D14.1

CONSULTANCY SERVICES FOR THE DEVELOPMENT OF A SUSTAINABLE URBAN MOBILITY PLAN (SUMP) FOR THE GREATER URBAN AREA OF THE CITY OF LIMASSOL

FINAL SUMP REPORT

Karlsruhe, 13.06.2019

Ευρωπαϊκή Ένωση
Ταμείο Συνοχής
Κυπριακή Δημοκρατία
Διαρθρωτικά Ταμεία
της Ευρωπαϊκής Ένωσης στην Κύπρο
Τμήμα Δημοσίων Έργων

The project is co-financed by the Cohesion Fund of the European Commission and the Republic of Cyprus

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Client:

Republic of Cyprus

Public Works Department, Ministry of
Transport, Communication and Works

Contractor:

PTV
Transport Consult GmbH
Stumpfstr. 1
76131 Karlsruhe
Germany

In partnership with:

PTV Planung Transport Verkehr AG - Germany
TREDIT SA - Greece
ALA Planning Partnership - Cyprus

Karlsruhe, 13.06.2019

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List of Acronyms

ANPR	Automatic Number Plate Recognition Cameras
AVL	Automated Vehicle Location
BCR	Benefit to Cost Ratio
BID	Business Improvement Districts
CBA	Cost Benefit Analysis
CBD	Central Business District
CBT	Central Bus Terminal
CCTV	Close Circuit TV
CEP	Courier Express Parcel
CUT	Cyprus University of Technology
D	Deliverable
DRT	demand responsive transport
EFV	Environmentally Friendly Vehicles
EV	Electric Vehicles
GIS	Geographic Information System
HGV	Heavy Goods Vehicles
ICT	Information Communication Technology
ITCS	Intermodal Transport Control System
ITS	Intelligent Transport Systems
KSC	Key Stakeholder Committee
LCAS	Limassol Centre Area Scheme
LEZ	Low Emission Zones
LGV	Light Goods Vehicles
LLP	Limassol Local Plan
LOS	Level of Service
M&E	Monitoring & Evaluation Plan
M&E	Monitoring and Evaluation
MCA	Multi-Criteria Analysis
MEM	Monitoring and Evaluation Manager
NGO	Non-Governmental Organisation
NPV	Net Present Value
OD	Origin/Destination
P&R	Park & Ride
PAX	Passengers Approximately
PDA	Personal Digital Assistant
PoI	Point of Interest
PSC	Project Steering Committee
PSC	Policy Statement for the Countryside
PSN	Persons with Special Needs
PT	Public Transport
PWD	Public Works Department
SCOOT	Split Cycle Offset Optimisation Technique
SEA	Strategic Environmental Assessment
SUD	Sustainable Urban Drainage Systems
SUMP	Sustainable Urban Mobility Plan
TEU	Transport Equivalent Unit
TMCC	Traffic Management Control Centre
ToR	Terms of Reference
UTC	Urban Traffic Control
UTC	Urban Traffic Control System
VMS	Variable Message Signs

Document information

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1 Introduction

The government of CYPRUS has taken up the idea of Sustainable Urban Mobility Plans (SUMP) and is going to undertake SUMPs for all urban agglomerations in CYPRUS. The situation in the country is generally characterised by a remarkably high use of cars, at the heavy expense of other more environmentally friendly modes of transport, and the subsequent numerous negative externalities that are caused by this great imbalance. This state of things also strongly characterizes the current transport system of the city of Limassol and is thus in urgent need for appropriate remediation and restructuring. The purpose of this project is to develop and provide a Sustainable Urban Mobility Plan for Limassol, on the basis of the internationally adopted SUMP principles, which have been and are being successfully applied in several European cities over the past few years. The Sustainable Urban Mobility Plan, in contrast to other past traditional transport master plan approaches, institutionalises both methodological and social aspects of transport planning under consideration of the common sense about existing deficiencies of transport systems in urban areas. A strong characteristic of a SUMP concerns the great efforts made and channelled to generate awareness, understanding and consensus amongst all involved/ affected parties and in this respect, it seeks to promote the active involvement of citizens and stakeholders in the process of problem analysis, development of objectives and definition of solution options, which will ultimately influence to a great degree the success of the project.

The SUMP for the Limassol area has followed the same set of overall objectives as defined by the EU White Paper on Transport, the SUMP guidelines and the Terms of Reference (ToR):

- **Economic Efficiency:** Improve the efficiency and cost-effectiveness of the transport network in providing for the transportation of persons and goods.
- **Environmental Sustainability:** Minimise emissions and pollutants associated with transport.
- **Accessibility and Social Inclusion:** Ensure all citizens are offered transport options that enable access to key destinations and services.
- **Safety:** Ensure personal safety and security within the transport system.
- **Quality of Life:** Contribute to enhancing the attractiveness and quality of the urban environment and urban design for the benefits of citizens, the economy and society as a whole.

The project “Consultancy Services for the Development of a Sustainable Urban Mobility Plan (SUMP) for the Greater Urban Area of the City of Limassol” was commissioned by the Public Works Department of the Ministry of Transport of Cyprus co-financed by the EU Structural Fund – The Operational Programme Competitiveness and Sustainable Development 2014-2020. The project officially started on 13 March 2017 and was successfully concluded on 13 June 2019. The consortium that carried out the consulting services consisted of:

- PTV Transport Consult GmbH, Karlsruhe Germany
- PTV Planung Transport Verkehr AG, Karlsruhe, Germany
- TREDIT SA, Thessaloniki, Greece
- ALA Planning Partnership, Nicosia, Cyprus

The Scope of this report – the Final SUMP Report – is the summarising description of the whole process of development of the Sustainable Urban Mobility Plan; the analysis of current situation in terms of mobility and mobility impacts; the Projections of future development (socio-demographic, economic, spatial); the Derivation of current and future deficiencies and problems (according to objectives); Development of consistent solution strategies (under the framework of defined objectives and desired achievements); Derivation and definition of measures and projects (under the criteria of economic efficiency and environmental goals) in all fields of transport including, institutional and organizational ones; the Choice of measures and projects (based on assessment and appraisal).

1.1 Area of intervention

The Limassol SUMP project started on 13/03/2017 and was concluded on 13/06/2019, a total of 27 months. The Study Area included six municipalities and eleven communities (as shown in Table 1) that together make up the 'greater' urban area of Limassol. This Study Area covers a total area of 222.5 sq.km and has a population of around 205,000. Figure 1 is a map illustrating the Study Area, while Figure 2 displays the Limassol city centre area.

Municipalities	Communities	
• Municipality of Limassol • Municipality of Mesa Yitonia • Municipality of Kato Polemidia • Municipality of Agios Athanasios • Municipality of Yermasoyia • Municipality of Ypsonas	• Pano Polemidia • Palodeia • Mouttagiaka • Agios Tychonas • Parekklisia • Moni	• Pyrgos • Tserkezoi • Trachoni • Kolossi • Erimi

Table 1: The components of the study area

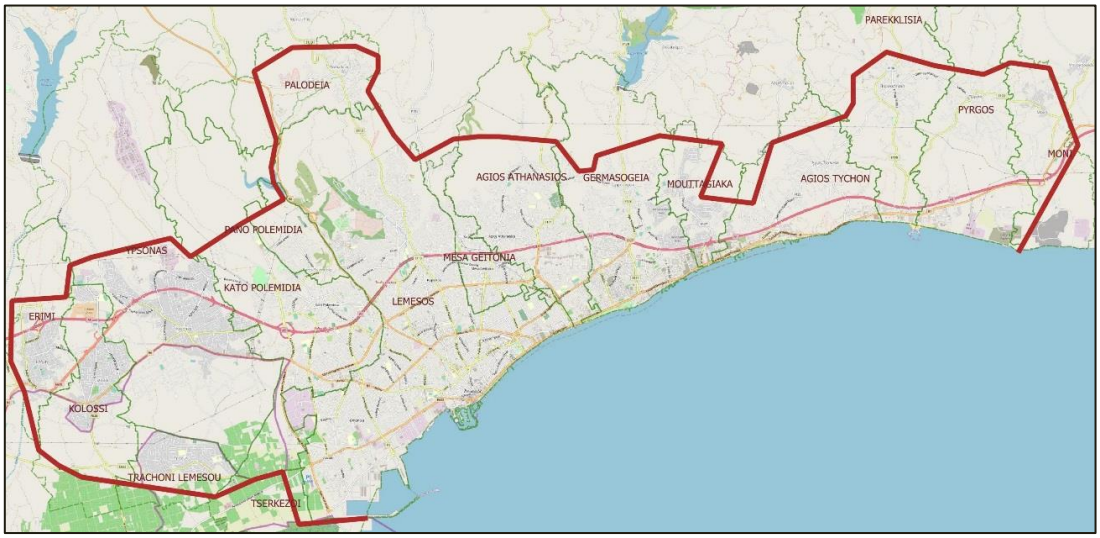


Figure 1: Map of the study area

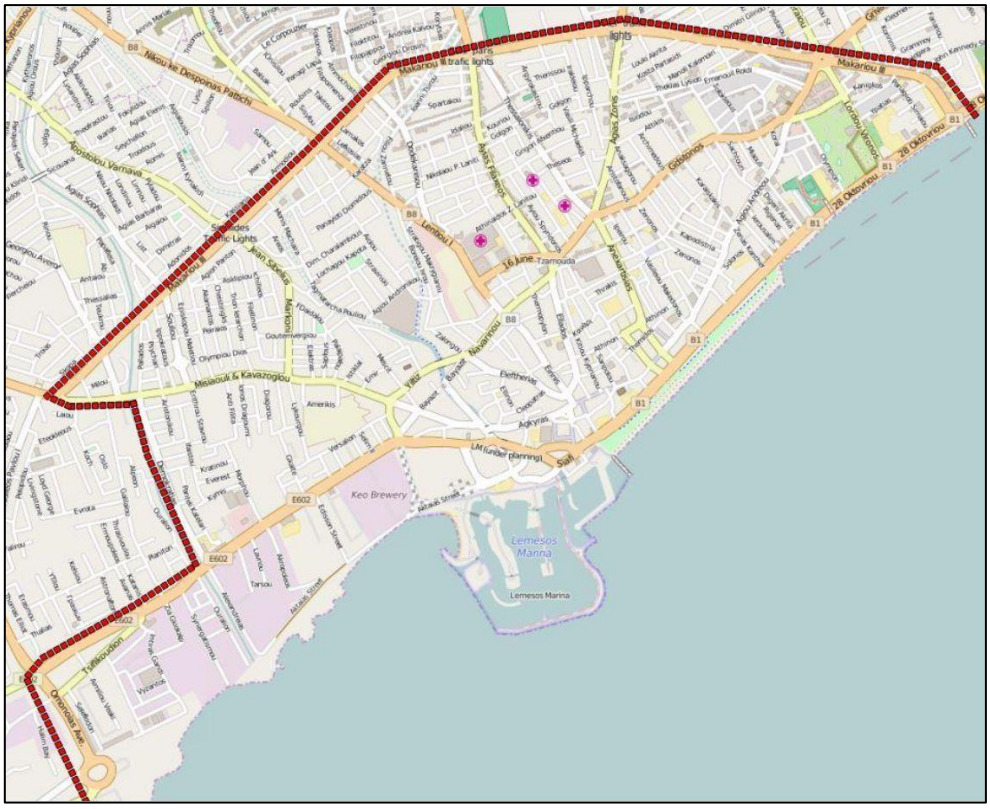


Figure 2: The Limassol city centre

1.2 The SUMP stakeholder engagement groups

Three different categories of project committees were formulated, which are aligned with the three levels of participation: the Project Steering Committee, the Key Stakeholder Committee and the wider stakeholder group. Each one of the stakeholders was allocated to the three different categories of project committees as shown in Table 2 below. Each category has fully involved in the SUMP study implementation process having their specific contribution and influence in the step-by-step decisions.

<table>
<tr><td colspan="2">Project Steering Committee (PSC- 6 members)
Ministry of Transport, Communications and Works (1)
Department of Public Works (2)
Department of Town Planning and Housing (1)
Directorate of Control, Ministry of Transport, Communications and Works (1)
Municipality of Limassol (1)</td></tr>
<tr><td>Key Stakeholders Committee
(KSC – 19 members)</td><td>Wider Stakeholders and Citizens
(indicatively referred a number of organizations)</td></tr>
<tr><td>Municipality of Kato Polemidia
Municipality of Mesa Yitonia
Municipality of Agios Athanasios
Municipality of Yermasoyia
Municipality of Ypsonas
11 Communities within the Study Area (2 representatives)
Cyprus Police
Cyprus University of Technology (ΤΕΠΑΚ)
Department of Environment
Ministry of Education and Culture
Deputy Ministry of Tourism.
The Planning Board of Cyprus
District Administration of Limassol
Scientific and Technical Chamber of Cyprus (ETEK).
Limassol Chamber of Commerce and Industry (ΕΒΕΛ)
CyPOVEK (Cyprus Confederation of Professional Craftsmen and Shop-keepers) (ΠΟΒΕΚ)
The Limassol Tourism Develop-ment and Promotion Company Ltd.
PWD District Engineer of Limassol</td><td>Presidents of Community Councils (Agiou Tichona, Kolosiou, Moutagiakas, Palodias, Pano Ptolemidiwn, Pareklisias, Pirgou, Trachoniou, Asomatou, Tserkez Tsiftlik)
The Ministry of Health
The Department of Road Transport (Ministry of Transport, Communications and Works)
Civil Engineering Department and Geo-Information Technolo-gies (ΠΟΜΗΓΕ-ΤΕΠΑΚ)
Scientific and Environmental Technology Department (ΤΕΠΑΚ)
Cyprus Association of Civil Engineers (ΣΠΟΛΜΗΚ)
Civil Engineering and Architecture Association
Town Planning Association of Cyprus
Cyprus Association of disabled people (ΚΥΣΟΑ)
Cypriot Organization of paraplegic people
Cypriot Organization of blind people
Cypriot Organization of deaf people
Cyprus Cycling Federation
Limassol Cycling Club
Public Transport Operator of Limassol (ΕΜΕΛ)
Aelos Travel - Tour services Cyprus
Travel & Express
Panayides P Coaches Ltd
Petsides Tourist Coaches Ltd
Intercity buses of Cyprus
Intercity Buses of Cyprus
The taxi drivers Association
Port of Limassol
Association of Cyprus Travel agents (ACTA)
Cypriot Association of International Transport
MY MALL Limassol
Limassol marine
The Department of Labour Inspection
Cyprus International Institute for Environmental and Public Health
Federation of Environmental Organisations of Cyprus
Limassol Committee for Natural Environment
Friends of the Earth
School Unions of K. Polemidia, Limassol, Mesa Geitonia
Kanali 6 Limassol
Limassol Newspaper
Etc.</td></tr>
</table>

Table 2: The Stakeholders involved in the SUMP Limassol process

1.3 Project outcomes (Deliverables)

The whole process of developing the SUMP for Limassol was thoroughly documented in the accompanying deliverables; this Deliverable D14 .1 being the summarising and concluding deliverable. The following table (Table 3) shows all the other project deliverables containing more details on the respective working steps and topics that are only described in summary in this report.

