands in between the radial axes. These islands are the result of public or private land divisions of unused areas and are always of secondary circulation value when compared with the radial or peripheral axes.
As a result, orientation and movement within the city area is a difficult task.

In addition Nicosia has the burden of the dividing line, halting its network to dead ends towards the north. As the Study Area extends southwards, urban density decreases

The main deficiencies of Nicosia's structure are due to the lack of an appropriate urban and town planning system, which contributes to a number of problems that arise, some of which are listed below:

- Lack of an orderly axial system and the development of scattered structures, due to the late introduction of an area plan
- Problematic situation for the development of a working and economic public transport system and decrease of the growth of private transport trips
- Inadequate prospects for the development of non-motorized traffic as well as of public transport

7.2 The Nicosia Pedestrian and Cyclist Traffic System

Pedestrians, cyclists and public transport are the environmental friendly means of transportation and together they form an environmental combination.

The Consultants in their various Reports highlighted the deficiencies in the existing situation and proposed new modal specific goals. Some of these new goals form the basis of the policy the Consultants have used to develop their short and medium term measures.

All Planning policies must aim to fulfil the prerequisites for promoting public transport as well as pedestrian movements and cyclists, thus reducing unnecessary vehicular trips.

The Study considers that as private car trips are replaced by Public transport trips, the pedestrian traffic will show an increase. This is because people will walk to the bus stations and since they will not have a car at their disposal while at work, this will contribute further to the increase of pedestrian traffic.

The 2010 time horizon allowed a modal split which expects pedestrian traffic to be 12% of the total number of daily trips, estimated to be around one million per day.

There is need to campaign and encourage private car users to move towards non–motorized means of transport. Measures need to be taken to support and facilitate walking and cycling.

7.2.1 Goals

General Goals:

As for the other means the general goal must be to enhance walking and increase the use of the bicycle for short-distance travel. The following goals are mandatory:

- Improve social safety
- Improve road-safety
- Improve attractiveness
- Improve comfort

Modal Specific Goals:

The following points represent a summary of the necessary modal specific goals aimed on improving the current situation.

- Provide Routes and the directness of the routes
- Orientation towards public transport origin-destination areas (for example schools, shopping areas)
- Safety
- Avoid conflicts with the car traffic
- Improve crossings
- Improve comfort
- Provide more space and a continuous surface for pavements and walkways without obstructions
- Connect pavements and bicycle lanes to public transport stops
- Provide bicycle routes/lanes and bicycle parking

The current road network in Nicosia was mainly built for car traffic and in the past the needs of pedestrians and cyclists were not considered to be very important. This must change to ensure that a regulated network is developed in Nicosia to accommodate all means of transport.

7.2.2 Modal Specific Deficiencies

A summary of deficiencies related to the non-motorised traffic is presented below. It is necessary to introduce immediate remedial measures for improving the situation:

- Narrow pavements
- Low quality of walking surface
- Pavements are obstructed by trees, road signs and advertisement placards
- There is a lack of continuation of pavements
- Missing pavement network
- Problematic crossings
- Parked vehicles on pavements
- Pedestrians cross roads at red light
- Cars stop on pedestrian crossings
- Pedestrian light signals are missing at many important crossings
- At many pedestrian crossings the markings are inadequate or missing
- Bicycle network is almost non – existent
- Missing or inadequate pedestrian islands

7.2.3 Measures

Walking and cycling are two forms of environmental friendly travelling and therefore and because of the possible reductions of short distance car trips measures need to be introduced to enhance the pavement and bicycle network. An intense campaign should be undertaken to promote walking and cycling for short-distance travel during the periods of the year when the climate permits. The campaign should improve the profile of walking and cycling and could include school and general advertising components.

For pedestrians, the directness of routes is one of the most important factors when deciding to walk.
The river, the old City Walls, streets and large blocks of houses are edges for pedestrians as well as for bicyclists. Considerations should be given to increasing the number of crossings to overcome such obstructions.

The old City Wall only allows the pedestrians to enter the Walled City at a few, well separated locations. People who park their cars in parking lots in front of the wall must walk significant distances before they can enter the old city.

It is necessary to consider this fact and find solutions for building stairs, bridges or even unobserved elevators thus making the walled city and the parking areas more accessible. These stairs/elevators need to be clearly marked and signs need to be posted at the car park as well as in the Walled City to lead the pedestrians to the stairs/elevators.
Additionally the access from the car parks at the base of the walls towards the Walled City must be improved.

There are few individual areas, especially in the CBD, that already have an existing, adequate pavement system. Even these areas are very often not interconnected. Attractive short-distance destinations (schools, shops, bus stops, etc.) need to be linked with pavements. Additionally, it should be noted that the continuity of pavements always provides a secure reference edge for bicycle movements.
To form an attractive pavement system and to increase the level of the amenity, a necessary first step is to bring continuity to the existing pavements and widen them where necessary.
In the long term, all pavements in the municipalities of the Nicosia Area need to be connected. The planning of such a system must therefore be based on a master plan for the whole region and implemented as a priority via comprehensive and sidewalk-specific regulatory plans.

This measure must usually be carried out in conjunction with a complete new design of the roadside environment and possibly with changes in the cross-sections of the roads.
When redesigning roads it is necessary to widen existing pavements taking into account the expected magnitude of pedestrian flow.
In order to do so, the existing cross-section layouts need to be revised and the cross-sections adjusted according to the neighbourhood and the width available.
The different categories need further to be subdivided according to where there is a separation between the bicycle way and the pavement or if there is only a separated pavement or even if there is no separation necessary.
This will depend on the location and the demand and the category of the road.

7.2.3.1 Lowering of the curbs

The tendency in a great number of countries in Europe is to have lower curbs than the ones presently constructed in most Nicosia streets. Lower curbs are more convenient for elderly people, handicapped people or people with small children, when leaving the pavement to cross the road.
It is therefore necessary to consider this matter in the new designs for high pedestrian-flow streets.

7.2.3.2 Remove obstructing objects from the pavement

It was observed that traffic signs and other obstacles (often wrongly planted trees) regularly interfere with the pedestrian flow. These objects need to be removed from the pavement and the principle must be adopted that when new traffic signs are installed or new trees planted, the pavement is not narrowed through this work and pedestrians are not put at a disadvantage.

7.2.3.3 Improve Pedestrian Islands

Some existing pedestrian islands at wide roads would be too small to cope with increased pedestrian flow. In other places islands do not even exist.
New crossings need to be designed without leading to such problems and existing crossings need to be improved.

7.2.3.4 Pedestrian signals at traffic lights

At many traffic lights that allow pedestrians to cross there are no specific pedestrian signals available. Pedestrians are therefore forced to orientate themselves to the signals for car traffic.
Especially in areas with a higher pedestrian flow, at dangerous crossings and at junctions without zebra crossings it is necessary to install pedestrian signals and/or to change the crossing to a zebra crossing.

7.2.3.5 Pedestrian Crossings

It is the belief of the Consultants that it is not always necessary to construct pelican crossings at distances so short that they will influence the traffic. This is meant specifically about the planned pelican crossings at Makariou III from the Woolworth Junction towards the Hilton (regulatory plan measure 12). A better alternative would be to use regular pedestrian crossings combined with speed reducing measures.
Such measures could include the construction of secured islands, a reduction of the road width to reduce the speed and to raise the street level near the pedestrian crossings. This would allow drivers to visualise the crossings better and thus reduce their speed.

7.2.3.6 Bicycle storage locations

If cycling is to be established in Nicosia there is the need to plan for secure bicycle storage facilities near bus stations, schools and in the city centre near attractive locations. This would be a positive step in introducing biking to Nicosia.

7.2.3.7 Bicycle network

In order to introduce a bicycle network in Nicosia it is necessary to link attractive destinations (university, schools, cinemas, etc.) together in a network. In addition to bicycle ways, the possibility of bicycle routes should also be considered. Such a measure would not necessarily require the construction of separate bicycle ways, rather cyclists could use side streets and the existing cross-section.
The recently designed bicycle network master plan would be the base for implementing the above stated considerations and ideas.

7.2.4 Assessment of Measures

Table 3 below presents the effects the various measures, proposed by the Consultants, will have on the Pedestrians and Cyclist when introduced. It must be made again clear, that single measures alone will not have a big effect on such a complex network as the Nicosia Traffic and Transport System.

Only co-ordinated and courageous introduction of different measures for the various means of transport will allow changing and improving the situation for all inhabitants of the Nicosia Area.

This means that the measures shown below are single measures that are interrelated to measures in the other Chapters of the Final Report.

Pedestrians and Cyclists

Measures	Assessment of effects						
	Improve road safety	Improve social safety	Improve attractiveness	Improve comfort	Improve driver behaviour	Improve roadside environment	Improve environmental situation
Campaign for walking and cycling		☑			☑		☑
Connecting of existing pavements in:	☑	☑	☑	☑		☑	
CBD							
municipalities							
residential areas							
Pedestrian crossing initiative	☑	☑	☑	☑	☑		
Pavement network initiative	☑	☑	☑	☑		☑	☑
Bicycle network			☑	☑		☑	☑
Overcome barriers		☑	☑	☑			
Complementary measures:							
Bicycle storage		☑		☑		☑	
Enforcement of driving and parking regulations	☑	☑			☑		
Driver behaviour campaign	☑	☑			☑	☑	
Road safety program	☑	☑			☑		

Table 3. Measures for pedestrians and Cyclists.

7.3 The Nicosia Public Transport System

The public transport system of Nicosia, like in most cities of the modern world, consists of three main components:

- **The Route:** road, stops
- **The Vehicle:** size, equipment, construction
- **The Operation:** schedule, route network, utilization of veh.
- **Duty roster**

Within each one of these components there is need for a multitude of decisions to be made. The characteristics of these components and sub-components are shown in Chart 7.

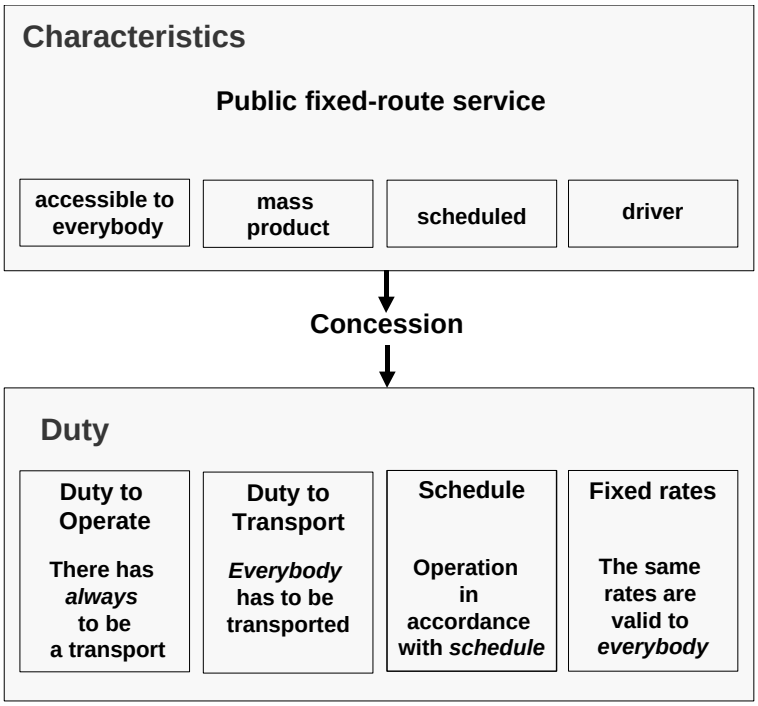


Chart 7: public transport characteristics

The Nicosia Bus Company, as a private company, operates an urban bus network within the Nicosia Greater Urban Area, but it also offers a coach service to Limassol.
The Company offers a so-called Fixed–Route Service and presently it does not provide service in the evening hours.

It operates 13 radial bus-routes using 36 buses, with a seat capacity of about 26,000 seats per day. One additional route operates in the Walled City as a circle-line.
All lines depart near the Walled City at Solomon Square serving the Study Area and partly ending in this area.

The average daily Seat utilization amounts to 4,800 or 18%, against a European average utilization of close to 66%.

7.3.1 Public Transport Subsidy Policy

Public transport nowadays is considered a public service and in Nicosia the Government subsidizes the Nicosia Bus Company in order to allow the operation of a basic bus-network. As in all other European cities, it is not possible to finance a public transport system solely from revenue from the sale of the tickets.

There are different reasons for a government to subsidize a public transport system. The main reason for such subsidization is the need to provide mobility for the general public, specifically for the young, the old and the handicapped, and to help to enhance the quality of service offered to the public and to sustain the operation of routes that are uneconomic to run.

Finally help is provided to modernize and replace the presently aging buses of the Company.

7.3.2 Level of Service

This bus system has very few nodes, where it is possible for passengers to change over to another bus. It is important to provide the possibility of interchanges as an attraction and as convenience to potential users, an inducement to shift people from the private car to the Bus.
The migration of the bus users to the private car has been continuous since 1980 when the annual passenger trips were almost 13.0 million per year and deteriorated to a present figure of about 3.0 million. This reduction has induced a reduction of the level of service being offered.

The Study found out that there is an extensive view within the public of Nicosia, that being transported by public transport is considered a degradation of social status. This attitude could make it more difficult to attract people from the private car to the public transport, which is the only sure way of reducing the traffic congestion in the Study Area. Advertisement and public relation must work on the status of the Public Transport in order to make it successful.

A detailed schedule of demands on Public Transport is shown in the Table below:

Passenger‘s demands on public transport

- Fares
- Stops in walking distance
- Security / protection from annoyances at night
- Exactness
- Frequency of departures
- Possibility for transfer / availability of connections
- Supply of direct connections
- Duration / speed of transport
- Weather protection at stops
- Security / protection from annoyances in the daytime
- Steady operation intervals
- Kindness of staff
- Comprehensibility of schedules
- Comprehensibility of fare system
- Cleanness in the vehicles
- Cleanness in stops / stations
- Announcements in the vehicles
- Location of places of purchase
- Passenger information
- Chance for seats
- Possibility to store luggage / prams
- Air conditioning in the vehicle
- Comfort / equipment of vehicles
- Comfort / equipment of stops / stations
- Supply of Park & Ride parking spaces
- Possibility for taking bicycles
- Supply of parking spaces for bikes
- Design of stops / stations
- Design of vehicles

Table 4 Passengers Demands on public Transport

Remedial Goals to be achieved:

The bullet-points listed below illustrate the requirements of potential passengers. Enhancement of these will help direct private car users towards the Bus:

- Temporal availability
- Local availability
- Accessibility
- Reliability
- Supply
- Good network structure
- Schedule
- Comfort of transportation
- Passenger information
- Improved marketing
- Improved environmental situation

7.3.3 The Bus Versus the Private Car

Chart 8 and Chart 9 below show the fall of bus passengers over the period 1979 to 1999 and the increase in car registrations over almost the same period, a situation that reflects on why public transport is deteriorating:

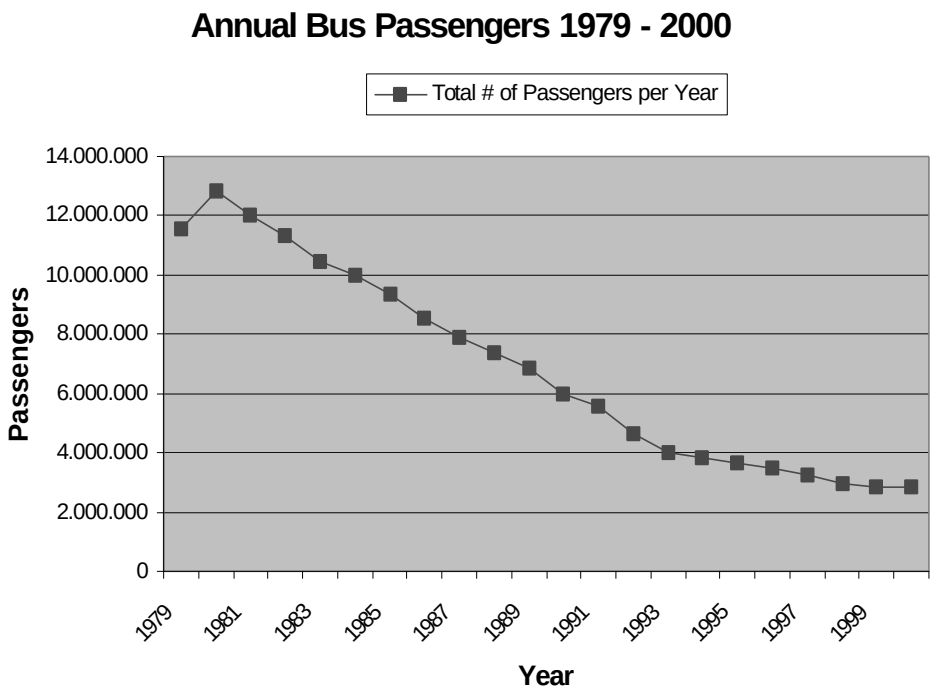


Chart 8: Annual Bus Passengers 1979 – 2000

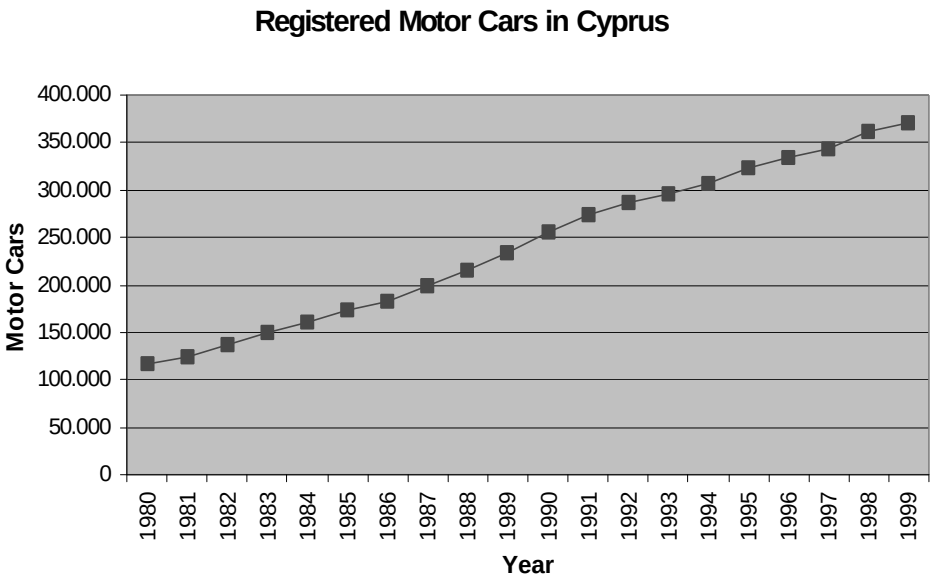


Chart 9: Registered Motor Cars in Cyprus 1980 – 1999

The charts above show the decrease of the public transport and the increase of the private car traffic that lead to the following modal split of the year 2001.

Modal Split in the Study Area 2001

Mean of Transport	Modal Split [%]
Car Trips per Day	85,0%
Public Transport Trips per Day	2,0%
Walked Trips per Day	12,0%
Bicycle Trips per Day	1,0%
Total Trips per Day	**100,0%**

Table 3: Modal Split 2001

Based on the existing situation target modal splits for the different scenarios were developed, that could be reached if the measures of this study would be introduced in an efficient manner. The following tables show these modal splits.

Modal Split
"Enhanced Bus Network Scenario 2004"

Mean of Transport	Modal Split [%]
Car Trips per Day	82,0%
Public Transport Trips per Day	5,0%
Walked Trips per Day	12,0%
Bicycle Trips per Day	1,0%

Table 4: Modal Split 2004 – Enhanced Bus Network Scenario

Modal Split
" Enhanced Bus Network Scenario 2010"

Mean of Transport	Modal Split [%]
Car Trips per Day	77,0%
Public Transport Trips per Day	10,0%
Walked Trips per Day	12,0%
Bicycle Trips per Day	1,0%

Table 5: Modal Split 2010 – Enhanced Bus Network Scenario

Modal Split
" Environmental Compound Scenario 2010"

Mean of Transport	Modal Split [%]
Car Trips per Day	65,0%
Public Transport Trips per Day	10,0%
Walked Trips per Day	20,0%
Bicycle Trips per Day	5,0%

Table 6: Modal Split 2010 – Environmental Compound Scenario

7.3.4 The Effectiveness of Public Transport

For Public Transport effectiveness, local and temporal availability and reliability of the service are essential.

In cities the Bus Stops should be within a radius of 300 meter for urban areas and 500 meters for suburban areas, since these are the maximum tolerable distances for potential passengers to walk to them.

In Nicosia many bus stops are located more than 500 meters away from one another and need to be readjusted.

In general the position of the bus stops needs to be improved regarding their location within a catchment area and spacing from each other, considering the following points:

- Local connection to the centre of gravity of the surrounding development
- Connection to the pedestrian network
- Connection to important uses :schools, social centres, shopping, leisure, etc.
- Connection to local trip producers

7.3.5 Bus Lanes and Bus Sluices

The introduction of a Time Schedule to the Nicosia Bus System is a necessary requirement for an Enhanced Bus Service. This can only succeed if the buses are enabled to run on time, even in traffic peak hours.