WP	Working Package Description	Deliverables
Phase 1: Preparing Well		
1	Plan stakeholder and citizen development	1.1: Stakeholders and Citizens Involvement Plan
		1.2: Website and Social Media Services Implementa-
2	Review of existing relevant studies and data	2.1: Review of existing land use, transport and re-
		2.2: Critical Review of Transport Network and Previ-
		2.3: Transport Modelling Plan
3	Data gathering collection	3.1: Survey Datasets
		3.2: Data Summary Report
4	Development of the transport model	4.1: Transport Modelling Report
		4.2: Transport Models
		4.3: Model Manual
5	Analysis of problems and defining objectives	5.1: Problem Analysis Report
Phase 2: Rational and transparent goal setting		
6	Develop a common vision, set priorities and targets	6.1: Vision Statement & Targets
Phase 3: Elaborating The plan		
7	Generation of future scenarios	7.1: Scenario Development Report
8	Development of scenario models and evaluation	8.1: Technical Modelling Report with Scenario Evaluation
		8.2: Presentation to Stakeholders
9	Selection and appraisal of preferred scenario	9.1: Strategic Environmental Impact Assessment
		9.2: Scenario Appraisal Report (CBA)
Phase 4: Delivery of the Plan		
10	Formulation of the SUMP	10.1: Draft SUMP Report
11	Preparation of an implementation plan, monitoring and evaluation plan	11.1: Implementation Plan
12	Preparation of a promotion and marketing strategy	12.1:Promotion and Marketing Plan
13	Model Training Activities	13.1: Training Activities
14	Production and adoption of the SUMP	14.1: Final SUMP Report

Table 3: The deliverables of the project SUMP Limassol

2 The Necessary Paradigm Change

The transport system of the City of Limassol is characterised by the predominant mode of transport i.e. the car. Hence, the society, the residents of Limassol are car-dependant. This finding is the result of comprehensive surveys, interviews and counts reported in Work Package 3 and of further analyses. The situation in Limassol is not different from other metropolitan areas or cities in Cyprus or the country as a whole. The residents of Cyprus as well as their long-term and short-stay visitors mainly rely on the car as preferred mode of transport.

The car is perceived as the only suitable mode providing flexible mobility, access and freedom to choose destinations, activities and time of travelling. Other modes of transport, namely the non-motorised modes walking and cycling as well as public transport currently have very low shares of the total number of trips: the modal share of trips by car is 91.8%, by bus only 1.8%, leaving 5.7% for walking and 0.7% of trips by cycling. Only captive riders use public transport, i.e. those who do not have access to a private car, walking is predominantly used for very short trips or for accessing the car, cycling does not really play a role in Limassol as in Cyprus as a whole, despite the favourable climatic and topological conditions. The attitudes of residents and visitors are car-oriented, other modes are perceived as less flexible and only for those, who cannot afford an own car and these attitudes and perceptions are of course reflected in the respective mobility behaviour. Everybody, every household will try to have private access to as many cars as possible, car ownership in Limassol as in Cyprus is very high and when available, then the car is used for almost every trip. The resulting car availability per household (H-H) is high, 2.5 cars per H-H as weighted average; indicatively 38%, 20.8% and 8.3% of the interviewed H-H possess 2, 3 and 4 passenger cars respectively. The overall car ownership index is high with 0.58 (i.e. 580 cars per 1,000 residents), almost all H-H dispose of at least one car (more than 95%).

This perception of the car as the preferred mode seems to be deep-seated in the Cypriot society and is already fixed and determined in the young generations, for example students. As soon as these have the possibility to use and get access to a car, also young people do so. For example, cycling does not seem to be an option for students to access their universities or schools as it is the case in many other European countries with far less favourable climatic conditions for cycling.

This is the transport behaviour that we face in Limassol that is reflected in the surveys, interviews and counts and which results in numerous issues.

Transport supply, provision of networks and services is similarly unilateral. The road networks in the Limassol metropolitan area are well-developed, reach every corner of the area, allow access by car to all destinations and at most destinations provide easy and cheap car-parking facilities. In case, parking facilities are not sufficient, car drivers park their cars illegally on pedestrian pavements, road shoulders etc., making movement for pedestrians difficult or impossible, certainly making it dangerous. Enforcement of traffic rules, particularly of parking is insufficient and fines are not high enough to really deter drivers from illegally parking on pedestrian facilities, putting pedestrians at risk and providing discomfort to other road users.

Networks and services of other modes are far less developed and provide a far less comprehensive accessibility of the territory of Limassol's metropolitan area. This is the case for public transport: the Limassol public transport system consists of buses only, operating on lines across the whole territory of the metropolitan area of Limassol. The general supply with public transport services is reasonable in the central areas of Limassol, most of the central area being covered by the catchment areas of 400m distance to the next bus stop. But already at the outskirts of the city, lines and services become insufficient with major service gaps, distances to next bus stop often at or above 1,000m, low service frequencies and altogether an insufficient spatial access of the territory to public transport. Frequencies are low, only lines 7, 17, 20, 21, 30 and the circle lines offer regular headways; all other lines do not have regular headways. Particularly outside peak hours, services are irregular, are consequently hard to remember for the occasional user and hardly allow for connecting services of different lines without long waiting times.

Service times are also not sufficient, services usually starting at 6:00am but ending too early in the afternoon/evening, between 18:00 and 20:00pm, and as mentioned, frequencies are too low and irregular and therefore not attractive for the non-captive users, i.e. those who have access to a car. Travel times and access times are far longer on public transport compared to the car. The access analysis showed a high level of accessibility of the whole territory by car (LOS A), whereas access by

bus was mainly LOS C, D or E. Only in some limited areas of the city centre could accessibility with LOS of A or B be provided also by public transport.

The result is a very low share of public transport (1.8% of the trips only), the limited number of services provided are mainly running with fewer than 5 passengers. For a Public Transport system to be attractive and to encourage people having access to a private car to use public transport, the services have to be comprehensive, continuous and interconnected, allowing the individual user to travel by public transport on the whole chain of trips of the average day. This very clearly is not the case in Limassol.

Pedestrian facilities are limited. The centre of Limassol's old town provides some short sections of pedestrianised streets and other sections with sufficiently wide pedestrian pavements. Similarly, in most of the centres of the other municipalities, walking conditions in the very centre, close to the town hall are acceptable. On the major road corridors, in Limassol, most have pedestrian pavements but with a high curb. This is probably intended to prevent car drivers from parking there. Unfortunately, this is not efficient as cars are still parked on these pedestrian facilities, and the high curb makes it difficult for pedestrians to literally climb on the pedestrian pavement, even more so if the pedestrians are mobility impaired. Apart from these central roads, pedestrian facilities are very poor or non-existing, making it difficult or even dangerous to walk in Limassol. One could conclude that apart from the seafront for recreational purposes, pedestrian facilities in Limassol are acceptable only in the immediate centres, allowing car users to walk from a car park to their final destination, but walking is not seen as an option or alternative to the car for any longer distance and pedestrian facilities are not provided for any other sort of walking.

Cycling facilities are limited and scattered in various areas. There are a few cycle lanes along the coastline and through parks, but these cannot be considered as a continuous and comprehensive network and are mainly used for recreational cycling only on these specific sections. Consequently, there are hardly any cyclists using the bike for regular trips on their average day.

Obviously, the non-available or non-adequate infrastructure and services do not encourage other modes of transport than the car. Particularly young but also fewer young children are not allowed to walk or cycle alone to school or to other destinations as is the case in other European countries. This is perceived as being too dangerous, and unfortunately this is right. Traffic in Limassol is dangerous, particularly for children. Consequently, children have to be transported by car by their parents, and these "mama-taxis" contribute even more to dangerous situations, particularly in front of schools and other children's' destinations.

Therefore, a transport behaviour learned as child, regularly demonstrated and applied by the parents and all other adults, will influence the child's perception and obviously also his or her future preferences, attitudes towards the different transport modes and finally, his or her mobility behaviour when grown-up.

This is a vicious circle, the population is relying on the car, is dependent of the car, uses the car wherever possible and reduces all other modes to very little modal shares in the range of a few percent only, e.g. as noted PT accounts for only around 2% of the trips. Other modes are marginalised in Limassol. The road space, the public urban space is not used by people but is perceived as being only destined for motorised vehicles. This is clearly different to many other European cities and the shares of the alternative modes are unreasonable and very low if compared to other cities of similar size in other European countries. The provided PT services are running more or less empty; hence authorities and operators do not see a need to improve service times, frequencies, quality of service, which in turn results in PT remaining as unattractive as it is today and consequently hardly attracting more passengers in the future. Similarly, walking and cycling: the population is not very enthusiastic about walking or cycling longer distances than from the car park to the door, the provided infrastructure also does not encourage to walk and cycle, the lack of safe infrastructure, the abandonment of sidewalks, the misuse of pedestrian facilities by parked vehicles, the lack of enforcement of traffic rules etc. all lead to less attractiveness of walking and cycling. The criticality for young people, for children has already been mentioned.

In addition, this vicious circle is nurtured by the public administration and local politics ever encouraging more use of the car, providing more capacities for moving and parking cars also in the sensible city centre and along the scenic coastline. Issues of car traffic affecting car traffic itself, like congestion in the city centre, or parking demand exceeding available parking facilities is only responded by wanting to provide still more car parking facilities in the centre, along the coastline and

by wanting to expulse public transport even further out of the centre. It is quite obvious that this is not a solution but contributes further to the vicious circle of more car traffic in sensible areas, fewer trips attracted to other modes. It has been recognised all around the World, that "you cannot build your way out of congestion". The solution can only be to limit car traffic, to provide more and more attractive alternatives to the car, to encourage residents and visitors to change their behaviour. But this has to start with the public servants, with decision makers and politicians, with their respective attitudes and behaviour.

Both, the attitudes, perception and the resulting mobility behaviour on one hand and the supply of network and services for the non-car modes on the other hand, are quite in contrast to the conditions and the development of many other comparable cities in other European Countries. Particularly the young generation in the more Northern countries has started adapting behaviour, relying less on the car, not owning cars any more but having multi-modal mobility patterns, walking, cycling, using public transport and using flexible access to cars if this is necessary through car-sharing, ride pooling, ride on demand etc. This seems to be an unknown trend in Limassol, but it has to come also to Limassol, for the city to remain attractive for residents and visitors and for the region to become sustainable.

Of course, today's car dependency in Limassol results in numerous problems and criticalities need to be properly addressed, that can be categorised in the main fields of:

- Road safety: the number of accidents caused by motorised vehicles, the high number of accidents, the high number of fatalities and seriously injured (e.g. 17 deaths among which 8 pedestrians and 3 motorcyclists and 1 cyclists and around 150 serious injured accidents in 2017), the large number of accident accumulation zones along major corridors and at major junctions around the city centre is one side of the coin. The perceived lack of safety, the danger caused by traffic is the other side. These two aspects of road safety have impacts on the behaviour, reducing the freedom to move for children, discouraging adults and children from using bicycles for daily activities and making walking a rather unpleasant experience.
- Accessibility: accessibility means the possibility of all groups of the population to participate in social life, to be able to reach destinations, to be able to go to work, school, education sites, to reach shopping facilities, leisure facilities and to meet with friends, family, and acquaintances. In Limassol, accessibility is good for those with access to a private car. Accessibility in Limassol is limited for those with no direct access to the car: larger supermarkets at the outskirts, only accessible by car at the detriment of the smaller local shops, where everybody can walk to, offices and work places moving to remote areas not served by public transport etc. Of course, as a result of this, most households dispose of private cars and household members use it for each and every trip. However, there is a part of the population without direct access, the younger than 18, the older who cannot drive anymore, the unable or simply those who cannot afford a car or another car in the household. Accessibility for those social groups is difficult and becomes more and more difficult, they are excluded from social life, public transport services are rather being reduced than improved, local shopping facilities disappearing, walking and cycling being dangerous.
- Quality of life: quality of life consists of numerous aspects, economic wealth, safety and security, public urban space for people to use, to linger, to sit and talk, clean air, lack of unnecessary noise, pleasant environment without visual intrusion from exorbitant road infrastructure or a vast quantity of parked cars along both sides of all roads and streets, no impediments or barriers for free movement of people etc. In Limassol, today many of these components of quality of life for Limassol's residents and its visitors are being impeded by excessive car traffic, road safety, and availability of public urban space for people, clean air and lack of noise are out at danger by moving and by parked vehicles in every corner of the city.
- Environmental sustainability: Sustainability has three components, environmental, social and economic sustainability. The environmental sustainability is mainly related to the natural environment, the emission of greenhouse gases (mainly CO2), the emission of pollutants, the emission of noise, energy consumption and the use of non-renewable resources (mainly fossil fuels). Cyprus has commitments towards the European Union to reduce the CO2 emissions by 24% by the year 2030 compared to 2005 levels. In Limassol, environmental sustainability is clearly put at danger by the uncontrolled and massive motorised traffic, the enormous fleet of cars compared to the number of residents and the age and quality of engines. CO2 emissions from transport grow and do not diminish. On top of this, the current transport system of Limassol also limits the social environment (see above) and the built environment in the city.

- Economic efficiency: Economic efficiency on one hand relates to the costs and economic efforts necessary for the social processes to be carried out, like people engaging in different activities over the day (education, work, shopping, leisure), distribution of goods to the residents and visitors, administrative processes etc. On the other hand, economic efficiency relates to how the current system allows for economic development, for growth and increase of wealth for the city and for all groups of the population. For the former, the necessary costs are comparatively high, as individual mobility is mainly provided by private individual vehicles, normally carrying only one passenger, losing time in congestion and in the search of parking facilities. For the latter, the potential economic development of Limassol is limited as capacity for the private motorised transport has been reached and capacities cannot easily be expanded further; the city risks to lose its attractiveness for further economic development through settlement of new companies and through attracting more tourists and visitors. Companies need good access to their premises for employees and customers, which in Limassol is limited as only the car can be used for access. Tourists are seeking clean air, an unnoisy environment and unhindered access to the attractions, mainly the seaside. This is currently not on offer in Limassol.
- Innovation: Innovation in transport is the development of new services and supply and the related change of demand, like car sharing, bike sharing, Mobility as a Service, car-pooling, electric vehicles, autonomous driving to name just a few that are currently evolving all around the world. Limassol has nothing of that, no car-sharing, no relevant charging infrastructure for electric vehicles, no shared space.

All these issues and problems can already be experienced in Limassol today. If nothing will be changed, then these issues will aggravate and will become worse, accidents and lack of safety, congestion, time lost, emission of pollutants, noise etc., as the population will increase, mobility will increase, but the space for traffic is limited.

The outputs of the traffic model for 2030 show that if related policies focused only on road network development then the traffic conditions will become worse i.e. delays, vehicle kilometres and vehicle hours in the whole study area will be increased by 44%, 18% and 25%, respectively, with serious impacts on safety, environment (noise and pollution) and the quality of life in the city.

Change is necessary. But it is not some individual measures here and there, some strategies of curing the disease. It has to be a complete change of paradigm, a comprehensive and fundamental change, starting with local politicians, public administrations and public servants, starting to change priorities in transport development and resulting in changing the attitudes, the perception and the travel behaviour of Limassol's residents and visitors.

What is necessary is an integrated urban mobility plan, taking all influencing factors of mobility into consideration, land-use development, economic development, development of awareness, attitudes, acceptance of sustainability issues and actions, personal and individual actions, i.e. changing of one's own mobility behaviour. Many of the latter points are related to marketing, to promotion of a sustainable way of moving and behaving. But a lot is related to providing the alternatives, physical alternative in form of modal networks and services for public transport, for walking and cycling safely and comfortably.

And this change has to start with decision-makers, planners. They have to act first, adapt their own behaviour and adapt the planning and development routines. Only then can this paradigm change also be accepted by other residents and visitors in Limassol.

Sustainable development in these action areas is complemented by a promotion and marketing strategy, starting with decision-makers, planners, authorities, service providers, other stakeholders and the general public. Strategies and measures for the 10 action areas are described later in sections 5-14 of this report.

3 The Vision

3.1 The Vision of a Sustainable Transport System for Limassol

The Vision has been defined by the Key Stakeholder Committee, taking on board the results of the public consultation events. The decisive meeting of the Key Stakeholder Committee took place on 22 January 2019 whereas the public consultation event took place on 23 January 2019. These interactive discussions were accompanied by online questionnaires (please refer to Deliverable D6.1 "Visions Statement and Targets" for more details).

The overall objective in the development of a Sustainable Urban Mobility Plan (SUMP) for the City and Greater Urban Area of Limassol is the desire and the need to improve mobility and quality of life for the citizens and visitors of Limassol and the region, allowing a future development of the area to be economically, environmentally and socially sustainable.

The development of a SUMP is not a just another traditional planning project, carried out by administration, planning institutions and some experts in setting up a plan. The development of a SUMP is a process, involving administrations, planning institutions but also all other relevant stakeholders, influencing or being affected by the development of the transport system and demand for mobility, operators, services providers, special interest groups and the population itself. The strength of a SUMP is not the plan in itself but is a plan that has been developed in a process involving all stakeholders, is a plan being understood and accepted by all or the majority of stakeholders, is a plan being accepted as their own plan, ownership of the plan being with the stakeholders and not some planning experts. Only if this is the case, will the plan be effective, will it really be implemented by planning institutions, will operations and services really be changed by the operators and service providers, and most importantly, will the general public really have an awareness for the objectives of the plan, acceptance and will the population finally take action, i.e. will residents and visitors change their mobility behaviour in accordance with a sustainable development.

Consequently, in developing the plan, stakeholder and citizen involvement was planned from the beginning of the project and was envisaged to accompany the whole process of SUMP development. Apart from analysing current conditions, setting up analysis and planning tools, the most important basis for the SUMP is the development of a common Vision for the future development of mobility in the City of Limassol and its Greater Urban Area, a Vision of how transport should develop, a Vision of how transport and mobility can contribute to a sustainable future for the area. This Vision is a significant qualitative description for the future the city desires. However, a vision statement is not enough. What needs to be achieved is the definition of specific objectives, which indicate the kind of changes the city needs. These changes must also be measurable, thus the selection of the appropriate objectives in correlation with the respective indicators that focus on selected areas, is deemed necessary.

Both, the Vision itself, but also the more specific objectives were not defined by some experts but were developed by stakeholders and the residents of Limassol. Although the development of vision and objectives was based on the EU White Paper on Transport and the supporting SUMP Guidance, stakeholders and residents were intensively involved in a five-step methodology. Stakeholders and citizens identified current deficiencies and developed requirements for the future of Limassol's mobility. These expectations can be summarised under the following statements:

1. The city needs a transport system, which will satisfy the increased travel demand
2. Residents and visitors should adopt new behavioural models
3. The city should adopt policies restricting the use of private vehicle
4. The city should adopt a new town planning model for densities' and land uses' management or propose solutions for achieving and managing high densities
5. The city should adopt solutions regarding the travel demand for work purposes (daily peaks)
6. The city should acquire an adjustable mobility system, adopting measures for the seasonal peak management
7. The city should adopt a mobility system accessible for specific target groups i.e. the elderly people and people with disabilities
8. The city should focus on the infrastructure of sustainable transport modes
9. The city should focus on the gateways' management

On one hand, according to stakeholders and citizens of Limassol, the deficiencies of today's transport system in Limassol and its projected future development relate to:

- Accessibility of destinations by the different transport modes and for all groups of the population, including those with no direct access to a private car;
- Emissions of greenhouse gases (CO2), emission of pollutants (NOx, CO, particulates etc.), emission of noise by transport operation;
- Road network performance- the lack thereof leading to congestion, travel time losses, reduced economic efficiency;
- Public Transport Quality and Operation- spatial and temporal service quality, capability to reach all destinations with PT, PT being a real alternative to the car as it has comparative travel time, costs, comfort;
- Road Safety- the absence of accidents, slight and serious injuries and fatalities on the roads of Limassol but also the feeling and perception of safety on Limassol's road network, allowing people to use the roads also for walking and cycling without fearing of getting killed, including the independence of the younger generation;
- Parking- sufficient parking to allow for those trips still carried out by car to park the vehicle safely and properly without impeding other road users or putting other road users at danger or discomfort other road users or make it impossible to pass, e.g. for wheelchairs, adults with prams or children. This does not mean that more car parks are needed in sensitive areas, but the car parks have to be more adequate. This coupled with strong enforcement will in fact reduce the number of cars that can park in central areas. This includes provision of parking at sensible locations, e.g. at P&R locations at the ring road outside the city centre; and it includes enforcement of the traffic rules to prevent drivers from obstructing others;
- Pedestrian Network Quality- comprehensive network of pedestrian facilities including pedestrian areas, shared space areas, wide and comfortable and green and unobstructed pedestrian pavements that can really be used by all groups of the population, including the mobility impaired with generally lower curbs and lowered curbs at access points, pedestrian crossings and junctions; enforcement of vehicle parking; enforcement of correct pedestrian behaviour;
- Bicycle Network Quality- comprehensive and continuous network of safe and comfortable links to reach every part of the Limassol territory by bike, including bicycle only highways (motorised traffic not allowed), bicycle roads (where cars are allowed at low speed), bicycle lanes along all major corridors and reduced and enforced speed limits on all other roads.

On the other hand, Limassol's SUMP should be guided by the following High-Level Objectives:

- Road Safety: the High-Level Objective is to reduce the number of accidents, the severity of accidents and particularly reduce the accidents involving children and the young generation; furthermore, the Vision will be to increase the perception of safety on Limassol's road network
- Operative Objectives are: reduction of major accident locations, the accident black spots, increase the safety measures for the most vulnerable road users, pedestrians and cyclists, particularly on the main destinations of children and the young, i.e. in front of schools and Universities
- Accessibility and Social Inclusion: the High-Level Objective is to increase the accessibility of all destinations in the territory of Limassol by other modes than the car, providing comparative travel times, comfort and costs for the whole daily mobility; this includes the development of the public transport system both in time (service times and frequencies), as well as in space (bus stops and hubs in the central areas and at the destinations not just close to them), regular time tables and improved connectivity between different lines, but also services on demand for areas and times of low demand; it includes the development of more and safer pedestrian facilities and a continuous and comprehensive network of safe bicycle routes; equal provision of free and accessible public space for pedestrians, cyclists and motorised vehicles; direct and unobstructed access to major destination for pedestrians, particularly the coastal front.
- Operative Objectives are: increase Public Transport service time, introduce services on demand to provide complete PT supply over the day, increase Public Transport spatial network coverage, equal allocation of road space to pedestrians, cyclists and motorised traffic and as a result increase the shares of Public Transport and non-motorised modes

- Quality of Life: the High-Level Objective is to reduce the negative impacts and the influence of motorised traffic on the Urban life, by providing more car-fee areas (pedestrianisation), areas with low car impact (shared space, traffic calming); better spatial mixing of activities through the provision of destinations like shops, leisure facilities closer to where people live and work in order to reduce trip distances, provision of more public space for non-traffic use like parks and green areas, improvement of the coastal front and the direct access to it by walking and cycling and by public transport; proper monitoring and organisation of public transport operation, enforcement of traffic rules, creation of "environmental zones"
- Operative Objectives are: increase infrastructure for sustainable transport modes, reduction of congestion in the city centre, increase of traffic-free public spaces in the city
- Environmental Sustainability: the High-Level Objective is to have clean air and acceptable noise levels inside the city, where people live, work and linger, the city of Limassol not contributing to Greenhouse Gas emissions more than the European average, to minimise the energy consumption from transport in Limassol and the use of non-renewable resources
- Operative Objectives are: reduction of CO_2 emissions and emission of pollutants, reduction of noise levels, increase of the number of electric vehicles and non-motorised modes
- Economic Efficiency: the High-Level Objective is to provide access to all destinations in Limassol without unnecessary time losses through congestion, by providing alternative modes of transport (public transport and non-motorised transport), including work places, shopping and leisure facilities, better integration of economic activities with land-use/ spatial planning
- Operative Objectives are: reduced congestions without building more roads, shorter trips
- Innovation: the High-Level Objective is for Limassol to become an engine for innovations, like electric vehicles, new innovative forms of transport and mobility
- Operative Objectives are: reduction of the share old technology vehicles, increase the share of electric vehicles for private and public transport, increase of car sharing, ride pooling and multimodal trips through Mobility as a Service; increase the network with smart technology, including e-charging facilities, ITS, infrastructure management and monitoring.

Each of these high-level objectives was associated with a number of qualifying statements. These expectations were further discussed, were ranked by level of importance by the Key Stakeholders, finally identifying the most relevant expectations for the future development of a sustainable transport system in Limassol. Some of the most relevant expectations included:

- Reduction of road accidents
- Reduction of accidents involving pedestrians and cyclists
- Reduction of accidents involving students
- Wider pedestrianisation of the city centre, parking limitations and parking spaces creation
- Enhancement of the Public Transport System services
- Reduction of the (irrational) use of private vehicles
- Easy and quick access to all the city's land uses
- Proper monitoring and organisation of the Public Transport system
- Improvement of daily trips (travel time reduce)
- Respect for all citizens' particularities and equal provision of free and accessible space
- Development of a Public Transport system on Demand and increase of service frequency and coverage to support the public transport demand
- Provision of public space to citizens - Creation of open spaces for citizens and promotion of the cultural heritage
- Creation of the necessary conditions and infrastructures in order to encourage short and medium distance trips by alternative transport modes
- Use of new technologies in order to improve citizens' mobility

Based on the highest rated expectations and taking into account the Key stakeholders' opinions, the vision statement was formed as follows in English and Greek, respectively:

"Lemesos to be an accessible, safe, functional and friendly city for its residents and visitors, with attractive, green and quiet neighbourhoods, a lively city centre, numerous spacious and magnificent open public spaces, a beacon of sustainable and smart mobility, facilitating an abundance of economic, business, educational, recreational and cultural opportunities."

«Η Λεμεσός να γίνει μια προσβάσιμη, ασφαλής, λειτουργική και φιλική πόλη για τους κατοίκους και τους επισκέπτες της, με ελκυστικές, πράσινες και ήσυχες γειτονιές, ζωντανό αστικό κέντρο, πολυάριθμους, ευρύχωρους και θαυμάσιους ανοιχτούς δημόσιους χώρους και υπόδειγμα βιώσιμης και έξυπνης κινητικότητας, δημιουργώντας μια πληθώρα οικονομικών, επιχειρηματικών, εκπαιδευτικών, ψυχαγωγικών και πολιτιστικών ευκαιριών».

3.2 High-level Objectives and Targets for 2030

The identification of objectives is achieved by defining the social, environmental and economic improvements required, focusing on what needs to be "reduced", "increased" or "maintained". The objectives are in fact the SUMP's ultimate goal/ vision - Objectives at a strategic level, while the respective measures are the means to achieve them -Objectives at an operational level (please see **Annex I, Table A-I 1** for more details).

The objectives at a strategic level are the prioritised expectations (as the specialisation of the High-Level Objectives in Limassol's case resulted in the formulation of the vision statement), while the operational objectives constitute a first "demarcation" of the alternative measures that may lead both to the achievement of high-level goals and the overcoming of problems and issues in the existing transport system of Limassol.

For the quantification of operational objectives, for the development of strategies, measures and respective implementation plans, it is necessary to define a number of SMART indicators. Targets for these indicators constitute the final step for assessing planning performance and for evaluating the success of the SUMP. In this process, indicative targets were defined for the horizon 2030.

The relevant Table of **Annex I (Table A-I 1)** depicts the Objectives' description, both the High-Level Objectives, as well as the Operational Objectives, the specific SMART indicators that have been defined for each of these objectives and Indicative Targets for the horizon year 2030. The proposed indicators are in effect based on the Applied Framework for evaluation activities (Deliverable D6.1 and D10.1 , CIVITAS PLUS II).

It has to be noted that despite the defined strategy and measures already being very ambitious, still not all of the indicative targets will be met, according to the forecast calculations of the transport model. In fact, in some instances, even more efforts are needed, requiring even more change in the political willingness of local authorities and individual behaviour of residents and visitors.

4 The Approach

The development of the Sustainable Urban Mobility Plan for Limassol followed the approved European Guidelines. The following figure (Figure 3) depicts the Planning Cycle for a Sustainable Urban Mobility Plan as suggested by ELTIS.

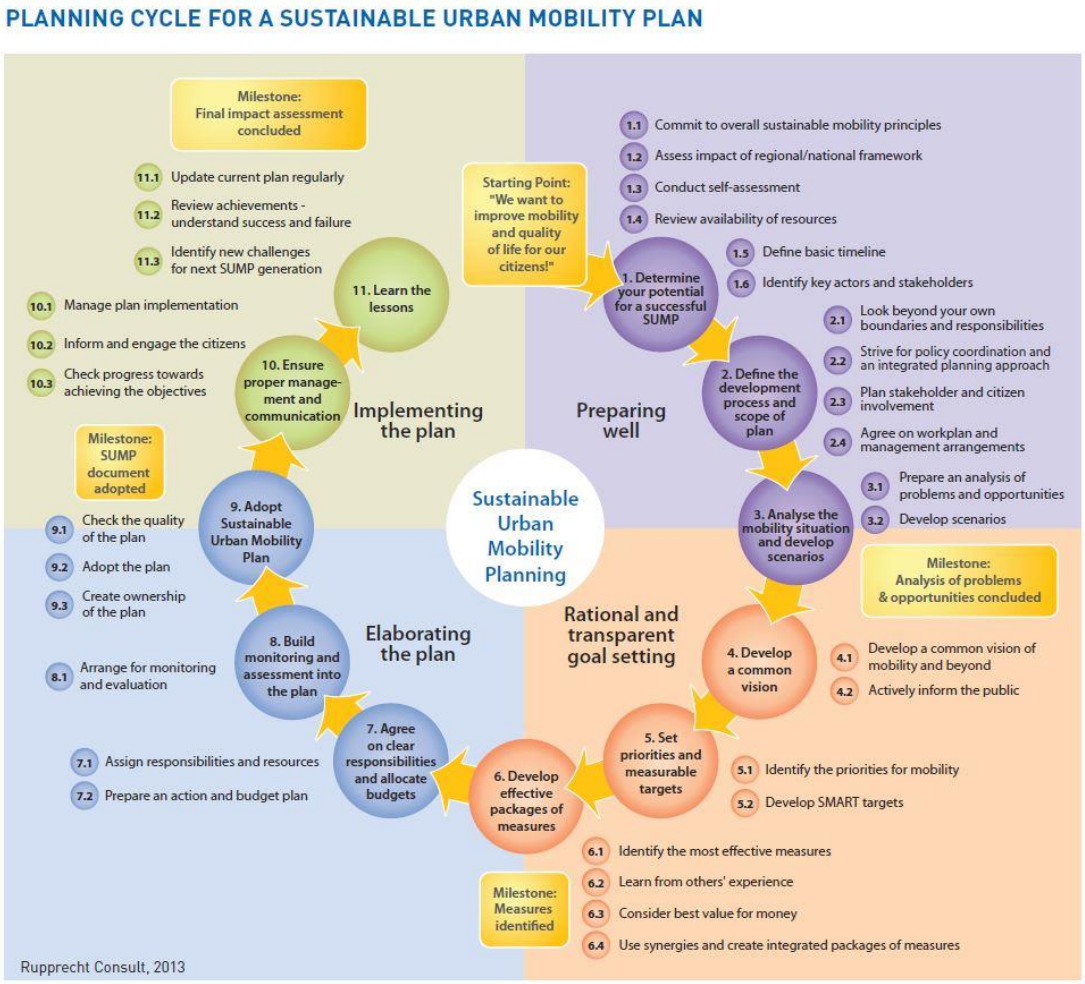


Figure 3: The SUMP process defined by ELTIS

The development is in fact a process, a holistic, integrated and participatory process, involving decision-makers, authorities, operators, service providers, all other relevant stakeholders and citizens in all relevant steps of the procedure. This process is based on comprehensive tools such as a transport model and a variety of assessment methods, Multi-Criteria-Analysis and Cost-Benefit-Analysis.