One way of achieving this is to dedicate a Bus Lane wherever the width of the road can be adapted to such a change together with the introduction of Bus Sluices (bus advance areas) at Priority Junctions and Intersections.

Considering the layout of the existing roads leading into Nicosia there are three possible solutions for bus-lanes:

- Two bus-lanes (one in each direction)
- Single bus-lane on either the right or left hand side of the road
- Single bus-lane in the middle of the road

Examples of road cross sections of various main roads, leading into Nicosia, where Bus lanes need to be provided are shown below based on a typical cross-section:

Existing Cross - Section

Primary Road - 4 Lanes

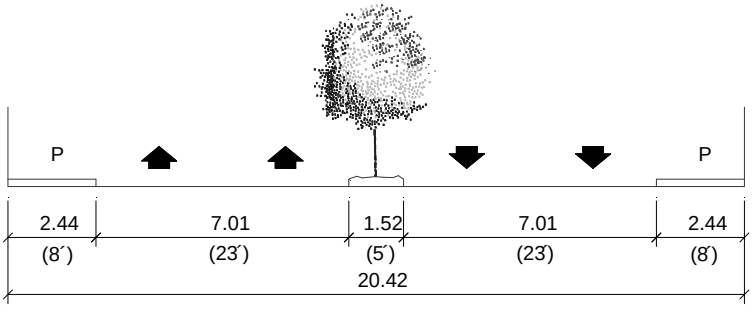


Chart 10: Cross-Section Leoforos Strovolos, 4-Lanes

Single bus lane on the left or right hand side or in the centre of the road:

Depending on the desired speed on the road either a 3.00m lane width without a separating strip but with a crash barrier, or a 2.75m lane width with a 1.30m separating strip can be used. Both lane widths are capable of carrying 1350 vehicles per hour with a share of trucks of less than 10% (lane width 2.75 m) or 15% (lane width 3.00 m). In order to separate the bus lane from the car lanes rubber elements as shown in the following photos can be used.
They have the advantages of allowing a slow crossing in case of an emergency (to pass an accident area), they are easy to install and remove and have been used for many years in continental Europe. Embedded reflectors within the rubber increase safety for the road users.
Pedestrians are not handicapped by high medians and they can cross the roads quite easily and safe.

Regardless what lane width is chosen, the capacity of the road would not be affected, but the speed v_{85} (the speed that 85% of the cars use) would be reduced to the legal limit when using the 2.75m lane width.

The following table shows lane width depending on the percentage of heavy goods vehicles.

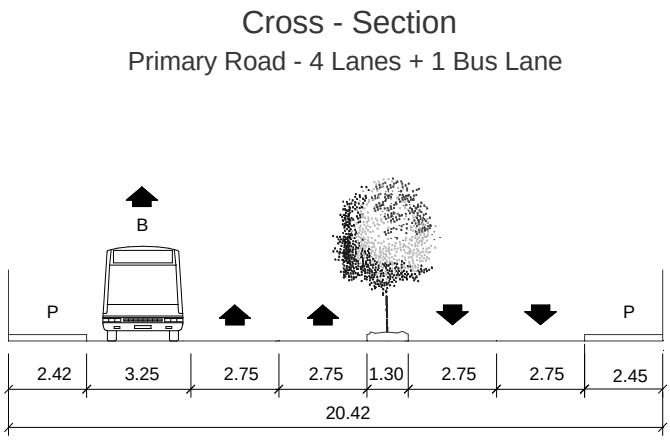
Standard Lane Width for Main Roads in Cities

Heavy Goods Vehicles [%]	Available Space	
	little restricted	restricted
> 20%	3.50 m	3.25 m
10% - 20%	3.25 m	3.00 m
< 10%	3.00 m	2.75 m

Table 7: Standard Lane Width

Example One - Single bus-lane on either the right or left hand side of the road:

The conversion of the Road Cross Section from above into a 4-lane road plus an additional bus lane towards the city centre is shown in the Chart below:



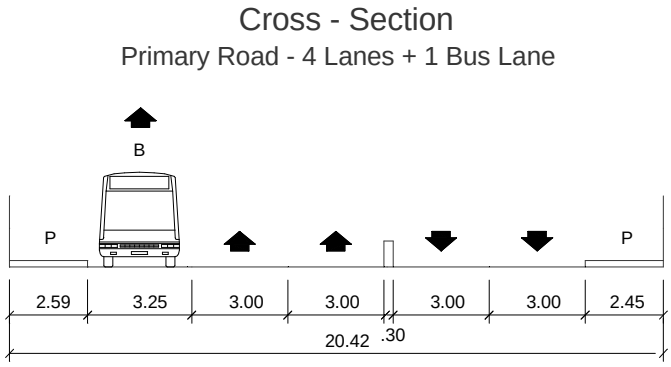


Chart 11: Cross-Sections 4-Lanes + 1 Bus Lane

It is pointed out that the road width of 3.00m or 2.75m will not reduce the capacity of the road; on the contrary it will force the vehicles to adhere to the speed limit.

Example Two - Cross-section for central bus lane:

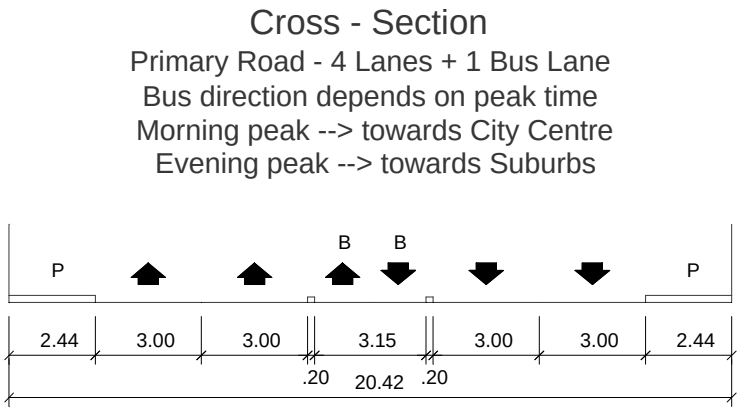


Table 5: Cross-section for central bus lane

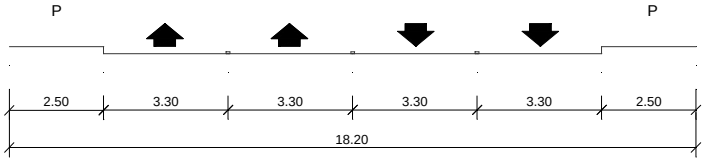
This cross-section would allow the bus to use the bus lane depending on the direction of the peak hour traffic. This means for example that during the

morning peak the buses running towards the city-centre would use the central bus lane and the buses running to the outskirts of Nicosia would use the uncongested regular car lanes.

Example Three - Cross-section for a 2+1 lane road:

This cross-section can be used for a first stage of the construction process of a 4-lane road as shown below.

Proposed PWD 4 - lane Cross - section
for Leoforos Kallipoleos
18.20m



Proposed 4 - lane Cross - section
for Leoforos Kallipoleos
18.20m

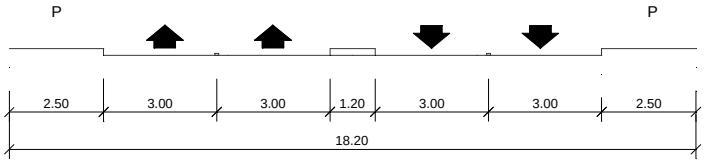


Chart 12: Sample Cross-Sections for Leoforos Kallipoleos

2 Lane Cross - section
for Leoforos Kallipoleos
with multi function lane
and parking
18.20m

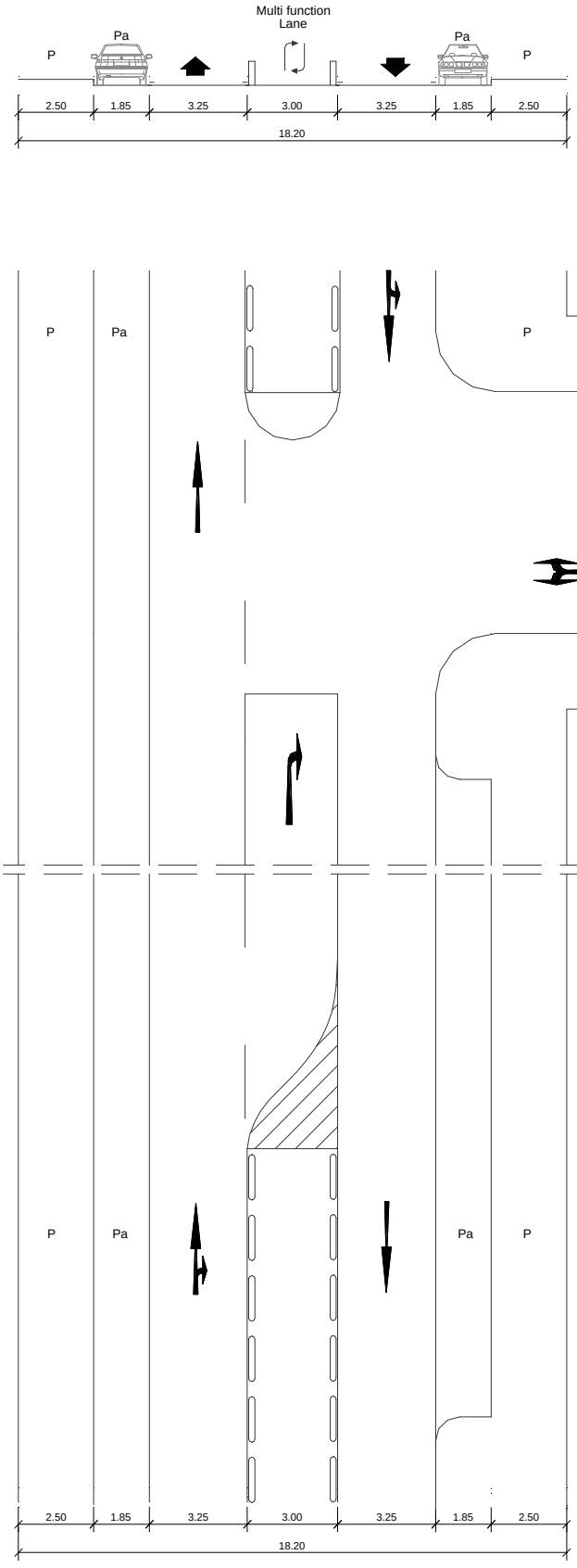


Chart 13: Leoforos Kallipoleos

Bus Sluice (Bus advance area):

The bus sluice operates in a way that allows the bus to enter the junction area ahead of the car flow. In order to do so, the bus has 2 seconds additional green time before the cars are allowed to enter the junction area. This happens about 6 times every hour when headway of 10 minutes is being used for the bus. The impact of a bus sluice would reduce the green time for the car traffic by only 12 seconds per hour.

The photo below shows a regular traffic light with an attached bus signal for bus priority. The sign “bus” indicates that this light is only valid for buses and the lights used for this signalling system are different from the regular traffic lights.

Photo 1: Bus Signal

7.3.6 Public Transport Enhancement Measures

In what follows, the recommended measures to help enhance the Public Transport are summarised. A Traffic and Transportation Co-ordination Agency should be established with the duties as shown in Chart 14:

Traffic and Transport Co-Ordination Agency for Public Transport

Participants	Tasks
Municipalities Government	Traffic and Transportation Policies Social and Society Policies
Traffic and Transportation Specialists Urban and Town Planners	Traffic and Transportation Offer and Demand
All Private and Public Public Transport Companies	Business Management and Financial Planning

Chart 14: Traffic and Transportation Coordinating Agency Scheme

The following Chart shows a sample of how to find suitable ways to Finance the Infrastructure and the Operation of an effective Public Transport Service.

PT System Financing

Infrastructure	paid by the government
Operation	Ticket Sales
	Fee from the government for additional services
	Subsidy from the government for reduced tickets (pensioners, students)
	Achievement-oriented subsidy

Chart 15: Public Transport Financing

Several changes in the existing bus-network are proposed by the Study. These will be found in detail in the Final and in the Short Measures Report.

7.3.6.1 Headways:

Bus Peak Hour Headways:

- Through lines <10 minutes
- Tangential lines <15 minutes
- Call Collect Bus <20 minutes

Bus Regular Hours Headways:

- Through lines <15 minutes
- Tangential lines <20 minutes
- Radial lines <20 minutes
- Call Collect Bus/Taxi <20 minutes

7.3.6.2 Rural Buses

Basically all rural buses should pass by the Park and Ride locations at the outskirts of the city and arrive at the bus terminal in the centre of the city to allow for passengers to change over to the urban bus lines. The parking of the rural buses should not take place at the bus terminal, but on dedicated bus parking areas (e.g. the existing bus parking areas near the Walled City or the park&ride location at Makariou Stadium or elsewhere to be selected).

When returning to their rural destinations in the evening, the buses should depart from the Central Bus Terminal and leave the city along the same route as they arrived in Nicosia.

7.3.6.3 Bus Terminal

The above mentioned Central Bus Terminal in Nicosia could be located at the land known as the Evcaf Land on Byron Avenue near the Hospital
This terminal should not be used as an end point for urban buses. These buses should only pass by the terminal and pick up/drop passengers for rural buses or allow passengers to changeover to other urban bus lines. Please refer to map AXF00157- for the proposed location of this bus terminal.

One of the most important points that must be considered to make a bus terminal successful is the co-ordination of the headways of the different bus lines stopping at the terminal. The urban bus routes especially need to be co-ordinated to allow for very short headways.

The terminal needs to be tailored to the needs of the customers. A terminal has to encompass the following facilities:

- Accessibility and interconnection
- Functional and attractive design
- Safety and cleanliness
- Information and communication
- Attractive service

7.3.6.4 Bus Depot:

Another important part of a bus network is a Bus Depot to be used for overnight parking and maintenance.

The Study proposes a location near the Park and Ride at the Makarios Stadium or the International State Fair.

7.3.6.5 Marketing

The public must be encouraged to change from the car to the bus. The measures proposed in this Report will give an advantage to public transport over private. An advertisement campaign needs to be launched to change the public transport's image and to convince people to use the bus instead of the car.

7.3.6.6 Investigating Alternative Scenarios

The Study considered some alternative scenarios for the enhancement of the present Bus system, as to attract more passengers:

- Enhanced Bus System
- Enhanced Bus System plus Light Rail Tram
- Enhanced Bus System Plus Guideway Transit System

The Enhanced Bus System:

It is an improvement program for the existing bus system and is recommended for immediate introduction. It includes new or combined bus lines with an improved local and temporal availability.
The first step would be to make changes in the existing bus network to create through lines, substitute existing bus lines as well as co-ordinate parallel lines.
Finally a network as shown in map AXF00099-4 that is based on line-type operated bus lines and direction oriented call collect bus lines, should be introduced.
Considering the high importance of Nicosia and Strovolos, the map shows a concentration of lines between these two municipalities and the creation of through lines connecting the municipalities of Engomi and Aglantzia to the other municipalities.
The map shows several tangential lines that establish a denser bus network and allow the passengers to interchange between lines. The catchment area of this network is shown in map AXF00117-4.

This network was designed for the study area and extensions towards the investigation area are possible and necessary. This should be considered in a future study which concentrates on both the study and the investigation areas and should design in detail the schedule for the whole public transport system.
When designing the bus network, the consultants considered the access to schools, hospitals and other public buildings as priorities.
On the long run, students should be able to use the regular bus service to go to school, college or to the University.
The same is true for larger hospitals, where visitors should be able to go by bus.
The Final Report should be the basis and the guidelines contained herein should be applied but it cannot define, for example, where new bus stops should be, or the headway on different lines. This requires a further, well thought out detailed design project.

G. C. Hadjicostas Consultancies
CY-1307 Nicosia P.O. Box 25238
TELEPHONE / Fax +357 (2) 669 777 gch.cons@cytanet.com.cy

AXIS INGENIEURLEISTUNGEN
A-1040 VIENNA RAINERGASSE 4
TELEPHONE +43 (1) 50 670-0 FAX-40 wien@axis.at

NICOSIA TRAFFIC MANAGMENT AND PUBLIC TRANSPORT ENHANCEMENT STUDY
Location for Bus Terminal

GZ.:	127350	Datum:				22.01.2002
Sachbearb.:	KRAPPINGER	Maßstab:				1:5000
Gezeichnet:	DRAGIC	PLANER		ART	LAUFENDE NR.	INDEX
Format:	0,06 m²	AX	F	0	0157	-

Enhanced Bus System plus Light Rail Tram:

The Examination of the other two alternatives showed in the case of a tram system that the narrow roads in Nicosia are the limiting factor and that trams that do not run on reserved tram lanes would not improve the current situation. Therefore a tram system on street level was not recommended by this study.

Enhanced Bus System Plus Guideway Transit System:

On the other hand, a system that is not limited to the use of roads could be a solution. An example for such a system is Guideway Transit Systems (e.g. Cable Car). These systems are driverless public transport systems using their own tracks and it is possible to adjust the system to the demand. It can use for example the river Pediaios in certain areas for it's track and in other areas runs above the existing roads, free spaces, etc.

Because of the larger catchment area that can be served by such a system, certain bus lines could be substituted successfully by the Cable Car system or other similar system, as soon as the volume of passengers reaches the levels where the operation of such system is probable and viable.

Such a system is shown as Development Case 3 in the Final Report.

However, all these alternative systems require expensive up-front investments and a very detailed planning process. Because of the small numbers transported by the Public Transport, the integration of a Guideway Transit System into the Nicosia Public Transport System is not warranted to take place during the 10-year horizon of this Study. It is nevertheless recommended to start with feasibility study for such a system as soon as the degree of success of the Enhanced Bus System to attract passengers is evaluated.

The following table shows capacities for different public transport systems based on minimum headways:

Maximum Capacities for different Public Transport Systems

Transportation System		Passengers per Vehicle	Minimum Headway [min]	Passengers per hour
Bus	Minibus S	15 - 25	15	80
	Minibus L	30 - 40	10	210
	Midibus	60 - 70	10	390
	Midibus	60 - 70	7,5	520
	Bus	100	10	600
	Bus	100	7,5	800
	Bus	100	5	1200
	Articulated Bus	180	10	1080
	Articulated Bus	180	7,5	1440
	Articulated Bus	180	5	2160
Tram	Railbus	30	5	360
	Street Car - Single Car	180	5	2160
	Street Car - Double Car	350	5	4200
Guideway Transit System	Cable Car Pinch Loop	30	2	900
	Cable Car Pinch Loop	42	2	1260
	Cable Car *	30	0,5	3600
	Cable Car *	42	0,5	5040

Table 8: Maximum Capacities for Public Transport Systems

Possible bus sizes are schematically shown in the following photo:

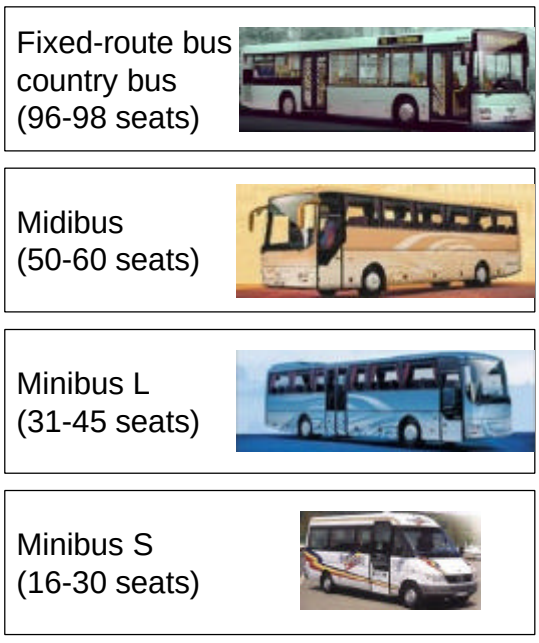


Photo 2: Available bus-sizes

However, the introduction of new buses has to be a step by step process depending on the number of new or changed bus lines.

The map AXF00099-4 shows the network for the proposed bus system and the bus type to be used for some of these lines.
Basically, for the first steps towards the new bus network, smaller buses should be used, like mini-buses for up to 30 passengers and sufficient storage area for luggage.
Certain lines with a higher demand should be served with midi-buses that offer space for 60-70 (40 seats, 20 standing room) passengers. Right now there is no necessity for larger buses, but the future development might ask for other bus sizes.
The following table gives an indication about the proposed bus lines and the bus size to be used at the beginning of the introduction of these lines.

Proposed Bus Lines		
Line	**Bus Type**	**Bus Capacity**
55,58	Midi-Bus	60
10,57,59	Midi-Bus	60
N1	Mini/Midi-Bus	30/60
N2	Mini-Bus	30
N3	Mini-Bus	30
N4	Mini/Midi-Bus	30/60
N5	Mini-Bus	30
Call-Collect	Mini-Bus	15-30
Existing Lines	Existing Buses	-

Table 9: Bus Lines and Bus Sizes

In order to visualise the possibilities of a Guideway Transit System, the following Charts show cross-sections road areas (e.g. Leoforos Strovolos) or other areas (e.g. the river bed):

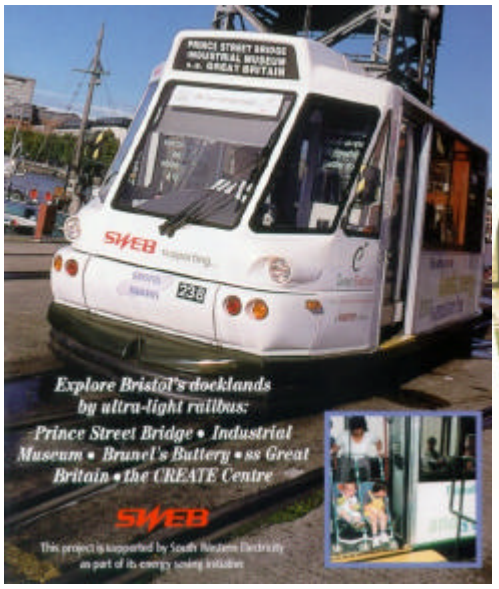


Photo 3: Railbus

Photo 4: Cable Car

Existing Cross - Section

Primary Road - 4 Lanes
With an Cable Car as example for a
Guideway Transit System

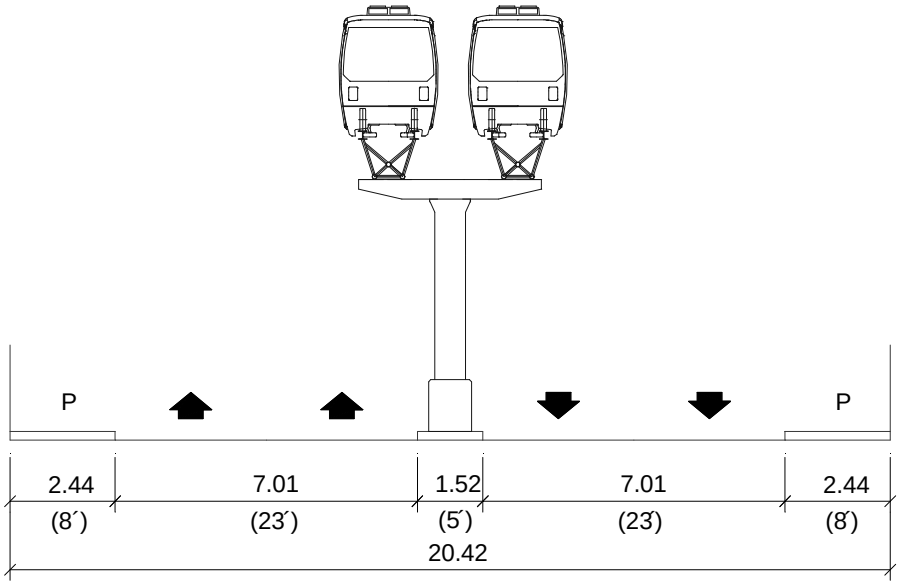


Chart 16: Cross-section 4 lane road with Cable Car

Cross - Section

Cycle and Pedestrian Ways
With an Cable Car as example for a
Guideway Transit System
using the river Pediaios

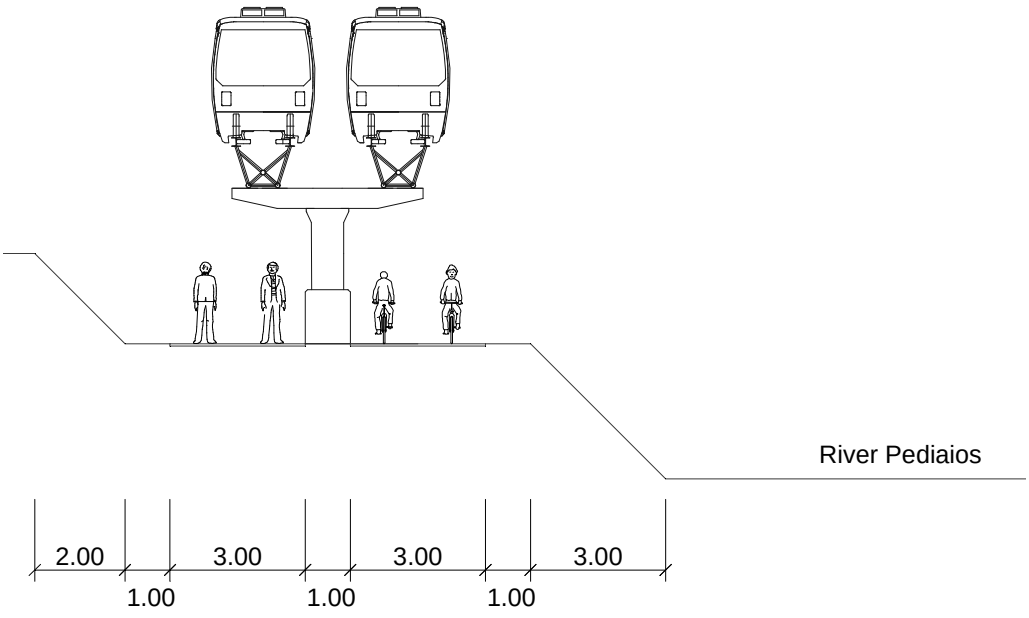


Chart 17: Cross-section pedestrian and cycle way with Cable Car

7.3.6.7 Bus Priority

It is desirable for public transport enhancement to have bus lanes and bus priority schemes that are available for the public transport (buses) and possibly for taxis. Please note that a Guideway Transit System that operates outside or above the road space does not need priority measures.

In order to do so all buses and taxis operated in the study area need to be equipped with priority transmitters.
These transmitters allow the vehicle to influence the green phase of traffic lights and to activate bus sluices.
However in order to speed up buses and trams it is necessary to install bus/tram lanes.

It is, however, not useful to install bus lanes in all roads where bus lines are situated. The following table shows the recommendations for 4-lane roads.

Recommended Public Transport Priority Measures for inner-city 4-lane roads

	Roadside Bus Stops					Additional PT Lane (Buslane / Tramlane)	Bus Sluices
	exclusive			exclusive - with priority and bus-sluices	Alternately (Bus Bay - Roadside)		
Exploitation of the PT vehicle	Bus Headway			Bus Headway	Bus Headway	Headway	Headway
	3,5- Min.	5- Min.	7,5- Min.	3,5 - 7,5 Min.	3,5 - 7,5 Min.	3,5 - 7,5 Min.	3,5 - 7,5 Min.
30 Pers./ Bus 80 Pers./Tram	Recommended >1.300 Veh./Peak H*	Recommended >1.300 Veh./Peak H*	Recommended >1.300 Veh./Peak H*	Recommended	Recommended	Recommended	Recommended
40 Pers./Bus 100 Pers./Tram	Recommended >1.300 Veh./Peak H*	Recommended >1.300 Veh./Peak H*	Recommended >1.300 Veh./Peak H*	Recommended	Recommended	Recommended	Recommended
50 Pers./Bus 130 Pers./Tram	Recommended >1.200 Veh./Peak H*	Recommended >1.200 Veh./Peak H*	Recommended >1.200 Veh./Peak H*	Recommended	Recommended	Recommended	Recommended
60 Pers./Bus 170 Pers./Tram	Recommended >1.200 Veh./Peak H*	Recommended >1.200 Veh./Peak H*	Recommended >1.200 Veh./Peak H*	Recommended	Recommended	Recommended	Recommended

* in both directions

Table 10: Recommended PT priority measures for inner-city 4-lane roads

Because some streets have already been widened to their maximum potential (Leoforos Strovolos, Leoforos Makariou III), it is not possible to install bus lanes in both directions without eliminating at least one lane for the regular car traffic.

In some cross-sections, it would be possible to operate the roads with only 2 lanes for cars. However, in the long term and with the expected increase of traffic in Nicosia, it would be a measure that the public (especially car drivers) would not understand.

One solution would be the installation of temporary bus lanes that only work during peak hours.

Map AXF00133-4 shows road sections where bus priority would be beneficial. This map indicates such areas, but it does not mean that in all roads bus lanes are possible. Bus priority includes multiple measures, like longer green phases if a bus approaches a traffic light and/or bus lanes including bus sluices (bus advance areas). The areas shown in map

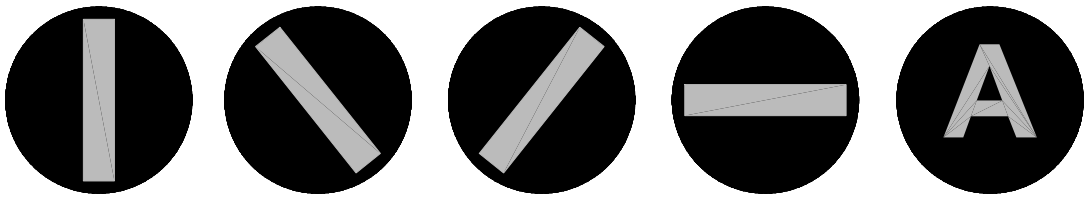
AXF00133-4 shows the areas for all these measures and it depends on the width of the roads if a bus lane is possible or not. Please note that this map is based on Development Case 1 for a bus only network.
If other means of transportation, especially guideway transit systems were used, some of the bus lanes would become obsolete.
However, on 4-lane roads without a median or without the necessary width, it is not possible to introduce bus lanes. This is especially true for Leoforos Strovolos and Dim. Severi. The fact that bus lanes can speed up buses at certain crowded sections (e.g. Leoforos Strovolos) would be a major improvement.
Bus lanes that would eliminate a lane for the regular traffic are not useful at the time being. Where no additional lane for the buses is possible, no bus lanes should be introduced.

If the proposed bus lanes were installed, there is the problem of how the buses can enter junction areas where it is not possible to implement bus lanes.
Bus sluices(bus advance areas) can solve this problem whereas they need to be activated by the bus driver with the help of a remote control in each bus or automatic by selective vehicle detection. It activates an advanced signal to stop the car traffic and allows the bus to enter the junction before the cars.
This is necessary to speed up the bus and to allow it to make right or left turns.

In order to display this to the bus driver it is necessary to introduce special signals for public transport. The following samples show a possible system that is in use in Austria for decades and therefore it is a checked and reliable system.

Photo 5: Bus Signals

This photo shows a regular traffic light with an attached bus signal for bus priority. The sign “bus” indicates that this light is only valid for buses and the lights used for this signalling system are different from the regular traffic lights. The colour of the bus signal is white and the following drawing shows the possible signals.



Straight **Left** **Right** **Stop** **Attention**

Chart 18: Bus Signals

The meaning of the signals is very simple but effective and covers all necessary possibilities. The first signal allows the bus to go straight, the second to turn left, the third to turn right and the horizontal bar indicates “stop”. The last signal is used to signalise an immediate change from “stop” to one of the other signals. Normally it is displayed 5 seconds before the bus is allowed to enter the junction.

These signals are used in addition to the regular traffic lights and have no meaning to car traffic. They can be used to give the bus a priority signal that allows it to enter the junction area before the regular traffic. If the regular traffic light shows “green” the bus signal is switched off and the bus driver has to use the same signals as the car traffic.

Such a system (selective detection) can be implemented in the existing SCOOT system and give priority to the public transport.
Basically selective vehicle detection influences traffic signal settings in favour of the bus by either extending the green light until an approaching bus has passed through the junction or if the bus is waiting in a queue at a signal which is red, by bringing in the green light as soon as practicable.

It is very important to understand that bus lanes and the proposed bus sluices (bus advance area) do not decrease the capacity of the car lanes or the junction itself. The priority signal for the bus takes about 2 seconds per bus, which adds up to 12 seconds green time per hour with a head time of 10 minutes.

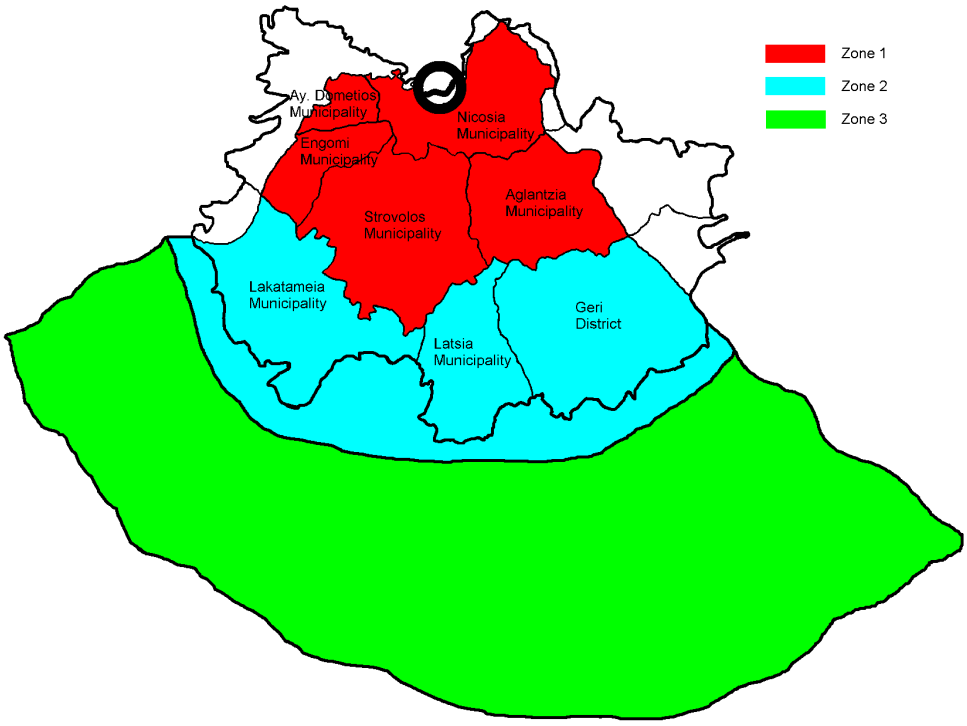
Depending on what kind of bus lane is used, taxis too could use the lanes and priorities.

Bus lanes will be successful if a schedule for the buses will be introduced and if the headway of the bus lines is reduced.

7.3.6.8 Fares and Zoning

In order to include the whole Nicosia area and the surrounding rural areas in a fair and easy to understand fare system it is necessary to develop fare zones and a transport authority that covers the desired areas.

The following map shows the Consultants’ proposal for a 3-zone system and a possible fare structure for such a transport authority.



Map 2: Transport Authority Zones

The transport authority area could consist of a central zone (Zone 1) that basically covers the Study Area, an extended zone (Zone 2) that covers the Investigation Area and a third zone (Zone 3) that extends to the rural areas.

The following tables show the proposed fare structure for the different zones:

Fare Structure for Nicosia Transport Authority

Ticket valid for 1 Fare Zone:

	Regular Ticket	Prepaid Ticket	Students/Pensioners prepaid only
1 hour ticket	£0,70	£0,50	-
24 hour ticket	£1,70	£1,50	-
Weekly ticket	£4,70	£4,50	£2,25
Monthly ticket	£12,70	£12,50	£6,25
Annual ticket	-	£125,00	£62,50

Ticket valid for 2 Fare Zones:

	Regular Ticket	Prepaid Ticket	Students/Pensioners prepaid only
1 hour ticket	£1,20	£1,00	-
24 hour ticket	£2,70	£2,50	-
Weekly ticket	£7,70	£7,50	£3,75
Monthly ticket	£20,20	£20,00	£10,00
Annual ticket	-	£200,00	£100,00

Ticket valid for 3 Fare Zones:

	Regular Ticket	Prepaid Ticket	Students/Pensioners prepaid only
24 hour ticket	£3,70	£3,50	-
Weekly ticket	£10,70	£10,50	£5,25
Monthly ticket	£27,70	£27,50	£13,75
Annual ticket	-	£270,00	£135,00

Table 11: Fare Structure

The table above describes a prepaid ticket that can be bought at supermarkets, post offices, banks, tobacconists' shops, at the offices of the Transport Authority and elsewhere. The tickets can either be valid for travelling in one, two or all three fare zones.

If somebody decides to buy the ticket on board of a bus or tram, the regular fee should be charged. Possible delays that are caused because of such transactions should be avoided and the customers should thus be subtly trained to buy prepaid tickets.

Finally, it is a political decision if pensioners and students should ride for free, for half price or if they have to pay fully. However, if a lower fee for these groups is charged, the difference must be paid by the contract awarder – the Government or municipalities that are part of the Transport Authority and the Transport Agency.
Such a direct payment should not be considered a subsidy, but a regular transaction for services provided.

7.3.7 Assessment and Benefits of the Proposed Measures

The Table below presents a summary assessment of the effect of the various measures to the effort to enhance the Present Public Transport of Nicosia.

Public Transport

Measures	Assessment of effects							
	Improve Supply	Improve network structure	Improve Schedule	Improve Availability	Improve Comfort	Improve Information	Improve Marketing	Improve environmental situation
Traffic co-ordination agency	☑	☑	☑	☑	☑	☑	☑	☑
Schedule, Maps			☑			☑		
Right of way for buses			☑					
More and convenient locations of ticket sales					☑		☑	
Creation of through lines	☑	☑		☑	☑			☑
Introduction of tangential bus lines	☑	☑		☑	☑			☑
Co-ordination of parallel bus lines (rendezvous bus stops)		☑	☑		☑			
Use of mini-size buses	☑	☑	☑	☑	☑		☑	☑
Introduction of Call Collect Buses as substitutes for existing bus lines	☑	☑	☑	☑				
Introduction of Call Collect Taxis	☑	☑		☑	☑			☑
Bus stop improvement program				☑	☑		☑	
Bus priority systems			☑					☑
Introduction of Park and Ride	☑			☑	☑		☑	☑
Co-ordination with rural bus network	☑	☑	☑		☑			
Public relations						☑	☑	

Measures	Assessments of effects							
	Improve Supply	Improve network structure	Improve Schedule	Improve Availability	Improve Comfort	Improve Information	Improve Marketing	Improve environmental situation
Establish regional bus terminal					☑			
Enhanced bus network - Development case 1	☑	☑	☑	☑	☑		☑	☑
Bus network + Tram - Development case 2	☑	☑	☑	☑	☑		☑	☑
Bus network + Guideway Transit System - Development Case 3	☑	☑	☑	☑	☑		☑	☑
Complimentary measures:								
		☑		☑				
Junction enhancement program			☑					
CBD area one-way system		☑	☑					
Junction co-ordination program			☑					☑
Pedestrian crossing improvement					☑			
Parking management							☑	☑
Enforcement of parking and driving regulations			☑		☑			

Other measures

Measures	Assessments of effects				
	Improve road safety	Improve driver behaviour	Improve environmental situation	Improve Level of service	Minimise impairment of the Public Transport
Road safety program	☑	☑			
Ride sharing program			☑	☑	☑
Travel plans			☑	☑	☑
Staggering of hours				☑	☑

7.3.8 Conclusion

One of the areas highlighted early on for improvement by the Consultants was public transport; firstly, to improve the level of service and secondly to attract passengers. One relies on the other and therefore measures have been proposed regarding all aspects of the public transport service provision.

The first step of enhancing the public transport system is shown in the so called Enhanced Bus Network Scenario, which improves the bus system in Nicosia.

The Consultants have evaluated the possibilities of integrating a tram into Nicosia but assert that the roads are too narrow to support an efficient service. On the other hand, a system with a dedicated track such as a cable car does not suffer from these disadvantages and could increase the share of public transport to between thirteen and fifteen percent along GTS lines.

It is important to note that other more basic changes are also needed: it is critical to introduce a timetable and bus stops and to display necessary information at the stops. A fare structure and bus priority schemes must also be established.

These measures would represent a major step towards making public transport more attractive and to increasing passenger numbers.

However, all these improvements won't be successful if the programming, planning and controlling duties won't be organized in an suitable manner.

In the EU there are different systems, how the countries deal with their public transport. Basically the programming and controlling should be within the responsibility of a Public Transport Authority.
Whereas in most countries the public transport is the responsibility of the traffic-regions (cities and surrounding municipalities). These regions are organized in Transport Authorities that plan, program and control all public transport services within their area.

The operators can either be various transport companies, which can be owned either by private companies, public companies or private/public partnerships. A separation between the programming authority and the transport operators is mandatory.

The most important thing is, that there is competition between the various transport companies and operators and that the contracts are awarded after a public tender. The access of multiple private companies to these tendering must be assured.

Depending on economic, legal, political and social aspects a detailed analysis needs to be carried out to find the right economic system, the right operating system and the right operators.
This analysis must be the base for all tender procedures for the public transport sector within the Nicosia Area.

7.4 Private Transport System

Nicosia's traffic system is mainly based on radial roads that lead to the Walled City. There are very few tangential roads running east – west and due to this situation it is necessary for most of the east-west traffic to go through the CBD. The roads themselves would have the capacity to handle this traffic but are limited by traffic lights and /or missing right-turning lanes. This leads to a strain on the roads in the CBD.

It is therefore an imperative need for the provision of an east-west traffic flow without the need for these trips to go through the CBD regions.

Surveys carried out for the Study indicates that about 15% of the whole traffic in the study-area originates in the Greater Urban Area adjoining the Study Area. The other 85% is local traffic originating from within the Study Area.

Therefore, it is necessary to find measures that change the local traffic patterns. In the long run the modal split must be adjusted in favour of public transport allowing mobility for all inhabitants in the Nicosia area.

Because of the heavy traffic in the city, the environmental as well as the economic power of the city is being impaired due to exhaust fumes, traffic jams, and migration of the economic powers from the CBD to the outskirts.

These problems will be reduced if it proves possible to shift people from the car to another form of transport.