The four major parts of this process are covered and were intensively worked through in the development process. The following 4 subsections describe the main points that were of particular importance in developing the SUMP for Limassol.

4.1 Phase 1: Preparing Well

This preparatory Phase consisted of five main parts:

A Stakeholder and Citizen Involvement Plan

The development of the stakeholder and citizen involvement plan consisted of a number of tasks, starting with the identification of specific target groups. The results of this first task were the definition of the Core Stakeholders and of the Wider Key Stakeholders. In the task of Key Stakeholder Involvement Plan, a Key Stakeholder Committee was established with 19 members. The “Wider Stakeholders” have been identified, were recorded, contacted and invited to the Public Participation Events. Six meetings of the Key Stakeholders Committee with the Steering Committee and the Consultants carried out and five Public Participation events took place and documented for the

relevant steps of the SUMP process. Additionally, separate meetings were organised with specific target groups such as the Association for Disabled People, the Green Party, the "Movement of Architects for Limassol", the shopkeepers of Anexartisias street, the Association of Residents and Friends of the Historical Centre of Limassol, and with individual citizens or other groups, who requested to meet the Coordinator and/or the Consultants of the project. Finally, stakeholders and the general public were informed about the project, its progress, the strategies and measures via the project's website (http://sump4cyprus.org/), several social media channels, local radio stations and local and national newspapers. Please refer to Deliverables D1.1 "Stakeholder and Citizen Involvement Plan" and D1.2 "Web-site and Social Media Services Implementation" for further details.

This ensured quality assurance of the entire process, that the interests of different actors were appropriately reflected in the plan, contributions to the definition of strategic goals and the consultation of key stakeholders for the fundamental decision points.

For the involvement of Wider Stakeholders, further to the l five Public Consultation Meetings were carried out and documented, ensuring the participation of the population and the information to the population was complemented by the development of a website and publication of information on the project progress on various Social Media: Facebook, Twitter account, LinkedIn Profile, Google+ profile/circle. This enabled the population to be well informed about the project and also allowed feedback from the population concerning relevant aspects.

The Review of Existing Relevant Studies and Data

All previous transport and land-use studies were reviewed, as well as environmental studies and other relevant studies and plans forming the current legal and planning framework for the development of Limassol. This included particularly:

- The Limassol Local Plan (LLP) of 2013 defining goals and general development strategy for Limassol and containing sections on transport policy, residential development and housing, building density, commercial, office, industrial development, environment etc.
- The Limassol Centre Area Scheme (LCAS), being an integrated plan covering in detail land-use and transport strategies and developments for the most important and complex part of the urban area.
- The Policy Statement for the Countryside (PSC) related to some of the peri-urban communities of the study area.

The review included the analysis of existing transport networks and existing transport strategic studies. Finally, the design of a transport model was planned at this stage.

Data Gathering and Collection

Data gathering consisted of collecting, evaluating and processing data about land use, socio-demographic and economic development, an inventory on current transport systems, walking network, cycling network, public transport network and supply, road network for motorised transport as well as data on traffic safety, freight and logistics and tourism.

Furthermore, an extensive programme of data collection and surveys was planned and carried out. This included the following surveys and counts in the Typical Season Period (2nd column) and some additional surveys in the Summer Season Period (3rd column) noted in Table 4:

Survey Type	Typical Season	Summer Season
Household Interview Surveys:	3,250 Interviews	
Bus Occupancy Surveys	15 Locations (bus stops)	2 Locations
Origin-Destination Surveys (RSS)	20 Survey stations	
Manual Classified Turning Counts	80 Junctions	
Classified Link Counts	20 Locations	
Automatic Traffic Counters	51 Sites	10 Sites
Bus Passengers Counts and Bus Services	11 Bus routes	2 Routes
Pedestrian Link Count	20 Locations	20 Locations
Car Journey Time Surveys	8 Routes	4 Routes
Parking Demand Survey	15 on-street road segments	5 Segments
	20 Off-street locations	5 Locations

Table 4: Surveys conducted for SUMP Limassol

Surveys were carried out between 20 March and 31 May 2017 for typical Season and 17 July to 06 August 2017 for summer season.

Development of the Transport Model

An integrated and multi-modal macroscopic transport model for the Greater Urban Area of Limassol is the essential planning tool for analysis of current transport supply, transport demand and resulting traffic conditions in the area. More importantly, this model can and was used for the analysis of future exogenous developments, i.e. development of the population, of employment, of economy and wealth and other socio-demographic developments. Furthermore, the model becomes an important and crucial tool to analyse what happens if, i.e. defining different options (Scenarios) of potential future developments of the transport system and of land use development and analysing the impacts on transport demand, and traffic conditions on the different modes, on environmental, social and economic impacts. The model is the tool to determine the impacts quantitatively and hence serves for definition of scenarios, for quantification of impacts, assessment of effects, comparison of scenarios and selection of the preferred scenario. The transport model is one of the most important bases for the Multi-Criteria Analysis (Scenario Selection) and the Cost-Benefit Analysis (Preferred Scenario Assessment).

The transport model consists of the following components and steps:

- Base Year Model for passengers and for freight demand
  - Passenger demand model, differentiating different homogeneous user groups, different trip purposes, different transport modes:
  - Traffic generation
  - Traffic distribution
  - Modal split
  - Traffic assignment
  - Freight demand model
  - Generation of freight trips
  - Distribution of freight trips
  - Calculation od trip matrices, HGV and LGV matrices
  - Assignment
  - Model Calibration
  - Model Validation
- Forecast Model for 2030
  - Reference model: the reference forecast scenario is the business-as-usual or “do-something” scenario, intending to include only those measures and projects that are currently already underway or are planned with detailed design, implementation plan and an allocated budget.

The model results include transport demand matrices, volumes of vehicles, passengers, cyclists and pedestrians on links and lines, at junctions and stations, plus parameters like volume capacity ratios, generalised costs for private and public transport, passenger hours and kilometres per transport modes, emissions of greenhouse gases, pollutants and noise, accessibility indicators, public transport operating indicators, public transport coverage and others.

These results and parameters are available for all scenarios, i.e. for the base year scenario and for the forecast reference scenario for horizon 2030.

Analysis of Problems and Defining Objectives

The analysis of problems included analysis of data collected and surveyed; data from external sources and data produces by the transport model for the base year case. Surveys were evaluated in terms of current mobility patterns and trip characteristics, parking demand and supply, level of service on the different modal networks, and were complemented by comparison (benchmark), projections of mobility patterns until the year 2030, tourist mobility in Limassol and interdependencies between sectorial trends.

The detailed analyses of current conditions, bottlenecks and current issues included calculation of emissions on the network covering the whole study area, the evaluation of public transport (network and supply, institutional set-up and financial aspects), analyses of accessibility in Limassol with the different transport modes, particularly focussing on central locations and relevant relationships and

putting emphasis also on accessibility aspects for groups with impaired mobility. Furthermore, an extensive safety analysis was carried out consisting of network safety management and safety inspections of existing roads. A capacity analysis was carried out for the pedestrian network, for the bicycle network, for the road network including the determination and assessment of volume-capacity ratios. In addition, problems and issues reported by stakeholders were considered, Intelligent Transport Systems were evaluated and responsibilities for road maintenance and road safety determined.

Objectives were preliminary defined in terms of a holistic evaluation of identified problems and their interdependencies as well as the derivation of deficiencies and operative objectives as an input to phase 2.

4.2 Phase 2: Rational and Transparent Goal Setting

Phase 2 consisted of the following 4 activities:

Develop a Common Vision, Set Priorities and Targets

The findings from the activities in phase 1 were used to develop a common vision, set priorities and define targets for the horizon year 2030. As noted elsewhere in this report, it is important that the vision, the objectives, priorities and targets were not set or defined by the administration or group of experts, but were the result of an intensive participatory process, involving administration, institutions, operators, services providers and all stakeholders influencing or being influenced by the transport system, including special interest groups and the residents of Limassol. In a five-step participatory process, both the Key Stakeholders as well as the citizens of Limassol were invited to respond with questionnaires and contribute to the analysis of the current mobility situation in Limassol, to define requirements and expectations for the future development of the transport system and to rank these expectations in terms of priorities.

The resulting priorities were then consolidated into a Common Vision statement.

Finally, SMART indicators were defined for each objective and each requirement/ expectation. Based on the current conditions, targets were defined for all indicators that should be reached by the horizon year 2030. This allows assessing the implementation, verifying the achievements of the SUMP and fine-tuning strategies, measures and targets in the future.

Generation of Future Scenarios

Different scenarios were produced for the future horizon year 2030. The basis scenario is the reference scenario, “do-nothing” or “Business as Usual” scenario. This basic development scenario is the one without any special interventions from the SUMP process. This basic scenario includes all known and accepted developments of transport influencing factors, like population development, both in absolute numbers as well as in composition (locals, foreigners, age groups etc.), economic development including the development of touristic market and other influencing factors provided by authorities and statistical offices. Furthermore, this basic scenario includes all those developments and projects, that are currently already under construction, or are planned and have an approved financing and expected to be completed by 2030.

Additionally, different options were defined, where the SUMP would influence future development. The different options were defined for two dimensions, on one hand for urban policies, spatial and land use patterns having a high influence on the development of the transport sector, on the accessibility and mobility needs of the inhabitants of Limassol and on the potentials for a sustainable mobility with a decreasing dependence on cars. On the other hand, different transport mobility policies were defined including policies, projects, restrictions and incentives.

For the urban policy scenarios, the following 3 options were defined:

I. City Sprawl (Expected) – low mix of land uses, basically not influencing the existing trends
II. Targeted Development – directing growth to specific area in Limassol with development potential
III. Poly-Centric Development - mix of land uses in all the centres (Limassol and the other municipalities)

For transport and mobility policies, the following options were defined:

A. Improvement of Car Traffic conditions with the aim to reduce negative impacts
B. Further improvement of Car Accessibility with the aim of providing better access by car for all groups of the population
C. "The Carrots" – Improvement of alternative modes of transport, increasing their attractiveness and aiming at convincing users to switch away from the car
    1. Moderate
    2. Advanced
D. "The Sticks" – limiting or impeding car traffic with the aim of reducing the car traffic volumes particularly in sensitive areas.
    1. Moderate
    2. Advanced
E. Combination of "The Sticks" and "The Carrots", again moderate and advanced.

This resulted in a matrix of 24 possible combinations, i.e. future development scenarios shown in Table 5.

Strategies		Urban Policy Scenarios		
		I. Expected (Urban Sprawl)	II. Targeted (Incentives and policies)	III. Poly-Centric
Transport Mobility Scenarios	**A. Improvement of car traffic**			
	B. Further improvement of car accessibility			
	C. "The Carrots"			
	C.1 "The Carrots" – Moderate			
	C.2 "The Carrots" – Advanced			
	D. "The Sticks"			
	D.1 "The Sticks" – Moderate			
	D.2 "The Sticks" – Advanced			
	E. Combination of "the Sticks" and "the Carrots"			
	E.1 Combination - Moderate			
	E.2 Combination - Advanced			

Table 5: The scenario definition process

Out of these 24 possible scenarios, in the following process, the Stakeholders (the KSC and the SC) selected first a maximum of six scenarios for further analysis. This resulted in a substantially reduced matrix of options as shown in the table 6 below:

Strategies		Urban Policy Scenarios		
		I. Expected (Urban Sprawl)	II. Targeted (Incentives and policies)	III. Poly-Centric
Transport Mobility Scenarios	**A. Improvement of car traffic + Aktea road**	X		
	E. Combination of "the Sticks" and "the Carrots"			
	E.1 Combination - Moderate + Aktea bus lane	X	X	X
	E.2 Combination - Advanced + Aktea-BRT		X	X

Table 6: The final selected 6 scenarios

These final agreed scenarios formed the basis for the subsequent steps of the development of the Sustainable Urban Mobility Plan for Limassol.

Development of Scenario Models and Evaluation

The 6 resulting scenarios were defined in greater detail and were modelled with the transport model. This included the changes to the urban policy, i.e. spatial location of development of residents and workplaces, as well as the different transport mobility options, i.e. changes to transport networks, transport services, costs, travel times, parking possibilities etc.

The model results were calculated in terms of indicators for numerous aspects, e.g. mode shares, trip distances, average speed, volume/capacity ratios, level of service, public transport indicators, emissions of GHG and pollutants, emission of noise, were displayed in maps of volumes, passengers, LoS, impacts of individual measures and others. Scenarios were compared, and impacts reported.

The model results for the 6 scenarios formed the input for the Limassol SUMP Multi-Criteria Analysis (MCA) for Scenario Evaluation. The MCA approach enables the comparison of different options using criteria of different nature as it is the case for examining sustainability. In fact, each policy objective set in the Limassol SUMP corresponds to a main analysis criterion whereas the majority of the operational objectives define a sub-criterion in the MCA. Finally, the indicators used for measuring the various effects of the selected interventions in each SUMP scenario are also used for determining the score corresponding either to the effects of these interventions or to the targeted goals.

The MCA results, which rely on weight factors for each criterion and sub-criterion assigned by a panel coming from the nineteen members of the Key Stakeholders' Committee, rank as first option Scenario 6 followed by Scenario 4.

In detail, the scores are:

- Scenario 0: 36
- Scenario 1: 38
- Scenario 2: 54
- Scenario 3: 55
- Scenario 4: 69
- Scenario 5: 52
- Scenario 6: 72

Their difference is small, just 3.0 percentage units. The next closest scenario is SC3, having a distance of approximately 14 percentage units from SC4. SC 1 is ranked last from the 6 scenarios, whereas the reference scenario is even lower in the overall rank.