7.4.1 Goals to be achieved

The schedule that follows provides some of the primary goals for an improved Traffic System for Nicosia:

- Increase of the attractiveness for the pedestrians and bicyclists
- Restrictions for the transferable private car traffic
- Creation of good quality traffic conditions for the necessary car traffic
- Define Goals which would improve the flow of the traffic
- Raise the overall quality of transport
- Make efforts to limit the private car traffic to that which the town is able to cope with
- Increase of the attractiveness of the public transport
- Function sharing should be instituted to the advantage of town development
- Increase quality of Public Transport as to shift people from the Private car to the Public Transport
- Educate the public as to accept the need for the private car restrictions in favour of the public transport
- Improve road-safety
- Improve level of service
- Minimise impairment of Public Transport

- Improve level of service for non-motorised traffic
- Improve access for build-up areas
- Improve access for Parking, Delivery, Loading
- Achieve good traffic conditions and Traffic management
- Improve driver behaviour
- Improve environmental situation
- Improve roadside environment
- Improve Information
- Give priority for private cars during times of low traffic demand for shopping and leisure traffic)

Chart 19 that follows, indicates the demands made on Streets under a variety of uses:

Demands on Streets

- Pedestrians walking along roads
- Pedestrians crossing roads
- Social aspects
- Cyclists
- Public short-distance passenger transport
- Traffic and transport
- Parked vehicles
- Deliveries and load
- Design
- Tree and grass planting
- Supply and disposal
- Special use (garbage collection, fire brigade)

Chart 19: Demands on Streets

7.4.2 Traffic System Problems

A huge amount of money is being spent for the road infrastructure in order to satisfy the demand of vehicle traffic.

Whenever though the widening of a road is carried out, the new capacity is consumed by an increase of demand. These results on bottlenecks, that once existed at the outskirts of the city, to move towards downtown leading to a lengthening of the peak hours.

The environmental situation in the CBD is on the worsening. It will only improve if the motor traffic in this area decreases.

There is a continued problem of decrease in mobility, affecting the quality of life. Private car passengers must be pulled out from the private into the Public Transport Services.

7.4.2.1 Characteristics of some Main Streets

The Consultants have analysed the traffic situation and demands of many streets and listed the respective deficiencies for each case examined. As an illustration of how this was recorded samples are shown here in after for three main roads of Nicosia. This list shows the kind of deficiencies that need to be corrected.

Leoforos Archiepiskopou Makariou III at Leoforos Evagorou I:

This road represents on the one hand a shopping street with all related uses and on the other hand it is a main road with a heavy burden of traffic.

The characteristics of this road are:

- It is a 3-lane road: 2 lanes are westbound and 1 lane eastbound
- It is defined as a primary road
- Total peak hour flow of more than 2000 p.c.u. (Passenger car units)
- On both sides are pavements, partly on different levels
- Trees are planted on the pavements. These trees attract the eye and indicate environmental qualities, but create some obstruction to the pedestrians.
- This road represents a classical clash between the street's use and the traffic burden. This limits the attractiveness of the shops and makes shopping inconvenient for the customers.
- Loading and delivery is not adequately regulated and delivery vehicles that park on the pavement obstruct the pedestrians and the townscape.
- The same is true for the public transport that shares the road with the car traffic and in case of traffic jams is unable to run on time.
- Parking is prohibited in this road, but it was observed that quite often cars stop and park on the left lane towards the city or use the pavement as a car park.

Leoforos Akropoleos / Nikis at Arsinois Street level:

The Leoforos Akropoleos/Nikis is a 4-lane road with partly separated lanes that run north – south. It is a typical primary road with nearly 2700 p.c.u. both lanes.

The characteristics of this road are:

- It offers the pedestrians a wide pavement, but few possibilities to cross at a pelican crossing.
- Towards Nicosia the lanes are no longer separated and it runs through an area with multi-storey residential houses, where shops of different kinds inhabit the ground floors.
- The pavements become narrow due to the planting of trees.

Leoforos Strovolou at Leoforos Athalassis

Leoforos Strovolou is another primary road of Nicosia's network and like most of the radial roads runs north – south.

The characteristics of this road are:

- Its peak hour flow is about 3500 p.c.u. for both directions and represents one of the heavy loaded roads
- It is one of the typical widened roads that are so common in Nicosia
- Loading and unloading takes place in front of the shops where customers also park their cars
- It offers adequate pedestrian walkways and due to the trees in some areas the environmental effect is positive
- During the peak hour the streets are jammed and the public transport, which has no bus lane, is delayed

7.4.2.2 Junctions, Intersections, Traffic Flows and Traffic Lights

One of the main problems that need to be solved is the bottleneck at junctions.

Some General Facts:

- Capacity of Junctions and Intersections limit the traffic flow to about 70% of the capacity of the same lane between junctions
- Traffic lights frequently fail to provide a green wave during peak hours
- Measures such as the use of Q-turns (loops) helps to turn a right turning lane with a capacity of 300 cars/hour into a straight lane with a capacity of 900 cars/hour
- Reducing conflicts leads to increased road capacity
- All main junctions that show a significant difference between the theoretical capacities of junction and road and where the actual flow is close to the theoretical junction capacity need to be considered for improvements

Traffic Flow at Junctions:

The three charts below show two examples of P.C.U. flow at Junctions. These junctions are referred to as A05, which is situated above the roundabout on Limassol Highway entering Nicosia and A09 on Leoforos Makariou III near the Hilton.

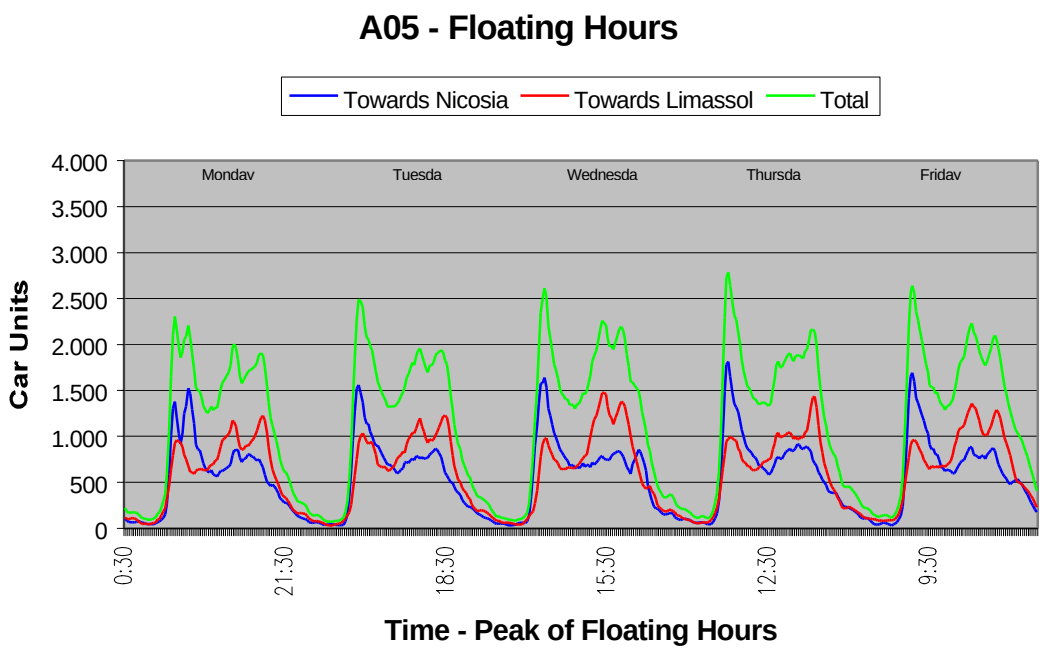


Chart 20: A05 P.C.U. Flows for a 5-day period

The chart above shows the very regular peak hours at a road that has not reached its capacity yet. With the exception of the Wednesday, when the shops are closed in the afternoon, all flows are very regular.

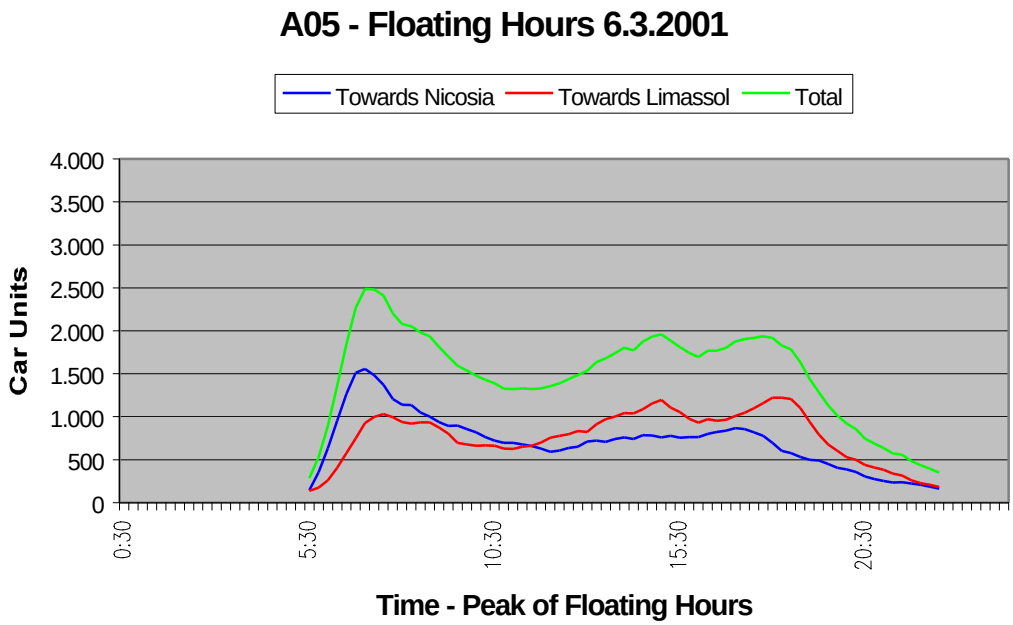


Chart 21: A05 P.C.U. Flows on Tuesday 6.3.2001

The chart here in above shows very wide peaks with nearly the same flow rates over hours for the Tuesday flows shown in Chart 21. This indicates that either the capacity of the road has been reached or that the nearby junctions are the limiting factor.

In comparison, the road (Leoforos Makariou III near the Hilton) shown in Chart 22, which is also a 4-lane road, has much more capacity than the nearby traffic light. The Chart shows a very wide peak with very little variation. Basically the peak hour last for a few hours. This leads to the

conclusion that either the capacity of the traffic lights has to be increased, or that the traffic flow must change.

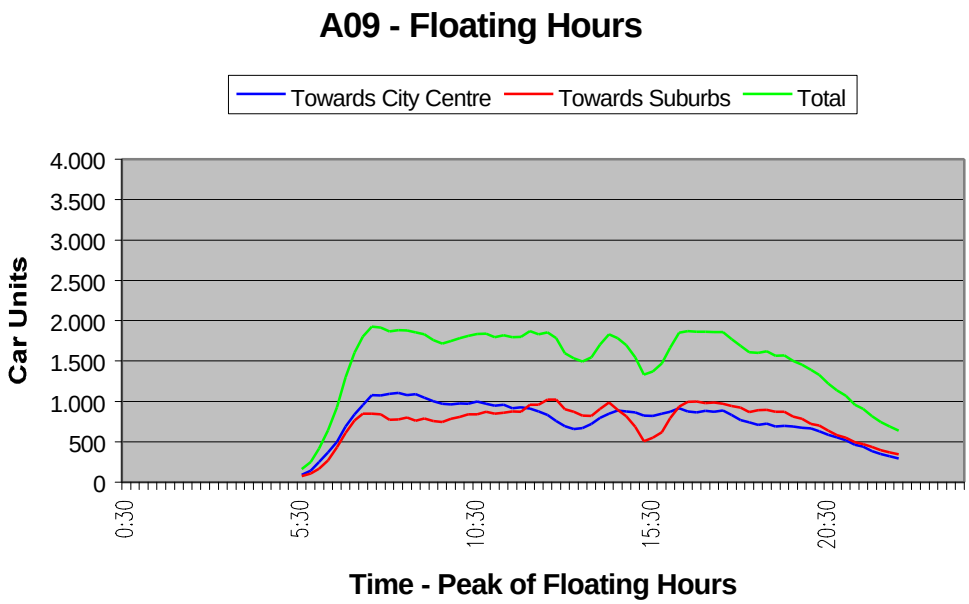


Chart 22: A09 P.C.U. Flows, Tuesday 6.3.2001

Roundabouts and the extensive use of traffic lights resolve the problem of intersections. The level roundabouts are gradually replaced by grade-separated junctions at the outskirts of the city and at end of high capacity Roads and Roads leading into Nicosia

In the Central Business District or CBD, the SCOOT system controls most of the traffic lights.

Some of the deficiencies related to the matters reviewed by this section of the Report are:

- Regardless of the daily traffic jams most of the people working in the Study Area use their cars to go to work
- The citizens consider the car as more convenient, faster and cheaper
- Even parking problems do not discourage the use of the private car
- In the CBD there exists the problem that the traffic lights do not produce a green wave and that they are sometimes separated by less than 350 m from one another
- The traffic flow into the junctions during the peak hour is mostly larger than the capacity of the different lanes within the junction
- To reduce traffic jams, the Government started widening the roads. With this came negative impacts on the townscape and a reduction in the facilities for pedestrians. Indeed, shortly after the widening, the free capacity was filled with new traffic.
- Free or cheap parking increase the traffic that flows into downtown
- Missing right turning lanes
- Right turning lanes are too short

- East – West Traffic flow has to go via the CBD
- Tangential Roads are infrequent or missing
- Inhomogeneous traffic system
- The combined effects of intersections and junctions is not optimal
- Distance between traffic lights is very short
- Capacity of traffic lights limit the system capacity
- The grid of the primary road network is not dense enough
- Parked vehicles block one lane
- Street names are hard to read and sometimes are not visible at all
- Operating cost of the car is too low
- Drivers do not stop at stopping lines at traffic lights

The past widening of the roads of Nicosia produced roads of high capacity which is very much reduced at junctions, since it is accepted that the lane capacity of junctions is only about 70% of the capacity of the same lane between junctions.

This leads to jams in the junction areas that affect other junctions because the distances between many junctions are so short. Finally during rush hour whole streets are blocked because of the low capacity of many traffic lights.
The low capacity results from the lack of right turning lanes and relations that might be avoided with other junction layouts.

At every junction where the peak hour load is less than 12% of daily traffic, the peak is not very strongly developed. If the regular cross-section is not at its capacity limit then the traffic light is the limiting factor of the system. This is especially harmful within a radial network where one junction in the centre can reduce the capacity many roads leading into the centre.

There is another problem in the CBD that the traffic lights do not produce a green wave and that they are sometimes separated by less than 350 m. The traffic flow into the junctions during the peak hour is mostly larger than the capacity of the lanes within the junction.

7.4.3 Measures

7.4.3.1 Junction Enhancement

The Consultants proposed certain measures to resolve the junction problems. These measures could be the permanent or temporary reduction of relations within the junction. Basically the use of Q-turns (loops) helps to turn a right turning lane with a capacity of 300 cars/hour into a straight lane with a capacity of 900 cars/hour. Reducing the relations increases capacity by reducing conflicts and providing more space in the junction. An example of such an Q-turn is shown in map AXF00073-4 for the junction of Makariou III and Santaroza (Woolworth Junction).
All main junctions that show a significant difference between the theoretical capacities of junction and road and where the actual flow is close to the theoretical junction capacity need to be considered for improvement.

Such changes include:

- Construction of new turning lanes
- Introduction of one-way systems
- Banning of certain relations (mostly right-turns)
- Q-Turns
- Reduction of the traffic flow by constructing new roads
- Narrowing of the existing lanes to make an additional lane

A detailed study needs to be considered to carry out this task and to make detailed proposals for changes in the junction layout. It is extremely important to review all right turns that do not have a separate right-turning lane or where the right-turning lane is too short in order to avoid the blocking of one lane by the turning vehicles.

The following proposals are considered important in order to improve the current situation in Nicosia:

7.4.3.2 Proposed Road Network (2002-2010)

Based upon the a hierarchy of the road network, map AXF00110-5 represents the recommendations of the Consultants for the structure of the primary network. This map also includes the proposed number of lanes. Please note that the already reserved land needs to be reserved in the future to allow possible widening of the 2+1 lane roads to 4-lanes. This scheme already includes the proposed one-way system in the CBD area.

This network includes also the network regulatory plan projects that were developed by the PWD. Map AXF00095-1 shows these projects.

Principally, primary roads refer to 4-lane roads with or without separation and pedestrian crossings. They can also be non-build-up roads with side roads. Primary roads bear a traffic flow of more than 1000 p.c.u/hour/direction.
In all cases, the junctions have to be improved to have enough capacity: this may be achieved through widening of the junction area or the construction of Q-turns (loops).

Main roads refer to 2-lane roads with improved junction areas and a traffic flow of less than 1000 p.c.u per hour per direction.

The junction areas play a very important part in a road network. Without an adequate capacity the proposed road network won't be successful: it is paramount to remove the current bottlenecks.

The principal scheme of the proposed network depends on primary and high capacity tangential roads that either distribute the traffic before it enters the city (Southern Ring Road) or distribute the local traffic in a west-east direction and on radial primary roads that lead the traffic from the tangential roads to the city centre.

G. C. Hadjicostas Consultancies
CY-1307 Nicosia
P.O. Box 25238
TELEPHONE / Fax +357 (2) 669 777
gch.cons@cytanet.com.cy

AXIS INGENIEURLEISTUNGEN
A-1040 VIENNA
RAINERGASSE 4
TELEPHONE +43 (1) 50 670-0 FAX-40 wien@axis.at

NICOSIA TRAFFIC MANAGMENT AND PUBLIC TRANSPORT ENHANCEMENT STUDY
M18 Phase 2 Junction Layout

GZ.:	127350	Datum:					09.07.2001
Sachbearb.:	KRAPPINGER	Maßstab:					1:1000
Gezeichnet:	DRAGIC	PLANER		ART	LAUFENDE NR.		INDEX
Format:	0,06m²	AX	F	0	0073		4

This principle includes the following main points:

- No or only when absolutely necessary widening of radial roads
- Development of non-built-up roads in tangential direction
- Increase the resistance of the road system towards the city centre
- Improve junction areas

The principle behind tangential roads is that distribution takes place more quickly (non-built-up roads, or high capacity junctions with appropriate traffic light cycles) in the tangential direction. Vehicles journeying towards the city centre would move with a uniform but lower speed. Traffic therefore would be able to seek the most suitable radial route and would be distributed more sensibly and evenly around the system. This would particularly alleviate some of the problems around the CBD. Especially the new coming projects that are on the planning phase, all demand accessibility through tangential movements and will load on east-west traffic even more. The map AXF00125 provides the locations of such projects.

Another main requirement/principle for tangential roads in developed areas is that speed when travelling towards the city centre be either the same or lower than the speed on the tangential roads. Additionally, the speed should decrease towards the city centre.

Some of the primary/main roads shown in this study are characterised as 2-lane roads, even when the network regulatory plan shows a 4-lane road. This discrepancy results out of the different time frames for this study and the regulatory plan. For the next 10 years and if public transport is improved, the solutions in this report will be sufficient.
When referring to primary or main roads with 2-lanes it is imperative to understand that no reduction of the reserved land should take place. The 2-lane road referred to includes an additional 3rd lane that can be used as a multifunctional lane. This lane allows right turning movements and acts as a pedestrian island where necessary. Additionally it should be used as a central reserve to establish a higher degree of safety and security for drivers and pedestrians.
It is imperative to understand that the necessary road space (reserved land) is the same as for a 4-lane road and that future widening must be possible.
The central reserve and the curbs for the 2+1 lane road should be constructed in a way to allow widening without additional cost for new curbs.

Especially the construction of the two tangential roads near Strovolos is essential for the future quality of the Nicosia road network:

New Northern Tangent - Tangential Road from Engomi (Leoforos Griva Digeni) to Aglantzia:

This road should work as an important distributing tangential road to avoid west-east traffic going through the CBD. It represents one of the absolute necessary proposals within this study.
Because of the residential areas it passes through and for political acceptance as well as for traffic reasons, it is suggested that this

road is built as a 2-lane road (partly 4-lane) with improved junctions and an environmental tunnel with 2-lanes in the area of Strovolos.
This tunnel can be built as a cut-and-cover tunnel and it would underpass the residential areas of Strovolos. It is necessary to protect the sensitive residential area of Strovolos and the river area.
Connections to Leoforos Strovolos as well as Leoforos Athalassis complete the road in the Strovolos area.

New Southern Tangent - Tangential Road from Engomi (Makariou Stadium) to Aglantzia (University):

Because of the residential areas this (partly) new road should be a 2-lane road and connect Engomi and Aglantzia. Additionally, the cross-section must be adjusted to the roadside environment and show green elements in order to increase the acceptance of the residents.
All junction areas need to be improved to allow a high capacity.

Especially in the Strovolos area, environmental and residential factors of the surrounding areas need to be considered and cross-sections should be chosen that minimise the impact of the new road.

A detailed study of the environmental impact and the compatibility with the functions of the surrounding areas needs to be prepared.

Additionally to these tangential roads, the Consultants proposed corridors for the planning of future roads.

Corridor for a new Tangential Road from Engomi (Leoforos Archangelou Michail) to Leoforos Stavrou:

This road should be another east-west connection that should indirectly develop the southern areas of Strovolos and function as a tangential connection within Strovolos. It is necessary to reserve land for such a road right now, to allow construction in the future. This road will be necessary in the future to condense the grid of the main roads in the south of Nicosia.

Corridor for a road through the Athalassa Forest:

The map AXF00109-5 shows another corridor that should be considered for a future road. This road is already shown in the regulatory plan. The Consultants strongly recommend considering the construction of a tunnel underneath the environmentally sensitive area of the Athalassa Forest.
The land for this road needs to be reserved, but the construction will most likely not start during this study’s time frame.

7.4.3.3 The Proposed One-Way System

For the CBD area the consultants worked out a one-way system, which they consider could bring a large improvement to the traffic flow (please refer to map AXF00070-4).

The measure consists of a one-way system with mostly 3 lanes in one direction plus one lane for other uses. It will need to widen most junction areas to four or even five lanes within the existing road space.

This will prove a major way of improving the capacity of all junctions and routes in the area as well as creating space for other means of transportation or for other road uses.

The Consultants believe that there will be a time saving for the travellers. However, this measure needs to be seen together with other measures, including the suggested creation of the Northern Tangent Road.

The main axis into the CBD stays the same within the proposed one-way system but the tangential flows are spread into two counter-moving flows.

Because of the decrease of conflicts in the junctions, the whole system gains safety and the phases and green times of the traffic lights can be optimised and the flow increased. A sample of such an improved junction is shown in map AXF000158 (Griva Digeni/Nikis junction).

With a one-way system, the relations into and out of junctions are easy to control and the green phases of the junction can be extended.

A green wave would also be easier to install and the often-short distances between traffic lights would not be such a problem as they now are.

In order to prepare for a unified Nicosia, this system can be extended to form two ring roads around the Walled City (map AXF00155-5).

7.4.3.4 Removal of Private Cars from the City Roads

The Study proposes a series of measures, other than the use of Public Transport which if followed by the Schools Population, large Employers, the Civil Service and others would reduce the number of motor cars from circulation at the Peak Hours. Such measures, which could be introduced, are:

- Ride Sharing
- Travel Plans
- Staggering Hours
- Park and Ride
- HOV lanes
- Restriction of Circulation
- Road Pricing

Ride Sharing:

The theory behind ride sharing is that the number of cars on the road at one time could be reduced if drivers with the same origin and destination shared cars.
The Government could create a special agency to co-ordinate and control the process. Individual drivers must register their interest in being driven or driving others with the agency linking these people together. A disadvantage is the loss of flexibility for the individual.

Travel Plans:

This is an alternative to ride sharing is for individual enterprises and organizations to form travel plans for their staff. Measures for a travel plan can address different types of travel associated with the organization's activities such as:

-
- Commuter journeys
- Business travel undertaken by staff
- Visitors
- Deliveries and/or contractors
- Fleet vehicles

The following table explains the benefits for different groups of people:

G. C. Hadjicostas Consultancies
CY-1307 Nicosia
P.O. Box 25238
TELEPHONE / Fax +357 (2) 669 777
gch.cons@cytanet.com.cy

AXIS INGENIEURLEISTUNGEN
A-1040 VIENNA
RAINERGASSE 4
TELEPHONE +43 (1) 50 670-0 FAX-40 wien@axis.at

NICOSIA TRAFFIC MANAGMENT AND PUBLIC TRANSPORT ENHANCEMENT STUDY

One way system for unified Nicosia Variants

GZ.:	127350	Datum:				22.01.2002
Sachbearb.:	KRAPPINGER	Maßstab:				1:25000
Gezeichnet:	DRAGIC	PLANER		ART	LAUFENDE NR.	INDEX
Format:	0,06M²	AX	F	0	0155	5

Who will benefit from a travel plan?

	You, as an employer	Your staff	The local community/ environment	Comments
Cost savings	☑	☑		A travel plan can bring cost savings to both you as an employer and to your staff, as travel becomes more efficient.
Increased productivity	☑			A healthier, happier workforce can increase productivity of staff.
Reduced demand for on-site parking	☑			Reduced demand for parking enables land previously used for parking to be put to more profitable use.
Healthier workforce and reduced absenteeism	☑	☑		A healthier workforce is a more productive workforce.
Improves your organisation's image	☑			Demonstrates your organisation's values.
Improved site access	☑	☑	☑	Improved site access.
Reduced congestion	☑	☑	☑	Also benefits just in time operations/ deliveries.
Reduced accidents	☑	☑	☑	Reduced trauma and cost savings
Improved staff morale	☑	☑		Improved morale increases productivity.
Opportunity for staff networking	☑	☑		Car sharing and joint working in the course of travel plan development enables staff to socialise as well as discuss work related issues.
Time savings	☑	☑	☑	Reduction in time spent travelling enables more time for doing other things e. g. leisure activities, work at the office etc.
Improved quality of life	☑	☑	☑	Time savings, reduced stress and improved health all lead to lifestyle improvements.
Reduced stress	☑	☑		Reduced stress means a healthier and more productive workforce.
More equal treatment of staff	☑	☑		Equal treatment of all staff improves morale.
Staff recruitment	☑	☑		A travel plan can help create a more attractive recruitment package, as well as create a wider base of potential employees.
Improved local air quality	☑	☑	☑	Reduced traffic levels will result in less pollution, which will improve air quality in the local area.
Energy savings	☑	☑	☑	Energy savings bring cost savings as well as environmental benefits through reduced use of fossil fuels.
Improved public transport service	☑	☑	☑	Staff and local residents would benefit from any improv. made by your organ. to local bus services and enable non- car owners to become part of your potential workforce.
Reduced overspill parking onto residential streets	☑		☑	Reduced demand for parking from staff will result in less overspill onto surrounding residential streets (improves image of your organisation).

Table 12: Benefits of Travel Plans

Staggering of Hours and School Bussing:

Staggering of Hours could prove the second most important way to reduce Traffic Congestion in Nicosia, after pulling private car users from the private car and pushing them to the Bus.

Looking at the Employment and activity pattern of Nicosia it appears that a very large proportion of the early morning regular travellers are the school population, the civil service staff including semi-government organizations, institutions, banks and large business or industrial organizations.

The staggering of the hours, students using the public transport, together with the provision of incentives for pool transport for employees of larger employers, would be the way to reduce early morning congestion.

The statistics shown below helps us to estimate the possible positive impact of School Bussing:

Educational Level	No. Students	No. Teachers	Total
Tertiary	8.895	719	9.614
Special	243	71	314
Secondary	22.278	1.938	24.216
Primary	16.997	954	17.951
Pre-Primary	8.207	557	8.674
Totals	56.620	4.239	60.859

Table 13: Students and Teachers in the Study Area

Administrative District							
Nicosia	Famagusta	Larnaca	Lemesos	Pafos	Overseas	Not Registered	Total
19,419	1,143	5,685	6751	3503	213	211	36,924

Table 14: Public Servants excluding Teachers and Police

The improvements to be enjoyed by the early morning changes in travelling habits will be reflected at the other congestion hours because there will be appropriate movement at the end of the respective work period.

A very preliminary estimation of the expected improvement of the situation if the bussing and staggered hours measures would be introduced could be as below:

In the case of students, it is estimated that around 60% of them are transported to school by private transport. This represents about 30,000 trips in the morning peak hour. If 50% of these students agree to travel by Public Transport this would remove around 15,000 car trips from the morning peak hour. Inquiries made amongst parents proved positive even when they were told that this arrangement could cost them a total of 10-15 pounds per month for the return trips.

In the case of Civil Servants and other organized employers, travel plans such as bussing, car-pool, paying for parking (now provided free) are estimated to reduce the present traffic load of about 15,000 trips by about 5,000 trips. Government could consider some incentive schemes to encourage car-pooling.

The report suggest that a logical way for Staggered Hours would be:

- Kindergarten and Primary Schools and Gymnasia to start at 7.30am
- Lyceum Schools, civil Service and Semi-Government organizations to start at 7.45 am
- Banks and Commercial Establishments to start at 8.00am
- Shops and others at 8.15 to 8.30am

Park and Ride:

The Consultants propose three possible sites for park and ride in the outskirts of Nicosia (please refer to map AXF00133-4).

However, the exact locations need to be found together with the planning of the bus stops and in general with the exact locations of the bus lines.

The first, and probably easy to manage, location is the already existing parking lots at the Makariou Stadium, which makes it possible to link this location with multiple bus lines to the city centre.

Another possibility is the junction of Leoforos Strovolos with the Southern Ring Road. This would serve the commuters that regularly use Leoforos Strovolos to go to Nicosia.

The third is near the big roundabout at the Limassol Highway.

Park and Ride is a typical Pull-method that needs complimentary Push-methods like short-term parking in the CBD to be successful.

The principle of Park and Ride is, that the Public Transport should go as far as possible and the car should be used as far as necessary. It is an offer based on a scheduled and frequent bus service.

Selected rural buses should arrive at these Park and Ride locations and the passengers should change to the regular Nicosia urban bus system using fare sharing. Therefore the schedules of the rural and urban buses need to be co-ordinated.

HOV lanes:

High Occupancy Vehicle lanes are a measure that can be used on roads with a minimum of 3 lanes in one direction to speed up the cars that transport more than 2 persons. Such a measure is useful on freeways leading into a city or ring roads with long distances between the intersections.
Nicosia does not have roads with 3 lanes in each direction and “closing” one lane out of two for most of the cars (car occupancy is an average 1.2 persons currently in Nicosia) would increase traffic jams. Additionally, enforcement would be nearly impossible.
Therefore, the Consultants do not recommend HOV lanes for Nicosia.

Restriction of circulation:

A total restriction of circulation for a transport mode such as the private car is not useful in an area like Nicosia. Normally such restrictions are applied to heavy good vehicles during the night, or dedicating certain streets to public transport.
Currently there is no indication that HGV traffic is a large problem in Nicosia and, therefore, such a measure is not necessary.

When considering partial restrictions for the private car, such a measure would only be useful in the CBD area. But the CBD especially is a heavily populated and used area with offices and shops in side streets and such a restriction would not be beneficial for these businesses.

Road Pricing:

Road pricing in the meaning of limiting the access to Nicosia and charging for the usage of the roads leading into Nicosia is a measure that cannot be recommended. The businesses of Nicosia would suffer from such a measure and the control of the entries/exits would be too complicated in a grown city like Nicosia.
To charge only for the use of certain roads would redirect the car flow to non-tolled roads and would cause even more congestion.

7.4.4 Assessment and Benefits of the Measures

The Table below presents a summary assessment of the effect of the various measures to the effort to enhance the Present Private Traffic of Nicosia.

Private Traffic

Measures	Assessment of effects								
	Improve road safety	Improve Level of service (traffic flow quality)	Improve conditions for non-motorised traffic	Improve access for build-up areas	Minimise impairment of the Public Transport	Improve driver behaviour	Improve environmental situation	Improve roadside environment	Improve Information
Function oriented road network	☑	☑	☑	☑		☑	☑	☑	
Review the network regulatory plan	☑	☑	☑	☑					
Review cross-section, function oriented	☑	☑	☑	☑	☑	☑	☑	☑	
Plan and build tangential roads		☑		☑	☑			☑	
Improve existing primary and main roads	☑	☑	☑		☑	☑		☑	
Introduction of CBD one-way system	☑	☑	☑	☑	☑			☑	
Junction enhancement program (improve capacity and increase conflicts)	☑	☑	☑		☑				
Junction coordination program (green wave, duration of phase, homogeneous traffic flow,		☑			☑		☑		
Traffic Calming	☑		☑	☑	☑	☑	☑	☑	
Reviewing and installing of street names		☑		☑					☑
Direction signs and signalling system	☑	☑		☑					☑
Driver behaviour campaign	☑		☑			☑			
Enforcement of driving regulations	☑		☑		☑	☑			
Complementary measures:									
Pedestrian crossing initiative	☑		☑		☑				
Parking management	☑	☑	☑	☑	☑	☑	☑	☑	☑
Enforcement of existing parking regulations	☑		☑		☑	☑			
Introduction of Park and Ride		☑					☑		
Road safety Program	☑		☑			☑			
Consideration for Bus network + Guideway Transit System		☑	☑		☑		☑	☑	
Bus priority program					☑				

7.5 The Parking System

As in most cases of the European cities, car parking in Nicosia is provided either on-street or off-street.

The current situation is summarized below:

- On-street parking is very often not clearly regulated. Side streets are crowded with parked vehicles. Most of the buildings in the CBD do not have car parks for the inhabitants.
- The off-street car parks can be separated into public car parks and private car parks. The public car parks are accessible by the public and, depending on who operates them, either a fee is charged or they are free.
- In order to control parking, there are legal possibilities and planning possibilities available that allow the municipality to influence the distribution and size of the traffic that depends on parking.
- In order to quantify the parking demand in the CBD, on-street and off-street parking surveys were undertaken at certain spots of the CBD in order to collect holding times for the different parking areas. These were used to propose parking measures.
- Right now it seems that the parking demand for drivers who are willing to walk a certain distance is definitely met with the existing facilities.

7.5.1 Goals for Parking

The following bullet points represent the general goals for parking in the Nicosia area and specifically in the CBD.

- Improve road-safety and efficiency of access roads
- Improve social security: Illumination, Supervision / monitoring
- Improve attractiveness: Location/distribution and allocation to important facilities
- Access by Parking Guidance System for parking facilities
- Preferential treatment of certain users
- Improve supply with new car parks
- Improve conditions for non-motorised traffic
- Improve access for build-up areas
- Minimise impairment of Public Transport
- Improve driver behaviour
- Improve environmental situation
- Improve roadside environment
- Improvement of the quality of life
- Improvement of the attractiveness of the town
- Reduction of parked vehicles in public areas
- Efficient use of the resources of the town

7.5.2 Deficiencies

- Minimum parking requirements for new buildings:
- Insufficient control of the short term parking areas leads to illegal parking
- Due to insufficient car- parks and the high car usage many drivers chose to park illegally
- Low parking rates invite drivers to use their car to go to work
- Parked vehicles aggravate the access to shops
- Parking on the left lane or on the curb side often aggravates the access to shops
- Missing parking guidance systems tend to produce unnecessary trips
- The current parking policy secured some private car parks from being used for new buildings for the next 5 years. Some of these car parks will vanish as present car parks are being built-up.

7.5.3 Measures:

7.5.3.1 Parking Management System in the CBD

The Municipalities of the Greater Nicosia Area together with other interested parties should create a Private – Public Company to manage collectively the problems relating to the Parking Services.
Large parts of the CBD are currently already short term parking areas. Therefore the Study recommends the establishment of a parking space management system for the on- and off-street car parks.

The system should be based on the principle that a parking lot nearer to attractive locations should be more expensive than a parking lot further away. A parking management system should include on-street and off-street car parks.
The willingness to walk should be the key to the cost of parking. All car parks in the immediate vicinity to attractive areas should be more expensive than car parks that require a short walk.

The distances people find tolerable to walk from Parking are shown in the Table below:

Willingness to Walk

User Group	Distance
Tourists	300 m
Delivery	10-20 m
Inhabitants	100 m
Guests	300 m
Employees	500 m

Table 15: Willingness to Walk

If the whole CBD would be a short-term parking zone with fee the number of trips due to the search for free car parks would be reduced.

The Municipalities in the Study area should form a traffic council that has the mandate to decide on traffic measures for the whole study area.
There could be a Private/Public partnership established including all the municipalities and a private company (or companies). The municipalities provide the legal framework for the parking management system and private companies control the short term parking zones, collect the fees (different systems are possible) and write parking tickets.
The same company (private/public) could use the money collected to build new off-street car parks that would then be included in the parking management scheme.
Additionally, this company should negotiate contracts with the owners of empty lots to use them as off-street car parks and include them in the system.

The Consultants propose that the Parking Management System incorporates three zones: the Walled City as Zone I, one part of the CBD as Zone II and the remainder of the CBD as Zone III. This is shown in map AXF00068. Overall, the system must include both on and off-street parking; the following paragraphs refer, however, to short-term on-street parking.

- Walled City – Zone I

  Especially within the Walled City there are many streets where parking meters are installed that are not favourable for the townscape and that handicap pedestrians. They are also expensive to maintain.
  Additionally, there is illegal parking and through traffic in the Walled City that need to be eliminated.
  It would make sense to install a short term parking zone with internal loops because it has only a few easy to control entrances and is handicapped by the separation of the city. This short-term parking zone would apply for the on-street parking whereas parking durations up to 3 hours could be possible. In off-street locations there should be offers for long-term parking.

  The easiest way to control the parking and the through traffic would be a system for controlled entry at all entrances and exits from and to the Walled City. The most modern one could be a CCD-controlled (video controlled system with number plate recognition) prepaid parking ticket or road-pricing system. Alternatively, a ticket system is possible and the driver would pay at the exits.
  The technology used is of minor importance, more important are the principles on which the system is based. Everybody would be allow to enter this zone, which means that this measure is not a car restraining measure, rather a parking management measure with controlled entry.

  Different rates would apply to different categories of user. For example, residents and shop-owners would receive a permanent parking permit (such as a key card) that entitles them to free parking at all times. For others, the fee should increase in steps: visitors and customers should be allowed to

park for a certain period free of charge (for example, one hour) and thereafter pay a progressive rate.
The existence of the free period means that cars are not restrained, or worse, banned from the Walled City, rather encouraged to act in a more organised fashion. A concept for possible movements within the Walled City is shown in Chart 38 on the next page.

The parking fee can either be paid at registers in convenient locations or at the exit itself. It is possible to use all kinds of cash (coins and paper money) or credit and debit cards.

Due to the one-hour free parking, the area of the Walled City would become more attractive for shops and businesses and more customers would visit.
Shops would undoubtedly profit from the parking management system. A possible incentive is to issue parking vouchers to their customers if their purchases exceeded a specified amount. This measure would boost the Walled City. The permanent parking permits for residents would create a more or less guaranteed and free (or at least inexpensive) car park and would make the Walled City an attractive area for living. This in turn would increase the number of residents.
Another advantage would be to reduce through-traffic and the long-term parked cars, thus allowing more people to visit the Walled City.

At least two bus lines should be established within the Walled City (similar to the existing city bus) with bus headways of less than 7 minutes during peak hour and a route that connects the whole Walled City and the CBD. Roads that are closed for private traffic should be used.
This concept needs to be transferred to the Walled City in order to make it again an attractive area, full of life and business.

This measure can be extended to the occupied areas if and when a reunion takes place. Please refer to map AXF00080 for more information.

- CBD - Zone II
  The zone II covers the attractive locations of the CBD and should be a short term parking zone with costs.
  The allowed parking duration should be between one and two hours and additional off-street locations should be available for long-term parking.
  As before, residents and shop-owners would receive permanent parking permits that would allow them to park permanently in the zone. The permits should be available for an annual fee.
  It should be noted that permits would only be valid for the zone in which the resident actually lives (either zone I, zone II or zone III).

The parking fees could either be paid with prepaid parking vouchers or with parking vouchers. The vouchers could be available from ticket vending machines located near the car parks or prepaid at supermarkets, shops etc.

The advantages would be that residents and people who need to park in a certain area could find parking spaces more easily and that long term parked cars would vanish from on-street car parks.

- CBD - Zone III
  The zone III covers the remainder of the CBD and should either be a free short term parking zone or a zone with cheaper fees than in zone II (depending on the method of fee collection).
  The allowed maximum parking duration should be longer than in zone II (up to 3 to 4 hours) and again long-term parking should only be available in off-street locations.
  As will the other zones, residents would receive permanent parking permits (valid only for zone III) and would, therefore, be allowed to park at any time in the zone.

Parking Fees:

The fees for short-term on-street car parks should be more expensive the nearer the car park is located to attractive destinations. Therefore the 3 zones were developed.
The following proposal can be used as a guide value for the parking fees.

On-street parking

	Pounds/hour
Zone I	0,6 (1st hour free)
Zone II	0,30
Zone III	0,30

Table 16: On-Street Parking Fees

The fees for underground car parks or multi-storey car parks need to be higher and digressive. The following paragraph shows the Consultants proposal.

Parking fees for underground or multi storey car parks could be between 0.60 pounds and 1.00 pound per hour and other off-street car parks should offer reduced fees for long term parkers. However, it is important that the parking fee is always more expensive than a return ticket for the public transport system. For example a 10-hour parking fee for an off-street car park could be between 2 and 3 pounds.

Parking in the evening:

In general the short-term parking should be limited to daytime parking and be valid possibly between 9:00 and 20:00 or following shop opening hours.

There would then be no parking duration limits between 20:00 and 9:00 the next morning.

This regulation would ensure that restaurants, bars, cinemas etc. and other shops open in the evening would not be affected by the parking limitations.

Off-street parking:

Supplementary to the on-street short-term parking there is a need for short-term and long-term parking in off-street locations.
The existing locations should be included into the parking management system and be managed by a private/public company.
With the collected parking fees, new off-street car parks should be built (multi-storey car parks, parking garages…) and the existing ones secured.

At least one parking garage should be built in the near future to prepare for the loss of some of the empty lots in the CBD area this will most likely take place soon.
The car park in front of the wall at Leoforos Omirou would be a good location for a new, modern and convenient underground car park. Other possible locations could be underground car parks underneath Leoforos Stasinou or a multi storey car park using one of the lesser attractive houses on Leoforos Stasinou or on any of the empty lots in the CBD.
Another possibility could be a parking garage underneath the Solomon Square.