Relating to the five high-level policy objectives scenario 6 ranked best in each of them:

- Economic Efficiency: scenario 4 and 6 are the best performing scenarios, particularly looking at vehicle kilometres and mode shares, travel speeds for PT.
- Environmental sustainability: scenarios 6 – along with 4 - perform by far best, particularly in terms of emissions, mode shares, travel distances, travel speeds for PT and bicycles.
- Accessibility and social inclusion: is again best achieved by scenarios 4 and 6 for the accessibility by other modes than the car, modal shares, travel distances, travel times in sustainable modes and number of PT passengers.
- Road safety: can be estimated to be improved most by scenarios 4 and 6, as here the car vehicle kilometres are the lowest and more passenger are travelling on the bus.
- Quality of life: is increased most by scenarios 4 and 6, with lowest noise levels in urban environments, lowest pollution levels and lowest vehicle kilometres.

Selection and Appraisal of Preferred Scenario

Based on the results of the previous steps, particularly the assessment of the scenarios with the transport model and the Multi-Criteria Analysis, the Steering Committee selected in majority the highest-ranking scenario 6 as the preferred scenario after the feedback provided by the Key Stakeholders Committee meeting took place on 22 January 2019 and by the Public Consultation Event on 23 January 2019. Scenario 6 combines the polycentric land use approach, where development is focussed in the municipalities of the Urban agglomeration, with the more advanced options of transport policy measures, i.e. "the Carrots" – Advanced and "the Sticks" - Advanced.

The preferred mobility scenario for Limassol included the most advanced and ambitious interventions for the target year 2030, comprised by a mix of carefully selected interventions such as:

- One-way schemes
- Extended pedestrianisations in the CBD area
- Bus-only road network to accommodate bus traffic to the CBT at Andrea Themistocleous street
- Traffic calming interventions and low speed zones (<30kph) for the residential area
- Re-organisation of the PT network at network level as well as the Quality of service level (frequencies, hours of operation)

The mix of all these measures, policies and interventions was modelled and evaluated through the macroscopic transport model (PTV VISUM) and the results were included in deliverables of the project. The model outcomes were found reasonable and a substantial step to the direction of changing citizens' mobility behaviours by effectively reducing the private vehicle ridership from 91% to 78% while substantially enhancing PT ridership almost tripling it between 2017 - 2030. This alone has contributed to create an urban road network system that is more efficient and productive, therefore less crowded and congested during rush hours in the near future. Due to the nature of the SUMP study, the results cannot be attributed to each single intervention to allow direct comparisons in terms of traffic impact, but it is safe to say that the volume over capacity indications in most road network locations have shown adequate resilience to cope with the extensive pedestrianisations.

A Cost Benefit Analysis (CBA) was then carried out for the preferred scenario, aiming at the comparison of the expected social and economic benefits that will be produced from the adoption and implementation of the specific SUMP with the costs deemed necessary to implement all actions, interventions and investments for this purpose

The final CBA results show that benefits outweigh costs; more specifically the Net Present Values is positive equal to approximately 669.24 million euros. The BCR takes a value of 3.07 which is well higher than the threshold value of 1.0. In case a 2% or 3% discount rate is used, the NPV and the BCR improve significantly. The Sensitivity Analysis results verify the CBA outcome that the specific SUMP scenario improves the wellbeing of the Limassol inhabitants. In all different tests, the CBR value remained well greater than 1.0 and the NPV was positive. Even in the worse-case scenario the BCR value took a value of 2.09. Finally, it should be mentioned that other positive effects of qualitative nature not appearing in the economic analysis calculations and results contribute to the sustainability of Limassol and to the city upgrade. Therefore, the overall recommendation, combining the economic analysis results and the other non-monetized effects, is definitely positive.

4.3 Phase 3: Elaborating the Plan

Formulation of the Draft Sustainable Urban Mobility Plan

This report is the documentation of the main step within Phase 3, the Formulation of the draft SUMP. It is based on the previous activities and aims at developing all SUMP elements according to the selected preferred scenario. The Plan elements include the following 10 areas of action:

1. City centre detailed traffic management
2. Public transport
3. Pedestrian measures
4. Cyclist measures
5. Parking
6. Freight logistics
7. Traffic safety
8. Needs of specific groups
9. Intelligent Transport Systems (ITS)
10. Strategic Plans and Policies

These 10 areas of intervention are documented in the respective following sections of the report. To finalise the SUMP, the draft SUMP report will be complemented by activities in Phase 4, preparation of an Implementation Plan, Preparation of a Promotion and Marketing Plan, Model Training Activities, to be then completed in the Final SUMP report.

4.4 Phase 4: Implementing the Plan

Phase 4 is constituted by the following 4 activities, which are not finalised yet but are currently being processed in parallel to the production of this draft SUMP report.

Strategic Environmental Assessment

According to the provisions of the Directive 2001/42/EC of the European Parliament and of the Council, on the assessment of the effects of certain plans and programmes on the environment a

Strategic Environmental Assessment (SEA) is required for the consideration of environmental protection and sustainable development in decisions regarding Government plans and programmes.

The Directive has been transposed into Cypriot law with the Assessment of Environmental Impact of Certain Plans and/ or Programs Law (No. 102 (I)/ 2005), which has been published in the Gazette on 29.7.2005.

The objective of the Strategic Environmental Assessment (SEA) is to identify and evaluate all direct and indirect impacts that would be brought about by the implementation Preferred Scenario of the Sustainable Urban Mobility Plan for Limassol and provide documented recommendations on the identification, adoption and implementation of measures to avoid or minimise such impacts.

Preparation of an Implementation Plan, Monitoring and Evaluation Plan

The task of the implementation plan is the listing of projects in a sequence of proposed realisation taking into account the priorities, the interdependencies and the financial capabilities. This includes:

- List of projects
- Short term projects: 0-5 years of implementation, high urgency, short duration of preparation, can be financed more or less immediately
- Medium term projects: 5-10 years of implementation
- Long term projects: more than 10 years of implementation
- Phasing and interdependencies: projects will be listed by order of realisation in case of interdependencies
- Financial plan: investment, maintenance, subsidies, potential for PPP

The monitoring and evaluation plan will be developed according to the "Applied framework for evaluation in CIVITAS PLUS II" (2013) guidelines yet considering the specific local conditions of Limassol.

Preparation of a Promotion and Marketing Plan

The preparation of a promotion and marketing plan first consists of some preliminary steps like research and analysis of the current situation, definition of objectives and strategy for promotion and marketing. Furthermore, the promotion and marketing plan aims at developing Key Messages for different audiences and to define optimum communication means and channels. Finally, in this task a strategic business and marketing plan will be formulated aiming at development of strategic business and marketing plan as well as the evaluation of the SUMP promotion and marketing programme.

Model Training Activities

Model training activities are necessary to allow the authorities in Cyprus and Limassol to use the developed transport model as a planning tool for future changes and developments. In order for the Ministry, the Municipality and potentially other stakeholders to be able to use the model, it was necessary:

- To provide the needed software licences for PTV VISUM and PTV VISSIM.
- To train the end users, with training on transport modelling in general, development and use of the transport model, details associated with preparing and running basis scenarios in PTV VISUM, details associated with preparing and running basic micro-simulation scenarios using PTV VISSIM, particular issues that arise following completion of the training.

The trainings were conducted in the weeks 4th of March to 8th of March and 18th of March to 22nd of March 2019.

Production and Adoption of the Sustainable Urban Mobility Plan

The final SUMP is the synthesis of all the deliverables noted earlier in Table 3 and the official participation processes followed through the Steering Committee, the Key Stakeholders Committee, the Public Consultations and other meetings organised.

5 City centre detailed traffic management

5.1 Introduction

5.1.1 Current status

The Greater Area of the city of Limassol (the Limassol Municipality and the 5 neighbouring municipalities), which is the study area of the project, crossed by a network of a total length of approximately 1,000 kilometres, dominated by road axes with one (1) traffic lane per direction (approximately 900 kilometres). At the same time, the length of the pedestrianized road axes is only 1.5 kilometres, which are located in the central area (historical centre) of the Municipality of Limassol. On the other hand, the existing footway and bicycle way infrastructure in the whole study area is 17 and 15 km, respectively.

In the followings is summarised (as detailed in a previous chapter) the status of transport behaviour that is faced in Limassol, as it is reflected in the surveys, interviews and counts that conducted during the project life.

- The transport system of the City of Limassol is characterised by the predominant mode of transport, i.e. the car (approximately share 91.8%).
- Other modes of transport, namely the non-motorised modes walking and cycling, and public transport have very low shares of the total number of trips (5.7%, 0.7% and 1.8%, respectively).
- The attitudes of residents and visitors are car-oriented, other modes are perceived as less flexible and only for those who cannot afford an own car, while when the car is available, it is used for almost every trip. These attitudes and perceptions are of course reflected in the respective mobility behaviour. The car ownership index in Limassol as in Cyprus is very high (570 cars per 1,000 residents is estimated the value of the index for 2020, based on the trends identified by the relevant data of the last censuses).
- Transport supply, provision of networks and services is similarly unilateral.
  - The road networks in the Limassol metropolitan area are well-developed, reach every corner of the area, allow access by car to all destinations and at most destinations provide easy and cheap car-parking facilities.
  - Networks and services of other modes (walking and cycling) are far less developed and provide a far less comprehensive accessibility of the territory of Limassol metropolitan area.
  - The Limassol public transport system consists of buses only, operating on lines across the whole territory of the metropolitan area of Limassol. The general supply seems reasonable in the central areas of Limassol, but already in the outskirts of the city, lines and services get insufficient. Service times are not sufficient, frequencies are low and irregular and therefore not attractive for the non-captive users, i.e. those who have access to a car.
- The road space is not used by people but is perceived as being only destined for motorised vehicles.
- This vicious circle is nurtured by the public administration and local politics ever encouraging more use of the car, providing more capacities for moving and parking cars also in the city centre and along the scenic coastline.

The solution can only be to limit car traffic, to provide more and more attractive alternatives to the car, to encourage residents and visitors to change their behaviour.

5.1.2 Objectives for this area of intervention

In the above described environment, the provisions of the Limassol Local Plan (LLP) and Limassol Centre Area Scheme (LCAS) come to set specific policies/ strategic objectives, which are summarized in the following table (Table 7):

Policies/ strategic objectives of Limassol Local Plan (LLP)	Policies/ strategic objectives of Limassol Centre Area Scheme (LCAS)
▪ The discouragement of the use of private vehicles for interurban movements, particularly within the Urban Centre and historical cores ▪ The substantial upgrade of the importance, role and effectiveness of public transport ▪ The creation of necessary conditions and infrastructure for the encouragement of interurban travel with environmentally friendly modes of transport, such as cycling and walking ▪ To coordination of the urban transport policy with the National Transport Strategy, the Public Transport Enhancement Programme, the outcomes of the Integrated Mobility / Transport-Land Use Plans for large urban centres, the Green Paper: Towards a new culture for urban mobility and generally with the European Transport Policy after 2010 ▪ The organization of an effective primary, secondary and tertiary urban road network, in order to guarantee the comfortable and safe movement of people and goods between the different areas of the LLP and the wider region, as well as the creation of appropriate conditions for the more effective and efficient control of roadside development ▪ The more effective coordination of land use and transport infrastructure spatial policy, so that transport design constitutes an integral part of urban planning and vice versa ▪ The management of the increasing transport demand in areas where the primary road network has been completed, with the adoption of traffic management measures, with an emphasis on traffic calming measures ▪ The management of parking demand, especially in commercial area/ activity axes, primary roads and residential areas ▪ The design and implementation of the entire urban transport infrastructure network taking into account the movement of people with special needs	▪ The regeneration and sustainable development of the town centre to a unified, multifunctional space which shall be the town's main commercial and services centre with a unique and symbolic character ▪ The creation of the necessary infrastructure to support alternative means of transport in the town centre in order to reduce traffic congestion and create the space for the reorganisation of the central spaces ▪ Essential improvement of the area's accessibility giving emphasis to the easy access of pedestrians and buses and separating as much as possible the movement of pedestrians and vehicles ▪ Clear completion of the road hierarchy in such a way as to ensure the effective transferring of traffic to selected main axes ▪ Application of traffic management and calming measures which will ensure peripheral east-west road traffic, parking spaces, creation of pedestrianised areas and the protection of the residential character of some neighbourhoods ▪ Restructuring of the public transport network in such a way as to avoid conflicts with other transport means and serve the entire town centre

Table 7: Policies/ strategic objectives of Limassol Local Plan (LLP) and Limassol Centre Area Scheme (LCAS)

Main strategic objectives of LLP and LCAS: It is obvious that, the transport policy of both, LLP and LCAS, aims to significantly improve the conditions and increase the capabilities/ possibilities and options of movements with all available transport modes for the entire population, irrespective of their income group or age. The main objective of the Plans' transport policy is to satisfy the movement needs without limiting the potential of future generations to address their needs based on their choices. This is in line with the modern European philosophy to achieve conditions of sustainable mobility in urban areas.

Despite the theoretical approach of the LLP and the CAS which promotes sustainable mobility, the relaxation policies for single housing and the continuous demand for expansion of development zones without a real demographic need has created a huge problem of dispersed and scattered development and strong car dependency which is opposite to all sustainability principles.

The general parking policy of the Development Plans does not promote sustainable mobility but maintains and strengthens the use of the private car. It has to be thoroughly reviewed because a balanced and integrated system has to be applied, which will include improved public transport, efficient parking pricing policy and enforcement.

The existing parking standards for developments promote the use of the private car and have to be evaluated and reviewed. Although the public transport objectives and principles of the LLP and the CAS, are compatible to the SUMP approach, the proposed implementation of policies and measures is ambivalent. Some of the proposed measures will in fact promote a sustainable development, reducing the need to travel by car and providing alternatives. However, some other measures seem to be counterproductive, such as upgrading the road network and providing more parking in the central urban areas which facilitate the use of the car.

The principles of sustainable mobility may only be successful through the implementation of an integrated and balanced transportation and land use policy restricting the use of the private car without affecting the financial viability of the city.

5.1.3 General approach – the principles

Moreover, both plans generally promote the application of traffic management measures in central areas and mainly the Urban Centre and the historical/traditional cores of the wider urban areas in order to improve the operation of the road network. In these areas, traffic calming measures also be proposed to be implemented, where necessary, to conserve/improve local physiognomy.

More specifically, the traffic management measures that constitute a strategic choice and can help improve environmental quality, upgrade the attractiveness of certain areas and readjust the emphasis given to the different transport modes, are listed in the following table (Table 8).

Policies/ strategic objectives of Limassol Local Plan (LLP)	Policies/ strategic objectives of Limassol Centre Area Scheme (LCAS)
➨ One-way road systems ➨ Traffic calming measures in Limassol city centre as well as in other urban areas ➨ Measures that discourage through traffic within purely residential areas ➨ Creation of bus lanes ➨ Traffic restrictions ➨ Pedestrianisation ➨ Creation of cycle lanes	➨ Creation of one-way road in the peripheral and basic internal road network, limiting the access to main roads ➨ Creation of footpaths in compact areas ➨ Strict parking regulations ➨ Creation of bus-lanes ➨ Correct and consistent means of movement and entry/exit signage in order to avoid unnecessary traffic and congestion (direction and street name signs, etc.). ➨ Traffic calming measures mainly in the eastern residential areas to reduce speed, give priority to pedestrians and bicycles and cater for the neighbourhood's needs rather than that of incoming traffic

Table 8: Main traffic management measures proposed by Limassol Local Plan (LLP) and Limassol Centre Area Scheme (LCAS)

Traffic Management measures constitute a strategic choice and can help improve environmental quality, upgrade the attractiveness of certain areas and readjust the emphasis given to the different transport modes.