7.5.4 Assessment and Benefits of the Measures

The following table shows the proposed measures and their benefits.

Parking

Measures	Assessments of effects									
	Improve road safety	Improve supply	Improve conditions for non-motorised traffic	Improve access for build-up areas	Minimise impairment of the Public Transport	Improve driver behaviour	Improve environmental situation	Improve roadside environment	Improve attractiveness	Improve social security
Parking management system	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑
Private/Public Parking Management Organisation (PMO)		☑		☑					☑	☑
Parking guidance system		☑		☑			☑		☑	
Build new car parks		☑		☑		☑	☑	☑	☑	☑
Enforcement of parking regulations	☑		☑	☑	☑	☑	☑		☑	☑
Park and Ride		☑		☑			☑			
Parking requirements for new buildings		☑		☑			☑	☑	☑	
Bicycle storage		☑	☑	☑			☑	☑	☑	☑
Complimentary Measures:										
Ride sharing Program							☑			

7.6 Conclusion

After an intensive study of the Investigation Area it is clear that the increase of the trips and the car ownership cannot be met without structural changes and an improvement of the public transport.

The structure of Nicosia needs to be urgently adjusted as to allow the public transport to access new and existing developments in a more efficient way.
In the future the big trip producers will still be Nicosia and Strovolos.
The modal split needs to be adjusted to provide a more balanced sharing between Private Car and Public Transport or some other means of transport (walking, Cycling).

Measures must be introduced to reduce the car traffic needs to the necessary trips.

Additionally the missing tangential routes need to be provided as early as possible. This east - west connection roads are a most imperative need to provide solutions that will offer the opportunity for as much traffic as possible not to travel via the CBD.

The introduction of an adequate schedule and timetable at all bus stops is a must, together with the need to improve the public transport – especially the introduction of bus priority schemes

On the other hand a certain restriction of the car traffic needs to take place together with a clearer definition of the functions of the different roads in the network.

The minimal parking requirements for new buildings needs to be enforced very strictly and for the future, additional off-street car parks need to be provided.

For the other means of transport parking facilities are needed to improve the connection to the public transport.

8.0 PROPOSED ACTIVITIES FOR AN EFFECTIVE IMPLEMENTATION

This section describes some of the steps that must be taken for the realisation of the measures proposed by the Study.

The Study being a General Study has only identified basic deficiencies and proposed measures required to overcome these. This situation makes it obvious that at the time of implementation of the measures it would be advisable to plan the exact Plan of Action by which each group of measures would be implemented.

8.1 Implementation Agencies

Presently the implementation of such measures will have to be reviewed and decided upon by the P.W.D, the Municipalities of the Study Area, the Police, the Town Planning Department, the Planning Bureau and others from the public and private sector, which obviously will make the implementation of the Study a very long and extended process.

The Study has a 10-year horizon, which means if it will succeed to bring about the warranted changes to reduce the Traffic and Public Transportation problems of Nicosia, work should start straight away with a time frame of five years for the implementation of the bulk of these.

To achieve this Consultants propose the creation and establishment of a number of ad-hoc Committees or Agencies who will be issued with a mandate to plan, programme and monitor the timely implementation of the measures. These Agencies will have as a time horizon of their existence the periods required to place into effect the measures falling under their jurisdiction.

The first and immediate step would be for the Municipalities and the Government, if necessary with the help of some implementation advisors, to prepare the mandate as to how these Agencies should function, to whom they shall be responsible, who will constitute it and how it will be funded.

The schedule of activities of these Agencies would amongst others be the implementation of the measures related to the following Traffic and Transport sectors.

8.1.1 Public Transport

The Transport Authority should implement all measures relating to the:

- Marketing campaign for the use of buses
- Bus network, bus types and sizes, and amenity requirements
- Bus routes, bus stops, time scheduling, Call Collect Bus, Call Collect Taxis
- Bus Priority Schemes, Bus Lanes and Bus Sluices,
- Fares Structure
- Financing of the Bus Public Company
- Follow Up to verify effectiveness of measures
- Plan for the erection and operation of Bus Terminal and Bus depot, etc.

8.1.2 Private Traffic

The Transport Authority should implement all measures relating to the:

- Road Hierarchy, including the development of variable cross-sections for the different kinds of roads
- One-way system in the CBD including the planning of the lane markings and cross sections at junctions
- Junction Improvement Program
- Provision of new Roads and Tunnels in sensitive habitable areas
- Direction Signalling System
- Network Regulatory Plan
- Traffic Calming
- Speed reduction in residential areas
- Junction co-ordination

8.1.3 Parking

It is extremely important to establish a **Public-Private Parking Company** for the Greater Nicosia Area, between the various Municipalities and the Private Sector to manage collectively the operation and problems relating to Parking Services.

The Parking Company shall implement all measures relating to parking and should manage the Parking Services:

- Parking management system: plan for a zoning system with a fee plan and a separate system for the Walled City which will attract visitors and shoppers
- Parking Guidance System: Select a suitable system, select the proper locations, be responsibility for the operation
- Parking Garages and Car-Parks on-street and off-street Parking
- Park and Ride arrangements

8.1.4 Pedestrians and Cyclists

The Study considers that in an area like Nicosia a large amount of private cars trips should be redirected to pedestrian and cycling traffic. This could be achieved through the energetic activities of the Transport and Traffic Authority.

Six measures were project specifically set out by the Study, namely:

- To construct and interlink pavements
- To improve pedestrian crossings and junctions
- To lower curbs (at least in new constructions)
- To implement bicycle routes in the city centre.
- To initiate a plan to encourage walking and cycling. under a name such as for example “WALK 2004”
- Create more crossings over the wall to help direct movement towards the Walled City

8.2 Important Projects

The following section lists some of the proposed measures relating to the sectors included here-in-above:

8.2.1 Pedestrian signals at traffic lights and pedestrian islands;

- Pedestrian crossings
- Junctions and pedestrian islands must be improved
- Additional pedestrian crossings need to be assessed and adapted
- New crossings need to be planned in detail

8.2.2 Lowering of curbs

Special attention must be given to areas where curbs should be lowered in order to allow better pedestrian access and easier movement for disabled people.

8.2.3 Bicycle network

- As part of the LIFE project, the first stage of implementation should be planned in detail.
- Bicycle storage locations should be introduced and relevant design guidelines for these formulated. All these measures must be
- co-ordinated with the LIFE project.

8.2.4 Regeneration of the area within the city walls

It is extremely important to undertake projects that aim at the improvement and regeneration of the Walled City with regards to housing, shopping and traffic.

8.2.5 Greater Urban Area Study

An extended traffic and transportation study needs to be carried out as soon as possible that aims at the transport and traffic relations in the areas surrounding Nicosia. The earlier this study will be carried out, the better the present model for Nicosia can be used.

8.2.6 Road safety program

A black spot study is right now in preparation and an additional educational campaign should be planned to improve the road safety.

8.2.7 Travel Plans

Large companies and the Government should work out travel plans in order to improve transportation and traffic in their neighbourhood.

8.2.8 Staggering of hours

A study should investigate this topic in respect of political acceptance and implementation.

8.2.9 Ride sharing

A project should aim at the possibilities and the organisation of ride sharing within the Nicosia area.

9.0 COST

Here-in-below the Report provides some basic information about the estimated cost for the implementation of the most important measures.

9.1 Public Transport Operating Cost

The large improvements of the proposed networks in comparison on the existing bus network are:

- New and improved lines
- Schedule and improved temporal availability
- Extended operating times

Enhanced Bus Network within Study Area - Development Case 1

Operating Time:	17	hours
Days of operation:	350	days
Cost per km:	0,75	Pound

Lines DC 1	Average Headway [min]	Peak Headway [min]	Network [km]	No. Of runs per day	Bus capacity [seats]	km per year	Peak Hour Capacity [seats]	Cost per year [£]
12	17	15	7,0	60	60	294.000	480	220.500
15	17	15	7,5	60	60	315.000	480	236.250
27	17	15	7,2	60	30	302.400	240	226.800
55/58	12	10	18,0	85	60	1.071.000	720	803.250
10/57/59	12	10	14,9	85	60	886.550	720	664.913
N1	17	15	7,1	60	30	298.200	240	223.650
N2	12	10	20,7	85	30	1.231.650	360	923.738
N3	12	10	10,5	85	30	624.750	360	468.563
N4	12	10	11,9	85	60	708.050	720	531.038
N5	12	10	12,7	85	60	755.650	720	566.738
CCB 1	20	20	4,2	51	30	149.940	180	112.455
CCB 2	20	20	6,0	51	30	214.200	180	160.650
CCB 3	20	20	6,6	51	30	235.620	180	176.715
Total	**15**	**14**	**134,3**	**903**		**7.087.010**		**5.315.258**

Cost per network km: 40.000 pounds

Total cost network: 5.300.000 pounds with an average peak hour headway of 14 minutes and 17 hours operating time

Table 17: Operating Cost Enhanced Bus Network – Development Case 1

The table above shows the annual operating cost of the bus network for the Development Case 1 with the above stated preconditions. However, these cost will arise after the completion of the complete network as shown in map AXF00099-4 (maybe 2005-2007). Before that the operating cost will be lower due to the smaller network in operation.

The total cost for a public transport system needs to be considered fewer than three components:

- physical infrastructure
- operational infrastructure
- operating costs

Summary of the Public Transport Operating Cost:

The first step to improve the existing public transport system should be to introduce the Short Term Measures for the Public Transport and complementary measures. Subsequently, Development Case 1 should be introduced.
In this scenario, together with complementary measures (e.g. parking management system), the modal split for the public transport will increase.
Depending on the increase and the political will to further improve the public transport system, other means of transportation need to be discussed. This could be development cases 3a to 3c.
It has to be clear that every further improvement of the public transport system costs money and that the public needs to subsidise such a system.

Regardless of the system employed (either a Tram or a Guideway Transit System) the infrastructure costs are approximately 8.0 million pounds per km.

The following table shows a summary of the different Development Cases.

Operating Cost Summary of the Development Cases

Development Cases	Network Length within Study Area [km]	Cost per network km bus [pounds/km/year]	Cost per network km Tram/Cable Car [pounds/km/year]	Cost per network km [pouns/km/year]	Total cost network [pounds/year]	Average Peak Hour Headway [min]
Enhanced Bus Network - DC 1	134,3	40.000	-	40.000	5.300.000	14
Enhanced Bus Network + Tram - DC 2a	129,8	40.000	86.000	42.000	5.500.000	12
Enhanced Bus Network + Tram - DC 2b	130,0	40.000	86.000	43.000	5.600.000	11
Enhanced Bus Network + Tram - DC 2c	124,8	39.000	86.000	44.000	5.500.000	11
Enhanced Bus Network + Guideway Transit System DC 3a	126,7	39.000	140.000	42.000	5.400.000	11
Enhanced Bus Network + Guideway Transit System DC 3b	123,1	37.000	140.000	48.000	6.000.000	11
Enhanced Bus Network + Guideway Transit System DC 3c	123,0	37.000	140.000	54.000	6.600.000	11

Table 18: Operating Cost Summary

This table shows very clearly that the Enhanced Bus Network and the Enhanced Bus Network + Guideway Transit System – DC3a have approximately the same operating cost.

9.2 Cost for Road Infrastructure Measures

When considering the infrastructure measures that were proposed in this Report, the most important is the construction of tangential roads and the improvement of the junctions.

9.2.1 Summary of Proposed New Roads

The following table summarises the amount to be spent on the proposed new roads in the next 10 years.

Summary of Proposed New Roads

Road	Cost
Northern Tangential Road	8.000.000
Southern Tangential Road incl. Roundabout	8.700.000
Tangential Road to Leof. Stavrou	4.000.000
Total	20.700.000

Table 19: Cost Summary of Proposed Roads

9.2.2 Junction Improvement

Junction improvement is one of the most important measures proposed for the car traffic. Because every junction needs to be improved individually, the Consultants show a general figure for the complete improvement of a junction without new traffic lights.

Based on already improved junctions in Cyprus, the average cost for the complete improvement of the junction area, excluding the cost of new traffic lights (about 100.000 pounds per junction) is 200,000 pounds.

9.2.3 One-Way System in the CBD

The total length of the proposed one-way system is about 5 km. The changes required are removal of islands, construction of separators, new road markings (that are in any case necessary in large parts of the CBD) and reconstruction of junctions.

Road Marking	£250.000
Removing of islands/seperators	£200.000
Junction reorganisation (excl. Traffic lights)	£150.000
Traffic Lights	£900.000
Total	**£1.500.000**

Table 20: One-Way System Cost

9.2.4 Bus Priority

Large parts of bus lanes would already be available with the introduction of the one-way system. Most cross-sections do not need to be widened to introduce a bus lane.

The main cost will, therefore, be for the removal of islands/separations between the lanes, construction of new separators and new markings. The largest part of the cost however will be the additional traffic lights that are necessary for bus sluices.

These traffic lights will cost approximately 50.000 – 80.000 pounds per bus sluice.

The removing of separators and the reorganisation of the lanes will cost approximately 100.000 - 200.000 pounds per km.

9.2.5 Summary of the Road Infrastructure Cost

The following table shows the cost for the planned regulatory plan measures and the cost for the proposed infrastructure measures. Some of the projects overlap each other and, for these projects, the costs have been adjusted

Cost for Road Infrastructure Improvements for the Trend Scenario

Local Plan Projects:

All cost shown below were calculated by the Planning Bureau.

Local Plan Project	Description	Cost [million £]
1+3+4+6	Widening of the Southern Ring Road and the road leading to the New Hospital, including the roundabout at Leoforos Strovolos	11,00
2+26	Widening of Leoforos Strovolos including a part of the new Southern Tangent	2,50
7	University Roads	3,30
8	Improvement of Rik Avenue including a link to the Limassol Highway and the grade separated roundabout	5,00
10	Aluminium Tower Interchange	4,00
11	Improvement of Leoforos Kallipoleos, Ant. Theodotou, Roikou and Digeni Akrita Avenue	3,00
14	Improvement of Byron Avenue and other roads in this area	1,50
15	Improvement of Archangelou, Ay. Prokopiou and parts of Delfon and Metochiou Street	3,50
16	Improvement of Navarinou, Tagmatarchou Pouliou and Zannetou	0,30
17+18+19	Improvement of junctions at Leoforos Griva Digeni	0,50
20	Extension of Heroon Avenue until Griva Digeni Avenue	0,45
23	Improvement of Prodromou Avenue	0,70
24	Improvement of Themistokli Dervi	0,80
25	Part of new Southern Tangent	0,50
Sub-Total		**37,05**

Proposed Projects:

The cost for the proposed projects do not show cost that are already included in the local plan projects

Proposed Project	Description	Cost [million £]
Northern Tangent	Tangential Road from Engomi (Leoforos Griva Digeni) to Aglantzia including tunnel near Strovolos	8,00
Southern Tangent	Tangential Road from Engomi (Makariou Stadium) to Aglantzia (University)	4,70
One-Way System	One-Way System in the CBD	1,50
Sub-Total		**14,20**
Total		**51,25**

Table 21: Road Infrastructure Cost

9.3 Cost for Parking Measures

9.3.1 Parking Management System

These costs depend very much on the retail system for the parking vouchers. If a prepaid system (vouchers available at supermarkets, shops etc.) is being chosen, the infrastructure costs are extremely low.
However, the proposal shows a controlled entry system for the Walled City that is more costly. The necessary control system and ticket machines will cost about 200.000 to 400.000 pounds.

9.3.2 Parking Guidance System

The cost of such a system very much depends on the quality of the displays used for showing the necessary information. However, a very rough assumption is that such a system would cost between 300.000 and 400.000 pounds.

9.3.3 New Parking Garage

The cost varies much depending on the location of such a garage and its size. However, a typical modern and customer friendly parking underground car park for 300 cars could cost about 3 million pounds and a multi-storey car park for 300 cars could cost about 1,5 - 2 million pounds.

10.0 COST-BENEFIT FOR ROAD INFRASTRUCTURE MEASURES

The cost of infrastructure for the different measures are shown below:

Capital Cost of Measures up to 2010

Measures	Cost [000 pounds] - 2001 prices		
	Public Transport	Infrastructure	Total
One Way	0,000	1,500	1,500
Southern Tangent	0,000	4,700	4,700
Northern Tangent	0,000	8,000	8,000
One Way + Northern Tangent	0,000	9,500	9,500
Northern + Southern Tangent	0,000	12,700	12,700
One Way+ Southern Tangent	0,000	6,2	6,200

The following benefits were calculated from the traffic model and transferred into monetary values by comparing the performance of each scenario with the Do Minimum Scenario.

Benefits of Measures

Measures	Benefits [000 pounds] - 2001 prices up to 2010
One Way	20,893
Southern Tangent	25,935
Northern Tangent	36,690
One Way + Northern Tangent	56,007
Northern + Southern Tangent	61,998
One Way+ Southern Tangent	40,707

Combining the cost and benefits from the tables above and expressing them as net present values (NPV) with discount rates of 6%, 8% and 10% gives the results in Table below:

Summary of the monetary Cost-Benefit Analysis
Net Present Value [000 pounds]

Scenario**	**2010**		
	6%	**8%**	**10%**
One Way	11,564	9,752	8,223
Southern Tangent	10,992	8,667	6,726
Northern Tangent	15,000	11,826	9,148
One Way + Northern Tangent	25,683	20,848	16,764
Northern + Southern Tangent	25,641	20,203	15,632
One Way+ Southern Tangent	18,851	15,262	12,249

**** comparison with 2010 DMS**

Note: No maintenance cost are included in this analysis

The table above shows the total of the cost-benefit analysis from 2001 until 2010 with different discount rates.

11.0 CONSIDERATIONS ON ENVIRONMENTAL IMPACT

The Consultants examined all aspects of Environmental Impact on the various sectors investigated by the Study and the assessed the effects on the Environment of all major measures proposed by the Study and concluded that all of threes were designed as to help minimise the impact of air pollution and its effects

Traffic creates various environmental issues such as:

- Atmospheric Pollution
- Negative Effects on Air Quality
- Noxious Pollutants
- Air pollution
- Respiratory System Failures
- Damage to Historical Monuments and Buildings,
- Produces acid rain
- Produces damage to vegetation
- Contributes to the formation of the smog phenomenon
- Affects change of the climate (green house effect).

Noise:

- Traffic noise in urban areas causes severe nuisance
- Has important negative effects on the environment, and on people.
- Sleep disturbance
- Physiological stress
- Influence on performance and productivity.

Economic costs:

Almost all of the proposed measures aim to reduce the use of private vehicles and to improve traffic movement within the study area. This will have positive effects on the environment and particularly in the improvement of the quality of the atmosphere and in the reduction of traffic noise pollution.

Principal Environmental Matters Considered:

Cyprus Legislation relating to Traffic and Environment (Laws ??? 30/94 and 70/1991).

Cyprus legislation on the environment has two main goals. The first is to sustain biodiversity and the second is to monitor, reduce and eliminate high pollution

The traffic noise is not presently regulated. Law 91/68 regulates activities that cause nuisance to people in residential areas.

Park and Ride:

The essentials to be examined for the determination of suitable Park and Ride locations environmentally are:

- The Park and Ride Measure should aim to reduce the number of cars entering the City commercial and residential areas
- The determination of the best location for the P&R facilities is essential
- Full traffic movement resulting from such Parking should be fully investigated
- The P&R facilities should offer to commuters comfortable and accessible facilities
- Should be constructed with environmentally friendly and recycled materials
- Should utilise lighting techniques that do not affect the local environment
- Should provide maximum use of shadowed areas for the cars
- Should be attractively landscaped
- The installation of noise barriers in the area should be considered during the detail design.

The Selected Locations

The preliminary environmental assessment indicates that the following sites could be considered as suitable locations:

- The Makariou Stadium
- The International Government Fair parking facilities
- The areas north and west of the Industrial Zone of Strovolos
- The area close the junction of Strovolos Avenue and Troodos Avenue
- The area north of Metro Supermarket

New Buses

It is recommended all buses are “green” vehicles, using gas-motorized after of course local legislation concerning the use and storage of gas fuel is enacted.

The Increase of Junction Capacities

One major short-term measure indicated in this study is the increase of the capacity of junctions. One way to achieve this is the provision of Loops.

The Two Junctions selected for the use of loops in order to eliminate the traffic conflicts are:

- Woolworth Junction
- Leoforos Athalassis and Leoforos Akropoleos junction

The conclusion of the preliminary environmental analysis carried out for these Junctions indicated that the proposed loops did not create any major negative environmental impacts because of the small number of buildings that will be affected by the diversion and the relatively light traffic that will use the loops.

Parking Places

There is immediate need to enforce environmental upgrading of the existing parking places in the study area.

Landscaping of the parking places using local materials and plants will improve the attractiveness of the parking place. There is need to enact legislation enforcing acceptable landscaping in the existing and new off-street parking lots.

12.0 ANNEX A

12.1 Recommended Timetable of Implementation

The Final report contains in tabular form a complete Schedule of the measures proposed by the Study. Against each of the major Measures the Consultants suggest a Starting date, aiming to have most of the measures are operating within five years from the Completion of the Study. of Implementation of each major measure of each Component investigated by the Study.

These tables are included as Annex A to this Executive Report so that the Decision makers can use them as a Guideline for their Planning the Implementation of the Measures.