It is concluded that, the provisions of the existing LLP and CAS contain most of the modern sustainable mobility principles, and therefore have been considered in the design of the proposed SUMP measures and policies.

In addition to the above, and for the purpose of creating the road network hierarchy, the followings are proposed by each of the plans (see the Table 9).

Policies/ strategic objectives of Limassol Local Plan (LLP)	Policies/ strategic objectives of Limassol Centre Area Scheme (LCAS)
▪ Vertical Road which connects Limas-sol Port with the Limassol - Paphos Highway (this project has already been completed) ▪ The connection of Franklin Rousvelt ▪ Avenue with the Coastal Avenue ▪ Expansion of Agias Fylaxeos Avenue and parts of Archiepskopou Malariou III Avenue in Limassol ▪ North Parallel Road of Limassol (it is expected that certain parts of it will be implemented) ▪ Improvement of part of the Touristic Coastal Road ▪ Expansion of the Germasogia Bypass Road ▪ Improvement of Archiepskopou Malariou III Avenue in Ypsonas ▪ Expansion – improvement of Agiou Athnasiou Avenue from the Nicosia - Limassol Highway up to the Coastal Avenue ▪ Expansion – improvement of the Mouttagiaka Road from the Coastal Avenue until the Nicosia-Limassol Highway ▪ Expansion – improvement of the Main Road towards Agios Tychonas ▪ Road which links the Nicosia-Limassol Highway with Parekklisia	▪ Improvement of the connection between the Coastal Avenue and Franklin Roosevelt Av. in such a way as to increase significantly the traffic capacity of this main road artery and upgrade the existing bifurcated road on each side of the urban land island which exists near the Marina. At a later stage and depending on demand alternative methods will be re-evaluated, in-cluding a direct underground road connection. ▪ Connection of Gian Simpelious and Filiou ▪ Zannetou streets so that they act as main exit roads from the centre ▪ Creation of the Castle bypass road ▪ Opening of Athinon Street and connection with Ellados Street ▪ Connection of Haci Hasan Street with Mescit Street ▪ Connection of Giagkou Potamiti Street (ex Romai Rolan) with Ifigenias Street through the area of the Tax Collection Office ▪ Opening and completion of the road network in the Marina area (opening of Aktea Road which will terminate vertically on Franklin Roosevelt Av. and completion of the inner main road of the Marina) ▪ Transferring of most traffic to primary roads created by upgrading the main peripheral road axes (Gladstone, Coastal Avenue etc.) and creation of good connection between Gladstone/ Navarinou streets and Makariou Av., which constitutes the main bypass road of Limassol's central area ▪ Completion of the internal peripheral traffic around the commercial core by improving some basic secondary roads ▪ Ensuring basic connections between the subareas of the town centre with the secondary road network (M. Alexandrou, Zinonos, Irinis / Enoseos, Cleopatras, Stasinou etc.) ▪ Accommodating for the neighbourhood's needs through a local road network, which will be appropriately configured and modified (one-way streets etc.)

Table 9: Road projects proposed by Limassol Local Plan (LLP) and Limassol Centre Area Scheme (LCAS)

5.2 Key strategies

Taking into account the above analysis, it is obvious that growth in the number and use of motor vehicles, especially cars, is the principal cause that the city of Limassol experiencing congestion, delays, noise, pollution as well as road safety and accessibility problems in its city centre as well as along arterial routes.

Traffic management measures of Limassol SUMP are intended to reduce the above-mentioned problems by reducing transport demand such that the use of private vehicles is reduced (e.g. measures to encourage a modal shift from private cars to public transport, walking and cycling; land-use planning measures which minimise distances between home, work, shops and leisure facilities and so reduce dependency on cars).

Limassol has traffic management measures in place already, but further measures are required in order to cope with future growth in traffic and fulfil the operational objectives of Limassol SUMP. There are many considerations which influence a city's choice of traffic management measure(s):

(a) Economic considerations. Some measures require expensive engineering works to be undertaken and are beyond the resources available. For example, a metro may be the preferred way of improving a city's public transport system in order to attract people out of their cars and onto public transport, but improved bus services may be the only option available on economic grounds. It is noted that, in the context of the development of the Limassol SUMP, besides identifying a series of measures and policies concerning the promotion of sustainable mobility, it was decided (in cooperation with the Contracting Authority) to include a series of development projects (reference scenario projects) to complement the implementation of the measures (see Chapter 5.3.5, below). However, some additional development projects (such as motorway crossing, tunnel, bypass road, etc.) were examined in the Scenario 1, as one of total 6 alternative scenarios. Scenario 1 is the only one of the 6 scenarios that focuses on improving traffic conditions for private vehicles (e.g. via ITS) and includes only road development projects (see Chapter 5.3.6, below). The remaining 5 scenarios focus on different urban development scenarios and on a series of measures to promote sustainable mobility. Comparative analysis of these 6 scenarios, with the help of the macroscopic traffic model developed, led to Scenario 1 ranking at the lowest scale (see Deliverable D8.1). This ranking of course has been done in terms of meeting the high-level objectives adopted for the SUMP (please see Chapter 3.2 of this report).

(b) Alternative goals. Traffic management measures, which have been implemented so far achieved different goals, than those related with sustainable mobility. Such measures have been for example, new road constructions to facilitate the traffic flows, in order to reduce congestion, improve mobility, reduce the number of motor vehicle accidents, reduce noise levels, etc.

(c) Attitudes of the public. Public support for individual measures varies greatly. For example, the introduction of an exclusive residents' parking zone, for which residents pay a permit, may be welcomed by residents of one district within a city but rejected by another. Weak public support for an implemented measure can lessen its impact considerably. For example, around a central traffic restricted zone, it is likely, commuters seek to park as close to the restricted zone as possible (within the city centre) instead of switching to public transport for their journey.

(d) National constraints. Traffic management measures could be initiated at the local or municipal level but may require approval by the regional or national tier of Government (institutionalized Local Plan). Guidelines may be set down as to what measures are likely to be approved and those, which will not. For example, the increase of the operational costs of the car through the price of the fuel or other charges is a measure that requires approval by the Government.

(e) Traffic control and ITS as tools for optimising traffic flow and minimising junction delays (see paragraph 6.3.3).

The single traffic management measures or the combination of measures that be proposed by Limassol SUMP are outlined in the following sections. Some single measures, for example, may spread rather than reduce traffic congestion, shifting the congestion from one part of the city to another. For this reason, a combination of additional measures, need to be introduced at the same time to prevent this eventuality. Similarly, a traffic restraint measure, which deters or prevents commuters from using cars, needs to be complemented by measures to improve public transport, walking or cycling facilities. Rarely does it make sense for a single traffic management measure to be introduced on its own; rather a package of measures is needed. In general, the key strategies that dictate and complement the measures detailed below are as follows:

- Convert two-way streets to one-way streets
- Plan transportation networks for all modes of transport
- Speed Limits and Controls
  - Reduce speeds on some identified local streets
  - Implement design features on some streets to reduce speeds
  - Enhance traffic control signs and street markings
  - Increase penalties for speeding
- Stop Controls and Interchanges
  - Re-examine stop controls
  - Improve stop controls
- Education and Enforcement
  - Implement an education campaign
  - Increase enforcement.

5.3 The detailed description of measures

5.3.1 Traffic restricted zone in the city centre

Area-wide bans or restrictions on traffic may be much localised (e.g. pedestrianised street) or cover a much wider area (e.g. historical or commercial district). Most city centres in Europe contain some pedestrianised streets, sometimes with buses and taxis allowed to travel along these streets.

Fully pedestrianised areas are difficult to achieve. The need for servicing for shops, accommodation of public transport, the accessibility needs of disabled people, residents and emergency vehicles mean that few areas can be solely for pedestrians.

The Limassol SUMP has therefore explored an alternative approach, which can improve the pedestrian environment whilst maintaining access for vehicles.

The extensive pedestrianisation of the core CBD (Central Business District) is proposed and detailed in Chapter 7 of D10.1 report, while determines these streets in the area that although have a variety of different functions – with most of them being shopping streets – serve as routes that eliminate the traffic through the core CBD. More specifically, it has been proposed that suitable alternative one-way routes to access within the city centre - it would not be practical to prevent vehicles using these roads – which are shown on the map below (Figure 4).

This system is complemented by the one-way traffic derationing of most of the city's main commercial streets, which are directed and/ or surround the core CBD (Environmental Zone – Area A). These road axes appear in bold blue and extend to the Traffic Calming Area, and more specifically in the B, C and D areas as depicted in Figure 5. These are Thessalonikis, Agias Filaxeos, Leontiou, Giltiz, Navarinou, 16th June 1943 and Gladstonos (between Thessalonikis and Agias Filaxeos) streets. Detailed maps can be found in **Annex II, Figure A-II 1 and Figure A-II 2**.

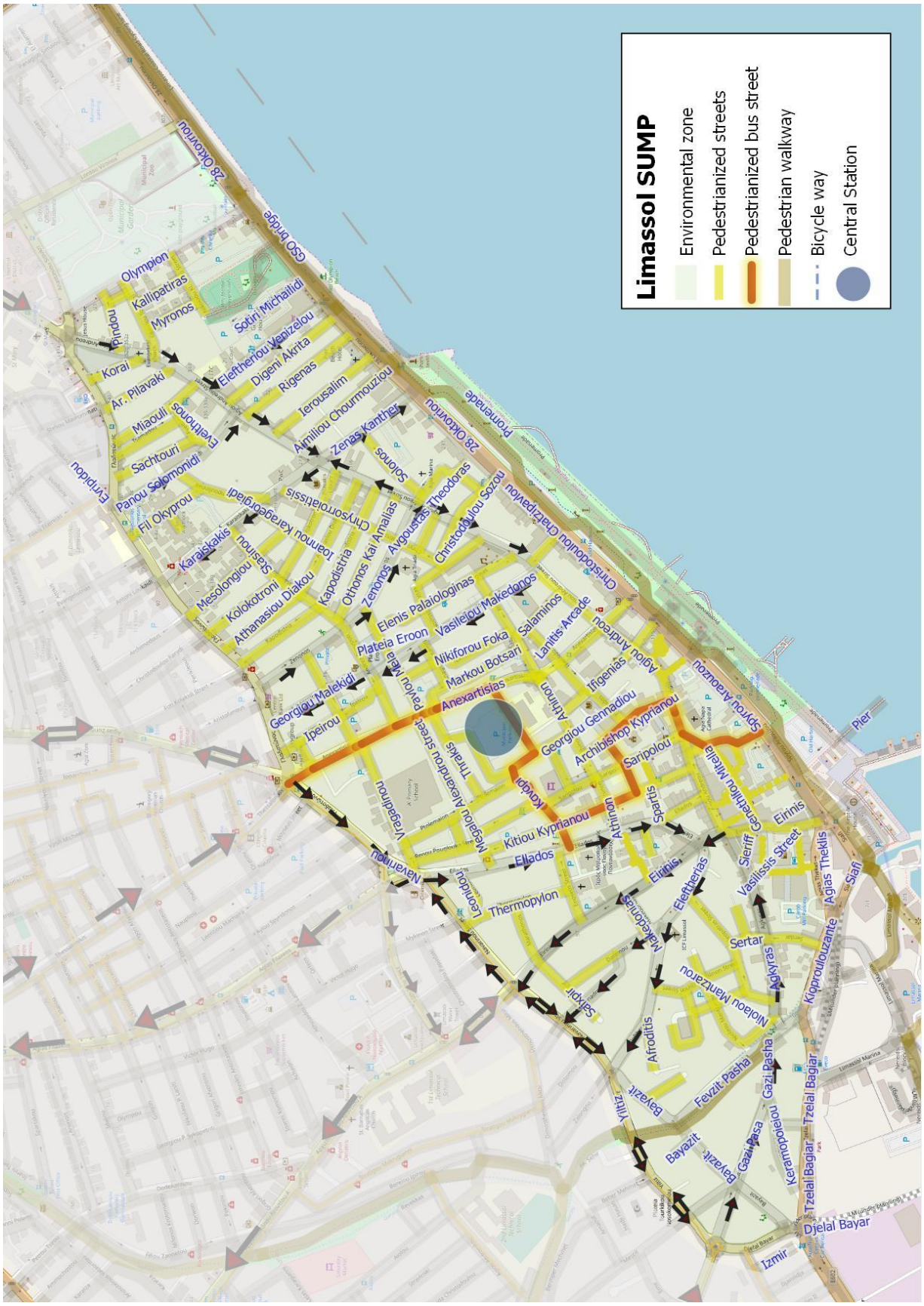


Figure 4: Implementation area of traffic management measures (Area A zoom)-pedestrianisations and one-way system

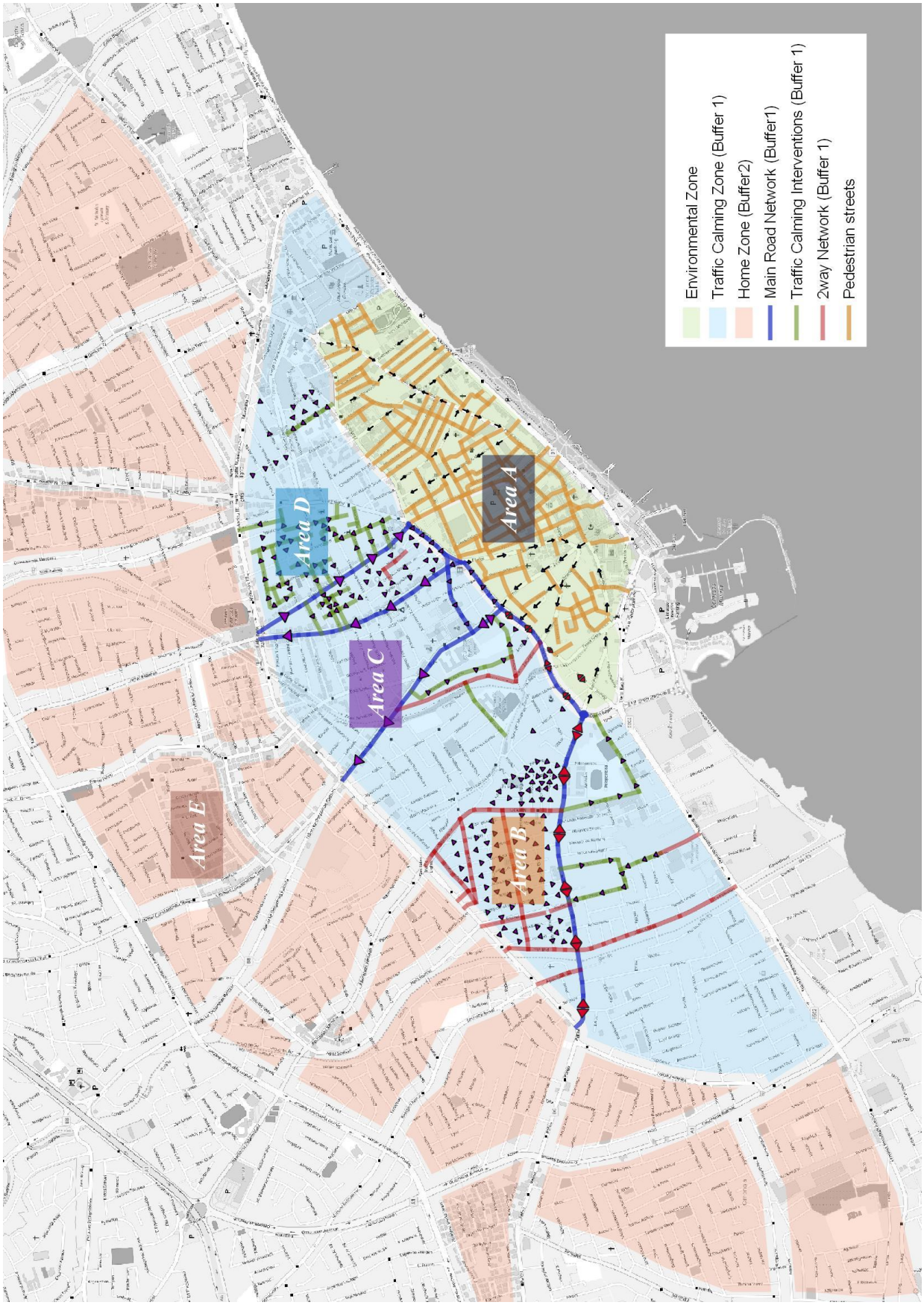


Figure 5: Implementation area of traffic management measures

Moreover, a wide range of parking restrictions should be applied to deter the proportion of journeys made by private vehicles to the core CBD area (environmental zone; see also Figure 4 and 5). These will include increasing parking charges in the city centre, reducing the number of roadside and public parking spaces (and greater enforcement against illegal parking), restricting the building of new car

parks and restricting the parking space allowed for new or even existing businesses. However, a high proportion of parking spaces being private and non-residential often limit the effectiveness of parking management. The specific parking policy measures provided in the Limassol SUMP are presented in detail in the corresponding chapter of this very report (Chapter 9).

A negative aspect of restricting parking spaces or raising charges in the city centre concerns the increase of traffic in nearby streets as motorists seek parking spaces or less expensive ones. To be more effective, parking measures need to be combined with other measures, which encourage a shift from private cars to public transport, cycling and walking (see Chapter 9).

For a public transport service to attract car users, it must be convenient, accessible, comfortable, safe and efficient (e.g. reliable and with minimal waiting time). Improved facilities at public transport stops can help avoid congestion and delay during boarding stops. Cheap, even subsidized, fares help. Bus lanes are the most common means of enabling buses to operate reliably and at higher speeds than they would in congested traffic, and so cut journey times. Moreover, Park and Ride schemes offer secure and free (or inexpensive) parking at a site on the outskirts of the city from which frequent and fast public transport services operate to the city centre. In detail, the public transport system scheme and provisions of Limassol SUMP, are presented in the relevant chapter of this report.

5.3.2 Traffic calming schemes (calming areas) and area-wide speed limits (pure home zones)

Residential areas which are located in the wider area of the city centre (in the Calming Area Zone and Home Zone as they depicted in the above maps) and used by commuters as short cuts require traffic calming measures.

Further, traffic restraint measures taken in the city centre may lead to increased traffic seeking parking spaces in adjacent residential areas leading to worsening conditions in these areas unless deterrent measures are undertaken.

Traffic calming measures in residential areas include mini roundabouts, raised crosswalks, road narrowing (Chicanes), woonerfs (shared space) and speed humps in order to reduce traffic speeds to a lowered speed limit of 30 kph, as well as systems of one-way streets to avoid traffic through neighbourhoods. More details can be found in **Annex II, Figure A-II 3 to Figure A-II 7**.

The Limassol SUMP provides for the implementation of the above measures in specific areas of the wider central area of the city (Areas B, C and D on the Calming Area Zone, see maps above) and in the surrounding residential area located outside this (Home Zone, Area E).

Measures on Area B of the Calming Area Zone

Particularly, in Area B a system of one-way streets is provided to eliminate through-traffic (speed and volume) making neighbourhoods less noisy and dangerous. These interventions will be combined with the reconstruction of Misiaouli & Kavazoglou Street, which is ongoing. The reallocation of the available public space of this commercial street in favour of vulnerable road users (pedestrians and cyclists) is likely to cause diversion of traffic in adjacent neighbourhoods. A limited two-way street length (red line on the map above – Figure 5 of this document) surrounds the one-way system (Pallados, Souliou, Peiraios, Markoni, Asklipiou, Agion Panton streets). In the intersections of the two-way network, the measures of mini-roundabouts and raised crosswalks will be implemented.

The introduction of the new one-way system needs careful implementation as such schemes can have a severe impact on a wide area. Nearby, two-way roads can be adversely affected by diverted traffic and roads that are turned into one-way streets can experience increased vehicle speeds, particularly narrow streets where two-way traffic previously acted as a natural form of traffic calming. Signs and road markings should be kept to the minimum sufficient to inform road users. Moreover, chicanes and speed humps will be introduced in the one-way system (indicatively on the roads Plympiou Dios, Mouson, Nikolaou Skoufa, Episkopou Meletiou, etc.).

South of Misiaouli & Kavazoglou Street, is provided the implementation of the woonerf/ shared space measure (green line on the map above) to protect certain school premises (Anti Filita, Erithrou Stavrou, Morphou, Likourgou, Versalion streets).

Measures on Area C of the Calming Area Zone

The same measure is to be implemented in Area C of the map surrounding the 2nd Limassol Technical School (Dimosthenous Mitsi, Stratigou Makrigianni streets). The images below (Figure 6 and 7) represent a view of implementation of the measure in the specific space. Additional interventions are not proposed in this area because a rather extensive one-way system already exists.

Figure 6: Woonerfs (shared space) surrounding the 2nd Limassol Technical School (1)

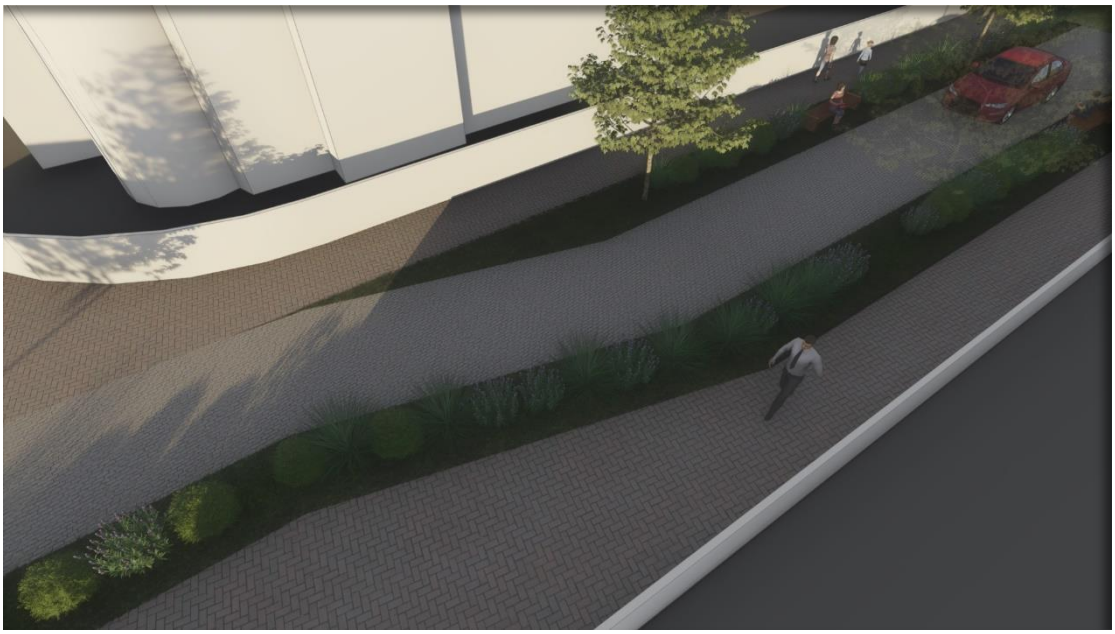


Figure 7: Woonerfs (shared space) surrounding the 2nd Limassol Technical School (2)

Measures on Area D of the Calming Area Zone

Area D is characterized by a more extensive implementation of the "woonerf/ shared space" measure (Iparchou, Vasili Michaelidi, Irakleiou, Golgon, Ioanni Kondylaki streets, etc.), as it is crossed by important commercial road axes which are converted into one-way streets, an intervention that will possibly spread the traffic to the secondary road network.

The aim of single surface schemes (shared space) is to create a better balance of priorities between drivers and pedestrians, to achieve slowing traffic down, changing priorities and ensuring accessibility for all. An inviting and accessible space based on the single surface concept could be created with delineation between areas designated for pedestrians only and areas where vehicles are permitted. Additionally, to eliminate the need for traditional signs and lines to control movement, the vehicle

route could be defined through the paved area by carefully placed street furniture, new trees and new street lighting.

Measures on the Home Zone (Area E)

Finally, in the residential Area E – Home Zone (of the map above), the measure of 30 kph zones, is provided. The cost and the time needed to create such zones is a comparative advantage over the choice of using traditional traffic calming zones.

In particular, a general 30 kph speed limit is to be introduced for the whole city street network of the area, except for priority streets where a 50 kph limit will be applied. Traffic calming schemes could only be introduced where there is a record of speed related car collisions resulting in injuries.

Regarding the special needs of children, a specific measure for the needs of primary-school pupils concerns the implementation of safe buffers around primary schools. Within a range of the school entrance, the ways to the school have to be made safe and adequate to the needs of children of ages 5 to 12 years old. Where feasible, the most efficient way to achieve this is through pedestrianisation around primary schools with a radius of 50 or 100 meters. In cases it might not be possible to pedestrianise street segments, alternatives are “No Parking areas” (more details in chapter 13.3.3 below).

5.3.3 The Coastal Avenue Scheme

The main principle of this project is a paradigm change towards sustainable mobility, a change of behaviour, a change of attitudes towards different modes of transport. This will become very obvious in the accessibility of the city centre.

One of the most beautiful assets of the city of Limassol is the seafront. Indeed, this is the major reason for visitors to come to Limassol. Today the seaside boulevard is a major road corridor, a 2x2 lane road for motorised traffic with vehicles often driving at speeds higher than the legal speed limit. This “urban motorway” physically separates the old town, the city centre from its major asset, from the seafront.

The first proposal therefore is to change the character of this boulevard completely, to slow down traffic, to reduce the traffic volumes, to reduce the negative impacts, to reduce the barrier effect between old town and seafront and to increase the space for non-motorised uses of the boulevard, walking, cycling. Traffic will be diverted to the ring roads and car drivers will be encouraged to use other modes for accessing or passing through the city centre.

The seafront boulevard will become the highlight, the show piece of the Sustainable Urban Mobility within Limassol and it will show to residents and visitors that Limassol is focussing on a new mobility behaviour. This will have a marketing effect, an effect on attitudes and behaviour.

The proposed boulevard is designed to have two adjacent bus lanes on the northern (city) side of the corridor; the remaining motorized traffic will be consolidated on two adjacent traffic lanes on the southern (coastal) side. This two-by-two solution

- guarantees unhindered bus services without obstructing cars while turning across the bus lanes or even stopping
- provides shorter and more convenient access for passengers to the attractions in the city environment
- allows easier and safer crossing of seaside boulevard since buses and remaining traffic are consolidated next to each other
- a central island strip between bus and traffic lanes provides space for bus stops, allows to rest for pedestrians while crossing the boulevard and can be partially planted between stops and crossings.

The following “before and after” pictures show how the seafront boulevard is proposed to be transformed in a more pleasant and less separating space with 2 bus lanes, only 2 lanes for remaining motorised traffic and more space for pedestrians and cyclists (see Figure 8, 9 and 10).

Figure 8: Street conversion: Coastal Boulevard between Old Port and Crown Hotel

The aim of the redesign of the coastal boulevard is to reduce its separation effect between the urban area and the seafront, regaining space for people instead of moving or parking vehicles and increasing the attractiveness of the major asset of Limassol for people to walk, linger, cycle, meet. The main ideas to achieve this, are:

1. The central island is not meant to be a footway but a limitation to motorised vehicles that also provides space for pedestrians to pause while crossing the boulevard anywhere
2. There are dedicated bus stops to board/ alight buses. Between bus stops, the central island can be used for crossing; still, the central island is suggested to be partially also designed as planted island (as is now).
3. The two bus lanes are located next to each other to the north side of the boulevard. The main destinations of daily traffic are inside the urban centre. The proposed location of the bus lanes allows passengers of the buses to easily reach the bus stops and the origins/ destinations in the city centre, minimising the conflicts with motorised traffic and the number of lanes to cross.

Figure 9: Street conversion: Coastal Boulevard East of Crown Hotel

Figure 10: Street conversion: Coastal Boulevard Near Amathus Hotel

5.3.4 Improving road network capacity through ITS

The Public Works Department has invested during the last decades in a widely acknowledged Vehicle Actuated Traffic Signalization System called SCOOT (Split Cycle Offset Optimisation Technique). This legacy system, has a dedicated Control Room for traffic signal management and operations and is installed in 90 intersections in three cities, providing advanced functionalities for traffic-actuated traffic signals operation, and signal progression at arterial level. The system for all traffic signalized intersections is centrally monitored and managed by the PWD Control Room. However, the system is currently not in operation in the city of Limassol since the existing traffic controllers are old, while there is also need for some further maintenance and upgrading of telecommunication connections as well as an expansion of inductive loops on the pavement in order to allow real-time traffic detection and communication to the signal controllers.

MTCW is currently preparing a procurement project for a substantial renewal of traffic controllers in the city of Limassol, which can be considered as a major prerequisite for the actual and smooth

operation of the vehicle actuated traffic signalization system. Through this intervention the following actions will be offered:

- Optimizing traffic flows/ minimizing delays at junction/ arterial/ network level
- Collecting traffic data through detective loops in real time – create traffic profiles per road segment/type – get prepared for scenario-based strategies
- Accommodate traffic variations within a typical day (inbound/outbound traffic)
- Get early warnings for network disruptions
- Future possibilities for implementing complex operations (event management/ evacuation plans)
- Enable deployment of other important ITS such as the bus priority, red light enforcement

For detailed description of relevant information please consult Deliverable D10.1, chapter 14.3.4.

5.3.5 Interventions proposed for the five municipal authorities of the Greater Area of Limassol

The concept of extensive pedestrianisation proposed for the municipality of Limassol, has also to be applied to all other five municipalities, in order to be consistent with the concept of polycentric development for the target year 2030. The idea behind this is that residential growth will be focused in the various centres, however, these centres will also serve future work place development as well as developments of shopping and leisure facilities, resulting in short distances and reduced need to travel. This concept does not reduce the importance of the central municipality as the driving force for the future economic and social development of the metropolitan area.