It is explained that normally such tables are not included in an Executive Report, but because in the present case the readers of this report will be those who will bear the personal responsibility to direct the initiation of the implementation of the measures, we include these tables for easy reference and as guidance to them.

Public Transport

Measures	Assessments of effects								Primary Responsibility of Implementation	Schedule Project Start
	Improve Supply	Improve network structure	Improve Schedule	Improve Availability	Improve Comfort	Improve Information	Improve Marketing	Improve environmental situation		
Traffic co-ordination agency									PWD	2002
Schedule, Maps			☑			☑			Bus Company	2002
Right of way for buses			☑						R.T.D.	2002
Fare Structure + conv. locations of ticket sales					☑		☑		Bus Company, R.T.D.	2002
Creation of through lines	☑	☑		☑	☑			☑	Bus Company, R.T.D.	2002
Introduction of tangential bus lines	☑	☑		☑	☑			☑	Bus Company, R.T.D.	2002
Co-ordination of parallel bus lines (rendezvous bus stops)		☑	☑		☑				Bus Company, R.T.D.	2002
Use of mini-size buses	☑	☑	☑	☑	☑		☑	☑	Bus Company, R.T.D.	2002
Introduction of Call Collect Buses as substitutes for existing bus lines	☑	☑	☑	☑					Bus Company, R.T.D.	2002
Introduction of Call Collect Taxis	☑	☑		☑	☑			☑	Bus Company, R.T.D.	2002
Bus stop improvement program				☑	☑		☑		Bus Company, R.T.D.	2002
Bus priority systems			☑					☑	PWD	2003
Introduction of Park and Ride	☑			☑	☑		☑	☑	Bus Company, R.T.D., PWD	2002
Co-ordination with rural bus network	☑	☑	☑		☑				Traffic Co-ordination Agency	2003
Public relations						☑	☑		Bus Company	2003

Measures	Assessments of effects								Primary Responsibility of Implementation	Schedule Project Start
	Improve Supply	Improve network structure	Improve Schedule	Improve Availability	Improve Comfort	Improve Information	Improve Marketing	Improve environmental situation		
Establish regional bus terminal					☑				Town Planning Dept., R.T.D.	2004
Provide bus depot									Town Planning Dept., R.T.D.	2004
Enhanced bus network - Development case 1	☑	☑	☑	☑	☑		☑	☑	Bus Company, R.T.D.	2004
Improve 4 existing bus lines,										
5 new bus lines,										
2 through lines,										
3 Call Collect Bus Lines										
Review of future possibilities:									Transport Agency, PWD, R.T.D., Bus Company, Municipalities	2005
Bus network + Tram - Development case 2	☑	☑	☑	☑	☑		☑	☑	Transport Agency	2005
1 tram line										
Change existing bus lines										
Bus network + Guideway Transit System - Development Case 3	☑	☑	☑	☑	☑		☑	☑	Transport Agency	2005
1 Guideway transit system,										
New Call Collect/Mini Bus feeder line										
Change existing bus lines										

Measures	Assessments of effects								Primary Responsibility of Implementation	Schedule Project Start
	Improve Supply	Improve network structure	Improve Schedule	Improve Availability	Improve Comfort	Improve Information	Improve Marketing	Improve environmental situation		
Complementary measures:										
New tangential roads		☑		☑					PWD, Town Planning	2002
Junction enhancement program			☑						PWD	2002
CBD area one-way system		☑	☑						PWD, Municipalities	2003
Junction co-ordination program			☑					☑	PWD	2002
Pedestrian crossing improvement					☑				PWD, Municipalities	2002
Parking management							☑	☑	Municipalities	2002
Enforcement of parking and driving regulations			☑		☑				Police, Municipalities	2002
Driver behaviour campaign									Government, Institutions, Police	2002
Road safety program									PWD, Police	2002

Private Traffic

Measures	Assessments of effects									Primary Responsibility of Implementation	Schedule Project Start
	Improve road safety	Improve Level of service (traffic flow quality)	Improve conditions for non-motorised traffic	Improve access for build-up areas	Minimise impairment of the Public Transport	Improve driver behaviour	Improve environmental situation	Improve roadside environment	Improve Information		
Function oriented road network	☑	☑	☑	☑		☑	☑	☑		PWD, Municipalities	2002
Review the network regulatory plan	☑	☑	☑	☑						PWD, Municipalities	2002
Review cross-section, function oriented	☑	☑	☑	☑	☑	☑	☑	☑		PWD	2002
Plan and build tangential roads		☑		☑	☑			☑			
Accelerate tangential primary road from Engomi to Aglantzia (north tangent of Strovolos)										PWD, Town Planning	2002
Accelerate tangential primary road from Engomi to Aglantzia (south tangent of Strovolos)										PWD, Town Planning	2003
Consideration for a new tangential main road from Engomi to Leoforos Stavrou										Town-planning	2002

Measures	Assessments of effects									Primary Responsibility of Implementation	Schedule Project Start
	Improve road safety	Improve Level of service (traffic flow quality)	Improve conditions for non-motorised traffic	Improve access for build-up areas	Minimise impairment of the Public Transport	Improve driver behaviour	Improve environmental situation	Improve roadside environment	Improve Information		
Improve existing primary and main roads	☑	☑	☑		☑	☑		☑			
Southern Ring Road										PWD, Town Planning	2002
Iroon Road up to Leoforos Griva Digeni										PWD, Town Planning	2002
Leoforos Archangelos Michail										PWD, Town Planning	2002
Leoforos Strovolos										PWD, Town Planning	2002
Leoforos Tseriou										PWD, Town Planning	2002
Leoforos Hadjijosef										PWD, Town Planning	2002
Introduction of CBD one-way system	☑	☑	☑	☑	☑			☑		PWD, Town Pl., Mun.	2003
Junction enhancement program (improve capacity and increase conflicts)	☑	☑	☑		☑					PWD, Town Pl.	2002
Junction coordination program (green wave, duration of phase, homogeneous traffic flow, distance traffic lights)		☑			☑		☑			PWD, Police	2002
Traffic Calming	☑		☑	☑	☑	☑	☑	☑		Town Planning Dept., PWD	2002
Reviewing and installing of street names		☑		☑					☑	Municipalities	2002
Direction signs, Compulsory signs and signaling system	☑	☑		☑					☑	Municipalities	2002
Driver behaviour campaign	☑		☑			☑				Governm., Instit., Police	2002
Enforcement of driving regulations	☑		☑		☑	☑				Police, Municipalities	2002

Measures	Assessments of effects									Primary Responsibility of Implementation	Schedule Project Start
	Improve road safety	Improve Level of service (traffic flow quality)	Improve conditions for non-motorised traffic	Improve access for build-up areas	Minimise impairment of the Public Transport	Improve driver behaviour	Improve environmental situation	Improve roadside environment	Improve Information		
Complementary measures:											
Pedestrian crossing initiative	☑		☑		☑					PWD, Police	2002
Parking management	☑	☑	☑	☑	☑	☑	☑	☑	☑	Municipalities	2002
Enforcement of existing parking regulations	☑		☑		☑	☑				Municipalities, PMO, Police	2002
Introduction of Park and Ride		☑					☑			Road Transportation Dept., Bus Comp.	2002
Road safety Program	☑		☑			☑				PWD, Police, Municipalities	2002
Consideration for Bus network + Guideway Transit System		☑	☑		☑		☑	☑		PWD, Road Transport Dept., Bus Company, Municipalities	2005
Bus priority program					☑					PWD	2003

Parking

Measures	Assessments of effects										Primary Responsibility of Implementation	Schedule Project Start
	Improve road safety	Improve supply	Improve conditions for non-motorised traffic	Improve access for build-up areas	Minimise impairment of the Public Transport	Improve driver behaviour	Improve environmental situation	Improve roadside environment	Improve attractiveness	Improve social security		
Parking management system in:	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	Municipalities	2002
CBD												
Walled City												
the municipalities												
Private/Public Parking Management Organisation (PMO)		☑		☑					☑	☑	Municipalities	2002
Parking guidance system		☑		☑			☑		☑		PWD, PMO, Tr. Agency	2002
Build new car parks in:		☑		☑		☑	☑	☑	☑	☑	Municipalities, PMO	2003
CBD											Municipalitiy	
front of the walls											Antiquities Dept.	
Enforcement of parking regulations	☑		☑	☑	☑	☑	☑		☑	☑	Municipalities, PMO, Police	2002
Park and Ride		☑		☑			☑				R.T.D., Bus Comp., Municipalities	2002
Parking requirements for new buildings		☑		☑			☑	☑	☑		Municipalities, Twn Plan	2002
Bicycle storage		☑	☑	☑			☑	☑	☑	☑	Municipalities, Twn Plan	2002

Measures	Assessments of effects										Primary Responsibility of Implementation	Schedule Project Start
	Improve road safety	Improve supply	Improve conditions for non-motorised traffic	Improve access for build-up areas	Minimise impairment of the Public Transport	Improve driver behaviour	Improve environmental situation	Improve roadside environment	Improve attractiveness	Improve social security		
Complementary Measures:												
Ride sharing Program							☑				Government, Institutions	2002

Pedestrians and Cyclists

Measures	Assessments of effects							Primary Responsibility of Implementation	Schedule Project Start
	Improve road safety	Improve social safety	Improve attractiveness	Improve comfort	Improve driver behaviour	Improve roadside environment	Improve environmental situation		
Campaign for walking and cycling		☑			☑		☑	T.P.D., Municipalities	2002
Connecting of existing pavements in:	☑	☑	☑	☑		☑		Municipalities, PWD	2002
CBD									
municipalities									
residential areas									
Pedestrian crossing initiative	☑	☑	☑	☑	☑			PWD, Municipalities	2002
Pavement network initiative	☑	☑	☑	☑		☑	☑	Municipalities	2002
Bicycle network			☑	☑		☑	☑	T.P.D., Municipalities	2003
Overcome barriers		☑	☑	☑				Municipalities	2002

Measures	Assessments of effects							Primary Responsibility of Implementation	Schedule Project Start
	Improve road safety	Improve social safety	Improve attractiveness	Improve comfort	Improve driver behaviour	Improve roadside environment	Improve environmental situation		
Complementary measures:									
Bicycle storage		☑		☑		☑		Municipalities, Town Planning Dept.	2002
Enforcement of driving and parking regulations	☑	☑			☑			Police, Municipalities	2002
Driver behaviour campaign	☑	☑			☑	☑		Government, Institutions, Police, Municipalities	2002
Road safety program	☑	☑			☑			PWD, Police	2002

Other measures

Measures	Assessments of effects					Primary Responsibility of Implementation	Schedule Project Start
	Improve road safety	Improve driver behaviour	Improve environmental situation	Improve Level of service	Minimise impairment of the Public Transport		
Road safety program	☑	☑				PWD	2002
Ride sharing program			☑	☑	☑	Government, Institutions, Employers	2002
Travel plans			☑	☑	☑	Government, Chamber of Commerce	2002
Staggering of hours				☑	☑	Government, Educational, Employers	2002

13.0 TABLE OF ILLUSTRATIONS

AXF00068-	after page 100
AXF00070-4	after page 100
AXF00073-4	after page 54
AXF00080-	after page 100
AXF00087-4	after page 100
AXF00095-1	after page 100
AXF00099-4	after page 100
AXF00109-5	after page 100
AXF00110-6	after page 100
AXF00115-5	after page 100
AXF00117-4	after page 100
AXF00125-	after page 100
AXF00133-4	after page 100
AXF00155-5	after page 58
AXF00157-	after page 35
AXF00158-	after page 100

14.0 ATTACHMENTS

Legend:

- Study Area
- Green Line
- Special School
- Hospitals
- Primary School
- Secondary School
- Tertiary School/College/University
- Existing Bus Lines
- Combined Lines 55, 58 including connection to new Hospital, new midi Bus Line; line-type operation
- Combined Lines 10,57, 59 including connection to new University, new midi Bus Line; line-type operation
- Call Collect Buses - direction oriented operation (mini-bus)
- Call Collect Buses - direction oriented operation (mini-bus)
- Call Collect Buses - direction oriented operation (mini-bus)
- New Mini/Midi Bus - Line
- New Tangential Bus - Line (mini-bus)
- New Tangential Bus - Line (mini-bus)
- New Tangential Bus - Line (mini/midi-bus)
- New Through Bus - Line (mini-bus)
- Park and Ride Area and parking for rural buses
- Regional Bus Terminal
- Bus Depot
- Main Public Transport Network Nodes
- Existing Government / Municipality Buildings
- New Government / Municipality Buildings
- Existing Hypermarkets
- New Hypermarkets
- Other Existing Traffic Generating Buildings
- Other New Traffic Generating Buildings

To new University

G. C. Hadjicostas Consultancies
CY-1307 Nicosia P.O. Box 25238
TELEPHONE / Fax +357 (2) 669 777 gch.cons@cytanet.com.cy

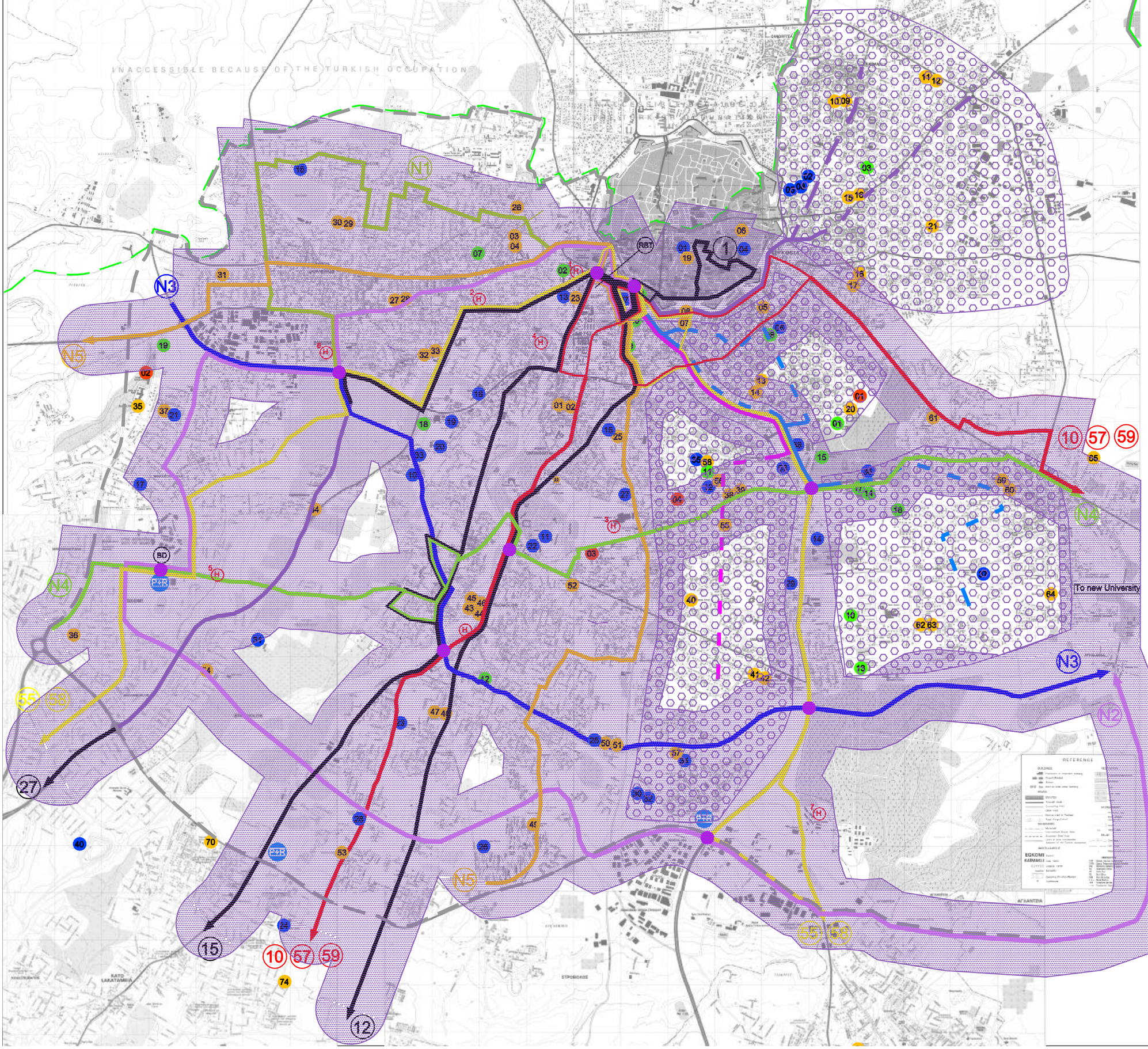
AXIS INGENIEURLEISTUNGEN
A-1040 VIENNA RAINERGASSE 4
TELEPHONE +43 (1) 50 670-0 FAX-40 wien@axis.at

NICOSIA TRAFFIC MANAGMENT AND PUBLIC TRANSPORT ENHANCEMENT STUDY

Development Case 1

Enhanced Bus Network

GZ.:	127350	Datum:	22.08.2001			
Sachbearb.:	KRAPPINGER	Maßstab:	1:30.000			
Gezeichnet:	DRAGIC	PLANER	ART	LAUFENDE NR.	INDEX	
Format:	0,12 m²	AX	F	0	0099	4



Legend:

- Study Area
- Green Line
- Special School
- Hospitals
- Primary School
- Secondary School
- Tertiary School/College/University
- Existing Bus Lines
- Combined Lines 55, 58 including connection to new Hospital, line-type operation
- Combined Lines 10,57, 59 including connection to new University, line-type operation
- Call Collect Buses - direction oriented operation
- Call Collect Buses - direction oriented operation
- Call Collect Buses - direction oriented operation
- New Mini Bus - Line
- New Tangential Bus - Line
- New Tangential Bus - Line
- New Tangential Bus - Line
- New Through Bus - Line
- Park and Ride Area and parking for rural buses
- Regional Bus Terminal
- Bus Depot
- Main Public Transport Network Nodes
- Catchment Area

G. C. Hadjicostas Consultancies
CY-1307 Nicosia P.O. Box 25238
TELEPHONE / Fax +357 (2) 669 777 gch.cons@cytanet.com.cy

AXIS INGENIEURLEISTUNGEN
A-1040 VIENNA RAINERGASSE 4
TELEPHONE +43 (1) 50 670-0 FAX-40 wien@axis.at

NICOSIA TRAFFIC MANAGMENT AND PUBLIC TRANSPORT ENHANCEMENT STUDY

Development Case 1

Catchment Area

GZ.:	127350	Datum:				22.08.2001
Sachbearb.:	KRAPPINGER	Maßstab:				1:30.000
Gezeichnet:	DRAGIC	PLANER	ART	LAUFENDE NR.		INDEX
Format:	0,12 m²	AX	F	0	0117	4

INACCESSIBLE BECAUSE OF THE TURKISH OCCUPATION

N1 N2 N3 N4 N5

RBT

BD

P+R

10 57 59

55 58

27

15

12

To new University

Legend:

- Study Area
- Green Line
- Bus Lines
- Bus Priority (Bus Lanes, Bus Sluices and/or bus priority in junction areas)
- Park and Ride Area and parking for rural buses
- Regional Bus Terminal
- Bus Depot
- Main Public Transport Network Nodes

G. C. Hadjicostas Consultancies
CY-1307 Nicosia P.O. Box 25238
TELEPHONE / Fax +357 (2) 669 777 gch.cons@cytanet.com.cy

AXIS INGENIEURLEISTUNGEN
A-1040 VIENNA RAINERGASSE 4
TELEPHONE +43 (1) 50 670-0 FAX-40 wien@axis.at

NICOSIA TRAFFIC MANAGMENT AND PUBLIC TRANSPORT ENHANCEMENT STUDY

Development Case 1

Bus Priority

GZ.:	127350	Datum:				22.08.2001
Sachbearb.:	KRAPPINGER	Maßstab:				1:30.000
Gezeichnet:	DRAGIC	PLANER	ART	LAUFENDE NR.		INDEX
Format:	0,12 m²	AX	F	0	0133	4

INACCESSIBLE BECAUSE OF THE TURKISH OCCUPATION

Troodos

Lakatamia

Tseriou

Limassol

Latsia

Legend:

- Study Area
- Green Line
- High capacity roads
- Primary Roads
- Main roads
- Main collecting roads
- Proposed primary roads
- Proposed primary roads variant
- Proposed main roads
- Town Centres, CBD
- Government District
- Corridor for future roads
- Corridor for future tunnel
- Tunnel; for details refer to Map AXF00115-
- 2(4) 2+1 — Number of Lanes (future widening untill 2025)
- 3+1 — One way system (3 lanes) plus Bus- lane (partly in contra-flow)

G. C. Hadjicostas Consultancies
CY-1307 Nicosia P.O. Box 25238
TELEPHONE / Fax +357 (2) 669 777 gch.cons@cytanet.com.cy

AXIS INGENIEURLEISTUNGEN
A-1040 VIENNA RAINERGASSE 4
TELEPHONE +43 (1) 50 670-0 FAX-40 wien@axis.at

NICOSIA TRAFFIC MANAGMENT AND PUBLIC TRANSPORT ENHANCEMENT STUDY

Proposed Road Network 2002 - 2010

GZ.:	127350	Datum:				21.01.2002
Sachbearb.:	KRAPPINGER	Maßstab:				1:30000
Gezeichnet:	DRAGIC	PLANER	ART	LAUFENDE NR.		INDEX
Format:	0,12M²	AX	F	0	0110	6

INACCESSIBLE BECAUSE OF THE TURKISH OCCUPATION

01 02 03 04 05 06 07 08 09 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26

REFERENCE

G. C. Hadjicostas Consultancies
CY-1307 Nicosia P.O. Box 25238
TELEPHONE / Fax +357 (2) 669 777 gch.cons@cytanet.com.cy

AXIS INGENIEURLEISTUNGEN
A-1040 VIENNA RAINERGASSE 4
TELEPHONE +43 (1) 50 670-0 FAX-40 wien@axis.at

NICOSIA TRAFFIC MANAGMENT AND PUBLIC TRANSPORT ENHANCEMENT STUDY

Nicosia

Network Regulatory Plan Projects

GZ.:	127350	Datum:				08.08.2001
Sachbearb.:	KRAPPINGER	Maßstab:				1:30.000
Gezeichnet:	DRAGIC	PLANER	ART	LAUFENDE NR.		INDEX
Format:	0,12 m²	AX	F	0	0095	-

INACCESSIBLE BECAUSE OF THE TURKISH OCCUPATION

New Supreme Court

Neurological Centre

New Government Buildings /Ministries

Stock Market Building

Intercollege

New House of Parliament

Charalamdides Hypermarket

Satyricon Theatre 500 Seats

Hypermarket 4000m²

Ministry of Education

Theatrical Organization

Cinema Multiplex (x6) 1000 SPCS

Government offices

New planing bureau Land registry

Strovolos Municipality

Student Housing

University

Church 1000 Ps

Papaellinas Hypermarket 4000m²

Louis Tourist Head offices 10.000m²

200

Hellenic Bank Headquarters 5500m²

800

New Lyceum and Gymnasium

Olympic Committee

EAC (Electricity Authority) 15.860m²

Commercial Centre 6500m²

Commercial Hotel and Cultural Centre (Shacolas)

Athletic centre

Existing Stock Market Building 12000m²

New Hospital Area

Fire service offices (main)

Commercial 500m² Each

Hypermarket Orphanides 10.000m²

Government Print Office

Athletic centre

Metro Hypermarket 6000m²

Commercial Centre 1500m²

300 Res. Units

New Stadium

Swimming Centre

Legend:

- Pending for Building
- Existing Building
- Areas with new Residential Plots with No. of Plots
- Other areas

G. C. Hadjicostas Consultancies
CY-1307 Nicosia P.O. Box 25238
TELEPHONE / Fax +357 (2) 669 777 gch.cons@cytanet.com.cy

AXIS INGENIEURLEISTUNGEN
A-1040 VIENNA RAINERGASSE 4
TELEPHONE +43 (1) 50 870-0 FAX-40 wien@axis.at

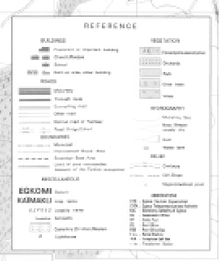
NICOSIA TRAFFIC MANAGMENT AND PUBLIC TRANSPORT ENHANCEMENT STUDY
Traffic Generator Projects

GZ.:	127350	Datum:				06.09.2001
Sachbearb.:	KRAPPINGER	Maßstab:				1:30.000
Gezeichnet:	WEISSL	PLANER	ART	LAUFENDE NR.		INDEX
Format:	0,12 m²	AX	F	0	00125	-

INACCESSIBLE BECAUSE OF THE TURKISH OCCUPATION

Legend:

- Study Area
- Green Line
- High capacity roads
- Primary Roads
- Main roads
- Main collecting roads
- Proposed primary roads
- Proposed main roads
- Town Centres, CBD
- Government District
- Tunnel; for details refer to Map AXF00115-



G. C. Hadjicostas Consultancies
CY-1307 Nicosia P.O. Box 25238
TELEPHONE / Fax +357 (2) 669 777 gch.cons@cytanet.com.cy

AXIS INGENIEURLEISTUNGEN
A-1040 VIENNA RAINERGASSE 4
TELEPHONE +43 (1) 50 670-0 FAX-40 wien@axis.at

NICOSIA TRAFFIC MANAGMENT AND PUBLIC TRANSPORT ENHANCEMENT STUDY

Proposed Road Network

High Capacity, Primary, Main and Main Collecting Roads

GZ.:	127350	Datum:				21.08.2001
Sachbearb.:	KRAPPINGER	Maßstab:				1:30000
Gezeichnet:	DRAGIC	PLANER	ART	LAUFENDE NR.		INDEX
Format:	0,12M²	AX	F	0	0109	4

G. C. Hadjicostas Consultancies
CY-1307 Nicosia P.O. Box 25238
TELEPHONE / Fax +357 (2) 669 777 gch.cons@cytanet.com.cy

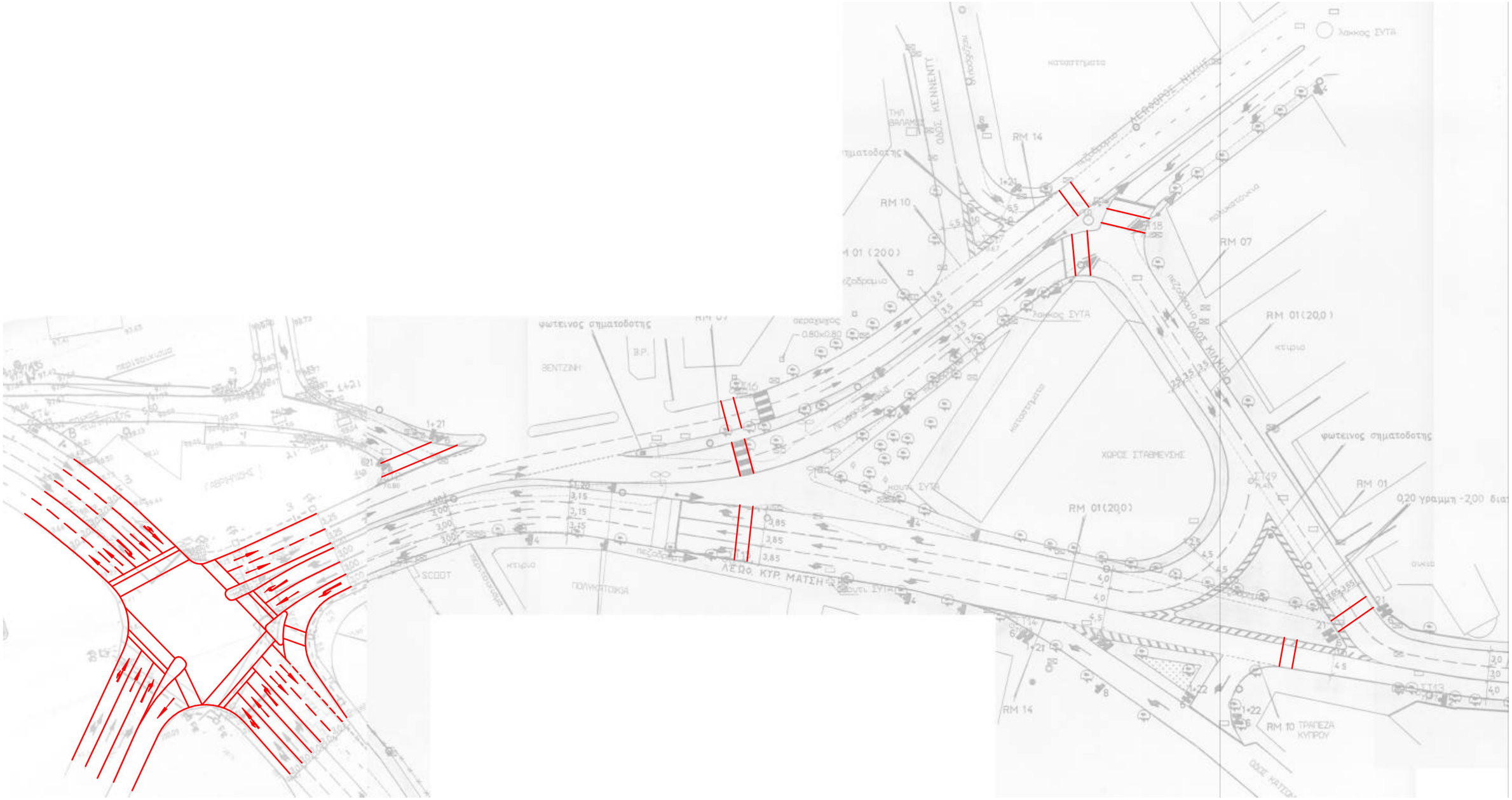
AXIS INGENIEURLEISTUNGEN
A-1040 VIENNA RAINERGASSE 4
TELEPHONE +43 (1) 50 870-0 FAX-40 wien@axis.at

NICOSIA TRAFFIC MANAGMENT AND PUBLIC TRANSPORT ENHANCEMENT STUDY CBD

One Way System

GZ.:	127350	Datum:				06.07.2001
Sachbearb.:	KRAPPINGER	Maßstab:				1:5000
Gezeichnet:	KRAPPINGER	PLANER	ART	LAUFENDE NR.		INDEX
Format:	0,12 m²	AX	F	0	0070	4

N



G. C. Hadjicostas Consultancies
CY-1307 Nicosia P.O. Box 25238
TELEPHONE / Fax +357 (2) 669 777 gch.cons@cytanet.com.cy

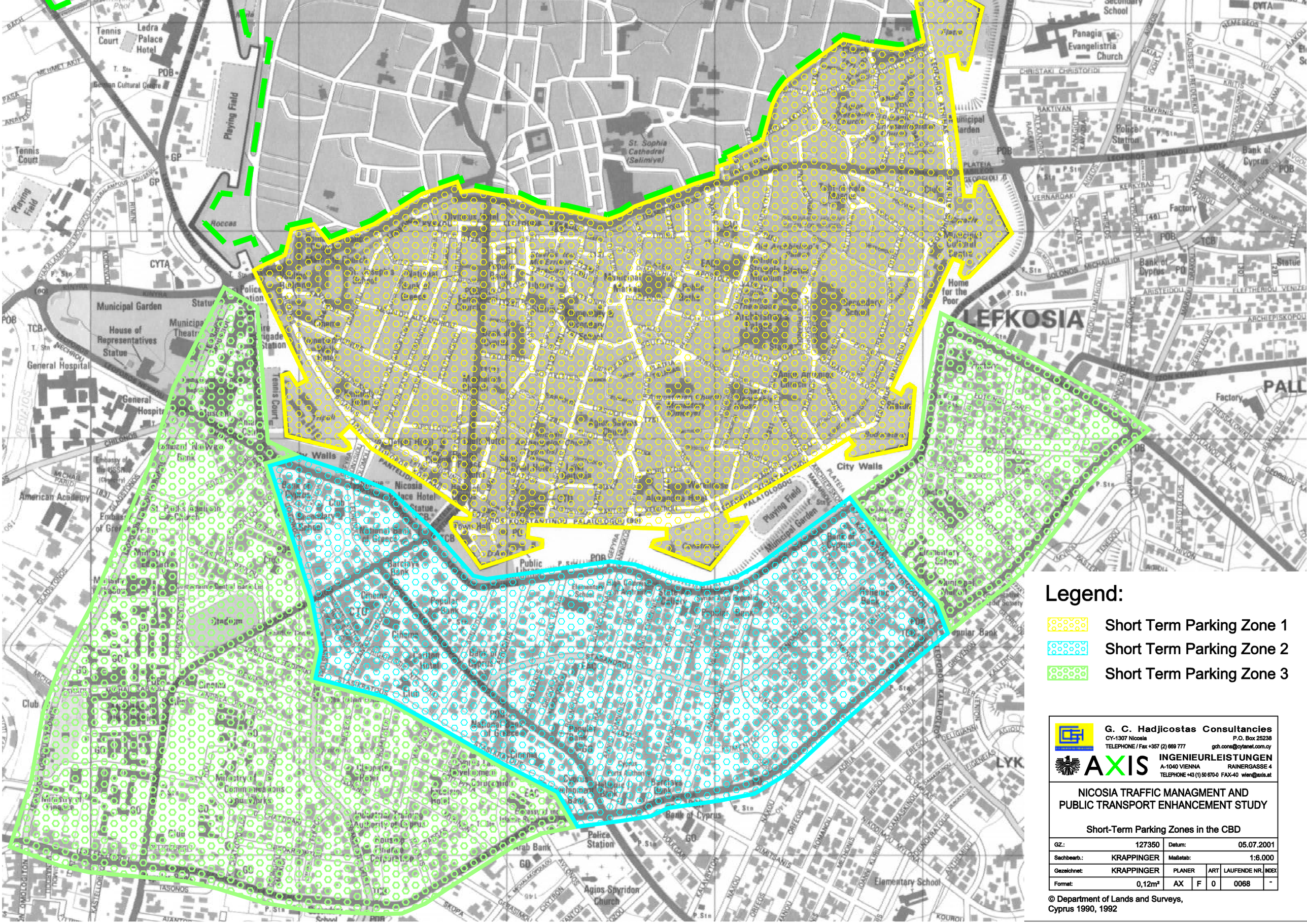
AXIS **INGENIEURLEISTUNGEN**
A-1040 VIENNA RAINERGASSE 4
TELEPHONE +43 (1) 50 670-0 FAX-40 wien@axis.at

NICOSIA TRAFFIC MANAGMENT AND PUBLIC TRANSPORT ENHANCEMENT STUDY

CBD Junction

Griva Digeni/Nikis

GZ.:	127350	Datum:				23.01.2002
Sachbearb.:	KRAPPINGER	Maßstab:				approx. 1:750
Gezeichnet:	DRAGIC	PLANER		ART	LAUFENDE NR.	INDEX
Format:	0,12 m²	AX	F	0	00158	-



G. C. Hadjicostas Consultancies
CY-1307 Nicosia P.O. Box 25238
TELEPHONE / Fax +357 (2) 669 777 gch.cons@cytanet.com.cy
AXIS INGENIEURLEISTUNGEN
A-1040 VIENNA RAINERGASSE 4
TELEPHONE +43 (1) 50 670-0 FAX-40 wien@axis.at

NICOSIA TRAFFIC MANAGMENT AND PUBLIC TRANSPORT ENHANCEMENT STUDY

Short-Term Parking Zones in the CBD

GZ.:	127350	Datum:				05.07.2001
Sachbearb.:	KRAPPINGER	Maßstab:				1:6.000
Gezeichnet:	KRAPPINGER	PLANER	ART	LAUFENDE NR.	INDEX	
Format:	0,12m²	AX	F	0	0068	-

LEGEND:

- Pafos Area
  Traffic Calmed Zone
  Short Term Parking
- Central Area
  Traffic Calmed Zone
  Short Term Parking
- Archbishopry
  Traffic Calmed Zone
  Short Term Parking
- Pedestrian Zone
- Green Line
- Barriers
- Loops

G. C. Hadjicostas Consultancies
CY-1307 Nicosia P.O. Box 25238
TELEPHONE / Fax +357 (2) 669 777 gch.cons@cytanet.com.cy

AXIS INGENIEURLEISTUNGEN
A-1040 VIENNA RAINERGASSE 4
TELEPHONE +43 (1) 50 670-0 FAX-40 wien@axis.at

NICOSIA TRAFFIC MANAGMENT AND PUBLIC TRANSPORT ENHANCEMENT STUDY
Loop Conception Walled City

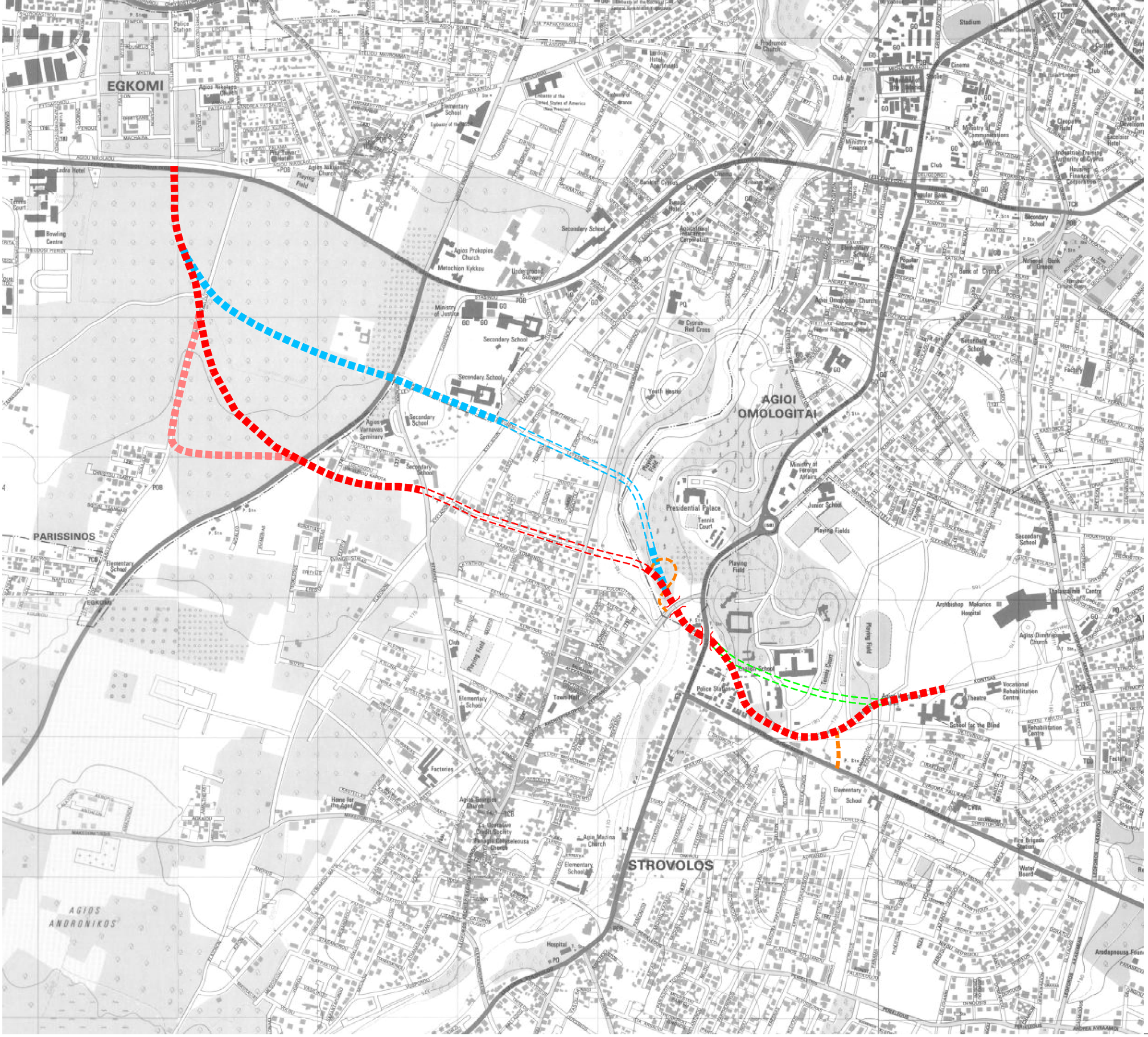
GZ.:	127350	Datum:				06.07.2001
Sachbearb.:	KRAPPINGER	Maßstab:				1:5000
Gezeichnet:	DRAGIC	PLANER	ART	LAUFENDE NR.		INDEX
Format:	0,12 m²	AX	F	0	0080	-

G. C. Hadjicostas Consultancies
CY-1307 Nicosia
P.O. Box 25238
TELEPHONE / Fax +357 (2) 669 777
gch.cons@cytanet.com.cy

AXIS INGENIEURLEISTUNGEN
A-1040 VIENNA
RAINERGASSE 4
TELEPHONE +43 (1) 50 670-0 FAX-40 wien@axis.at

NICOSIA TRAFFIC MANAGMENT AND PUBLIC TRANSPORT ENHANCEMENT STUDY
M23 Phase1 Junction Layout

GZ.:	127350	Datum:					18.07.2001
Sachbearb.:	KRAPPINGER	Maßstab:					1:2000
Gezeichnet:	DRAGIC	PLANER		ART	LAUFENDE NR.		INDEX
Format:	0,12m²	AX	F	0	0087		4



Legend:

- Variant 1 - Cut and Cover - Tunnel
- Variant 2 - Cut and Cover - Tunnel
- Variant 3
- Variant 4 - Tunnel
- Connections to Primary Road Detailed Projects for the connection of the tangential road to Leoforos Strovolos were already prepared by the Planning Bureau

G. C. Hadjicostas Consultancies
CY-1307 Nicosia P.O. Box 25238
TELEPHONE / Fax +357 (2) 669 777 gch.cons@cytanet.com.cy

AXIS INGENIEURLEISTUNGEN
A-1040 VIENNA RAINERGASSE 4
TELEPHONE +43 (1) 50 670-0 FAX-40 wien@axis.at

NICOSIA TRAFFIC MANAGMENT AND PUBLIC TRANSPORT ENHANCEMENT STUDY

Northern Tangential Road Strovolos

GZ.:	127350	Datum:				21.08.2001
Sachbearb.:	KRAPPINGER	Maßstab:				1:10000
Gezeichnet:	DRAGIC	PLANER	ART	LAUFENDE NR.		INDEX
Format:	0,12M²	AX	F	0	0115	5