The Consultant's proposals in this direction were firstly presented in the framework of Deliverable D7.1 and in more detail in this report - in the corresponding chapter (Ch.7) for the pedestrian measures. It is worth noting that the area of intervention (CBD) proposed is based on relevant provisions of the LLP for the respective Municipalities but expanded as necessary for taking into consideration major attractions that should be served in each area, namely churches, school premises, Town Hall premises etc.

As a final step for preparing the traffic management measures for the five municipalities, the Consultant through its local office prepared and conducted face-to-face meetings with the Mayors and their technical teams in order to discuss their current or future plans for:

- Regeneration of historic centres
- Bicycle and pedestrian networks
- Public Transport level of services provided
- Public parking lots (seeking ways to duplicate Park&Ride concepts scaled to fit the small municipal road networks)
- Potential relocation of initially proposed Park and Ride Stations along A1

In general terms, these discussions have shown that the concept of Sustainable Mobility needs more time to be cultivated and promoted in municipalities.

All the interventions proposed by the Consultants are reflected on a series of maps[1] (Figures 11-15), which are accompanied by a brief description of the rationale that led to the specific proposals.

[1] Special uses (on maps) are defined in the majority of cases as parking spaces, except in one case (Municipality of Germasogeia), where a Kindergarten is also designated as a special use.

5.3.5.1 Municipality of Ypsonas

Aside from the proposals for pedestrian and traffic calming streets, the four parking locations suggested by the Municipality are found reasonable with the exception of the one located at Ypsonas Square, which apparently falls within a fully pedestrianised area and should either be transferred to another location or be granted access through the designation of mixed-use roads for Georgiou Griva Digeni street and Panagias Chrysopolitissis street.

Figure 11: Traffic Management measures for Ypsonas

5.3.5.2 Municipality of Mesa Geitonia

According the Municipality representatives, the regeneration of the historic centre has been completed mainly based on conventional traffic engineering tools such as the one-way street network. For the same area, the Consultant's view is that placing the pedestrian at the forefront of design priorities is necessary especially in smaller communities where distances are shorter and traffic conditions are less problematic. The only public parking lot anticipated between Ag. Fanouriou street and K. Matsi street can have full access from I. Prodromou street which has not been proposed for pedestrianisation.

Figure 12: Traffic Management Measures for Mesa Geitonia

5.3.5.3 Municipality of Agios Athanasios

The proposed pedestrianisation scheme can serve the new sustainability principles proposed by the SUMP. With regards, to the public parking lots:

- Town Hall parking – (approx. 100 spots) / Parking at Katsaras / Parking at Varnali have full car access
- Parking at Minoos street is situated within the pedestrianised area but car access might be offered through mixed used road segments, if this is delineated as crucial by a dedicated traffic and parking study conducted in the near future.

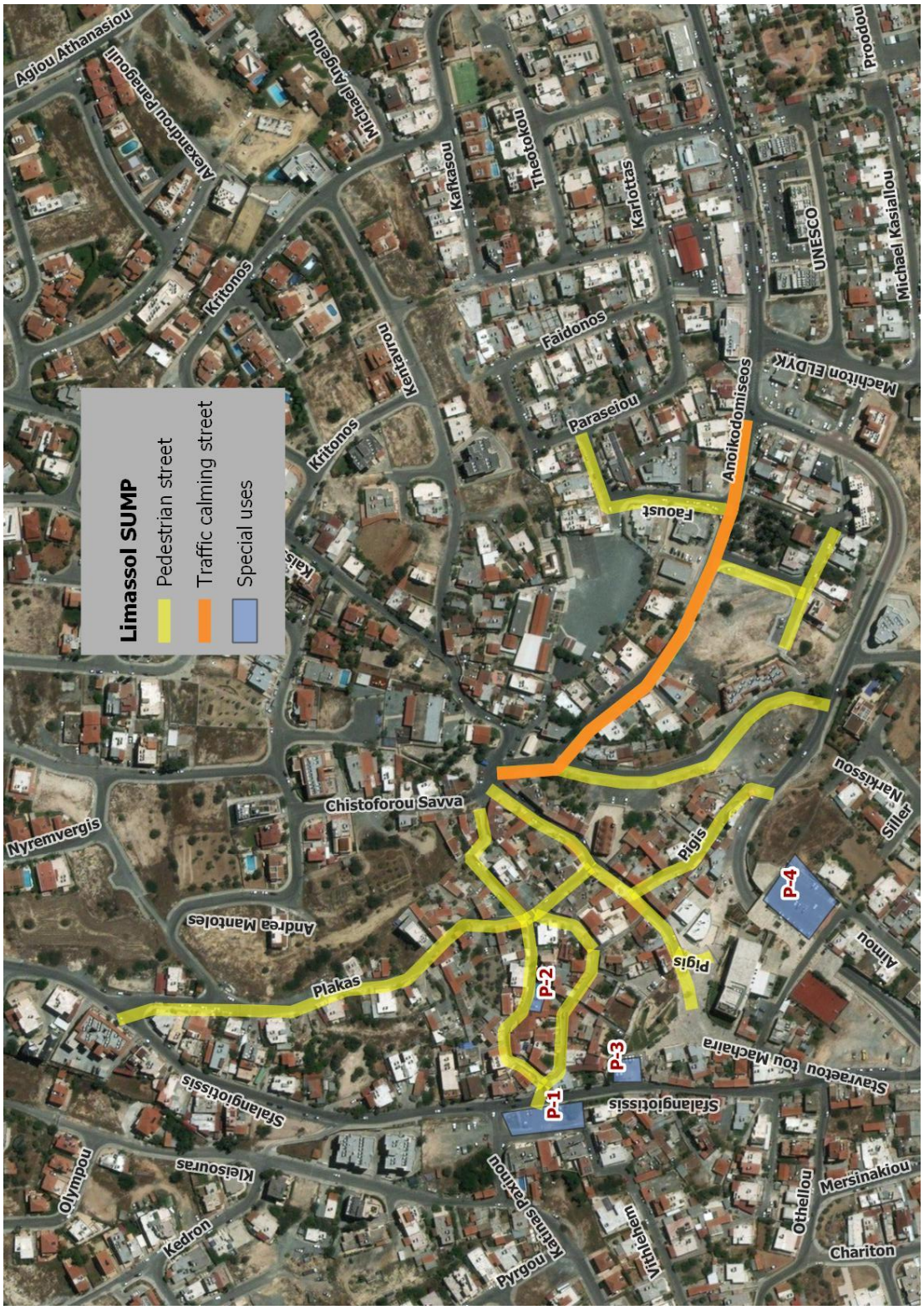


Figure 13: Traffic Management measures for Agios Athanasios

5.3.5.4 Municipality of Germasogeia

Car access to the parking lot adjacent to the new Town Hall (part of Ag. Paraskevis street from Dardanelion street to Sardeon street). The parking that serves the school premises is not recommended, while the free parking along Patron street (approx. 100 parking spots) may be served from its west side through a mixed-use pedestrian road beginning from Agias Christinis street up to the entrance point of the parking lot.

Figure 14: Traffic Management measures for Germasogeia

5.3.5.5 Municipality of Kato Polemidia

The proposed pedestrianisation scheme has taken into consideration:

- An extensive one-way street plan recently implemented by the Municipality that has to be modified in order to be consistent with the sustainability principles proposed by the SUMP. The public Parking lot on Agias Anastasias street next to Panagias Evagelistrias church, which is situated within a pedestrianised area, however, due to its special serving purpose exceptional access for certain hours of the day could be granted.

Figure 15: Traffic Management Measures for Kato Polemidia

5.3.6 Road development projects included in the Reference Scenario for 2030

In the first steps of the transport model development, the Reference Scenario was created, representing the future of the city by year 2030, without any special interventions from the SUMP process. This basic scenario includes all those road developments and projects, that were currently already under construction, were planned and/or had an approved financing in all cases expected to be completed by the target year. This extended set of projects roughly estimated in a 124 million Euro in budget are to be included in the final implementation plan of the SUMP, although these projects are neither proposed by the SUMP, nor their implementation is deemed necessary in order to deploy the programme. Thus, taking into account the given basic characteristics of these projects (deemed as of higher priority being in proximity to the areas of SUMP interventions) provided by the PWD, they are suggested for each case, a cross section with the perspective of sustainable mobility. In any case, the projects uncompleted yet need to be designed based on the principles of sustainable mobility favouring walking, cycling and public transport.

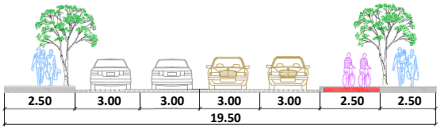
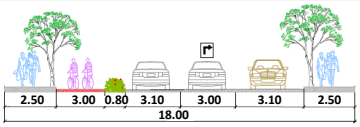
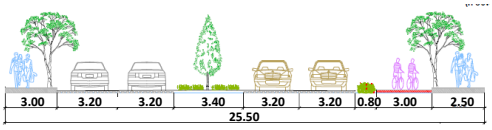
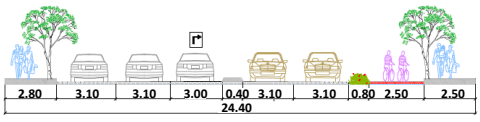
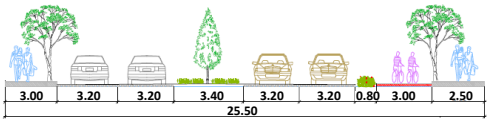
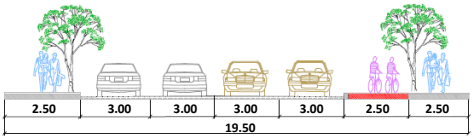
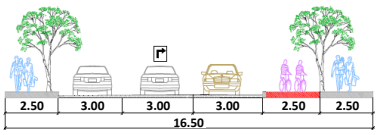
Proj. No.	Title of project	Road level hierarchy	Effective width (sidewalks + road)	Bicycle network prosposed by SUMP	Bus lines along the section	Indicative cross-section based on functional classification provided by PWD
2	Improvement of Agh. Filaxeos Avenue in Limassol (3 sub-sections):					
	- Agh. Filaxeos roundabout - Sp. Kyprianou (former Makedonias Avenue)	- Secondary arterial (with median)	~ 20.0 m.	N	Y	
	- Sp. Kyprianou (former Makedonias Avenue) - Arch. Makariou Avenue	- Main collector	~ 18.0 m.	Y	Y	
	- Makariou III Avenue - End of Phase A in Thessalonikis street	- Main collector	15.0 - 18.0 m.	Y	Y	
6	Vertical road to Limassol port - Parallel road to Limassol port (currently under construction)	Secondary arterial	30.5 m.	Y	Y	
16	Pafou Street	Primary arterial (no median)	21.0 - 23.0 m.	Y	Y	
49	Upgrading of Agh. Athanasiou - Jumbo Street	Secondary arterial (with median) / Local collector	~ 25 m.	Y	Y	
48	Kolonakiou str - updrade	Secondary arterial	~ 21.0 m.	Y	Y	
50	Upgrading of Griva Digeni Street	Main collector	15.0 - 20.0 m.	Y	Y	

Table 10: Indicative cross-sections for road development projects (Reference scenario 2030)

5.3.7 The major development projects as assessed under Scenario 1

As mentioned above (see Chapter 5.2), a number of development projects were included and evaluated under Scenario 1, which was the only scenario that exclusively focused on improving traffic conditions for private vehicles (e.g. via ITS) and includes only road development projects.

Specific projects of these were the subject of particular reflection and extensive discussion between stakeholders and residents thus it is appropriate to briefly refer to the evaluation outputs through the traffic model.

It should be noted that the model results used for scenario evaluation reflect the impact of the mix of interventions, measures and policies, therefore the results cannot be attributed to each single intervention to allow direct comparisons in terms of traffic impact. For a more detailed evaluation of impacts, a microscopic traffic analysis is needed and has to be performed through a different software application accommodating design layout and details of the traffic network (PTV VISSIM).

5.3.7.1 Agias Filaxeos A1 crossing (underpass)

Figure 16: Average Weekday: volume capacity ratios

Although traffic conditions will improve at the junction itself, on the northern road axis, the v/c (volume/capacity) ratio will exceed 125%, while on the south axis it will range between 75-100%, indicating not an improvement in the overall or local traffic conditions.

5.3.7.2 Nikou & Despoinas Pattichi A1 crossing (underpass) – Kato Polemidia

Figure 17: Average Weekday: volume capacity ratios

Similarly, to the previous roundabout, although the traffic conditions will improve at the junction itself, on the southern road axis, the v/c ratio will exceed 125% while on the northern axis it will reach up to 75%, suggesting not an improvement in the overall or local traffic conditions.

5.3.7.3 Andrea Papandreou street (2W/2L per direction) according to the provisions of Limassol Local Plan (LLP)

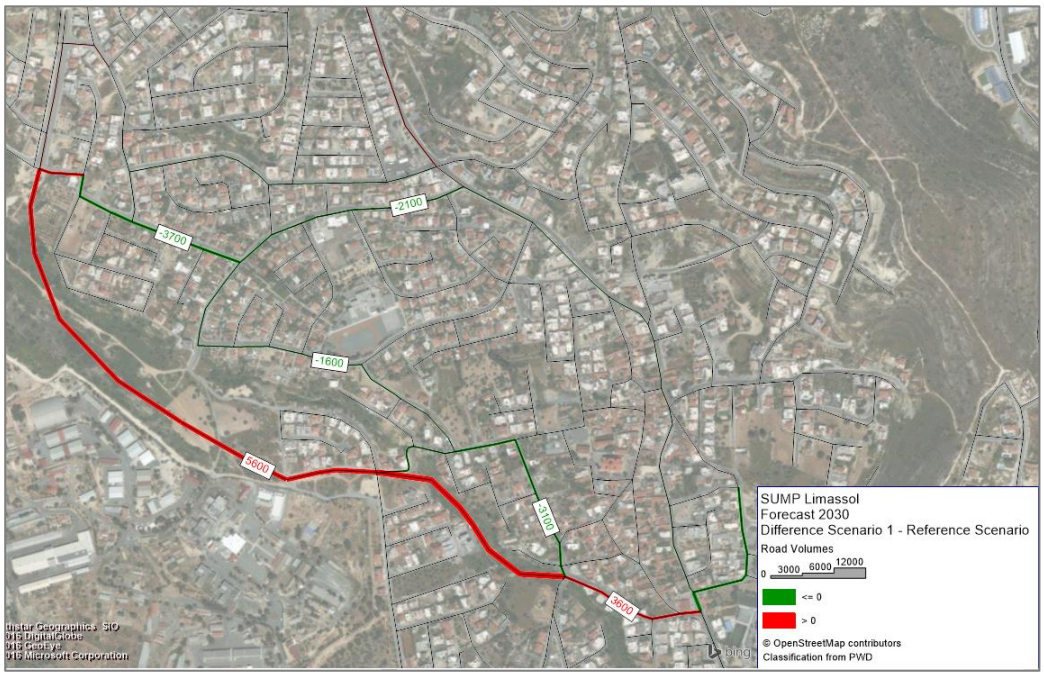


Figure 18: Average Weekday, Difference Road Volumes

The proposed road seems to attract an average daily traffic volume of around 5500 vehicles in both directions and instead significantly reduced the corresponding volume on residential roads from 1600 to 3700 vehicles, showing a positive impact.

5.3.7.4 Germasogeia Bypass Intersection (Northern Bypass) – Synergatismou Boulevard

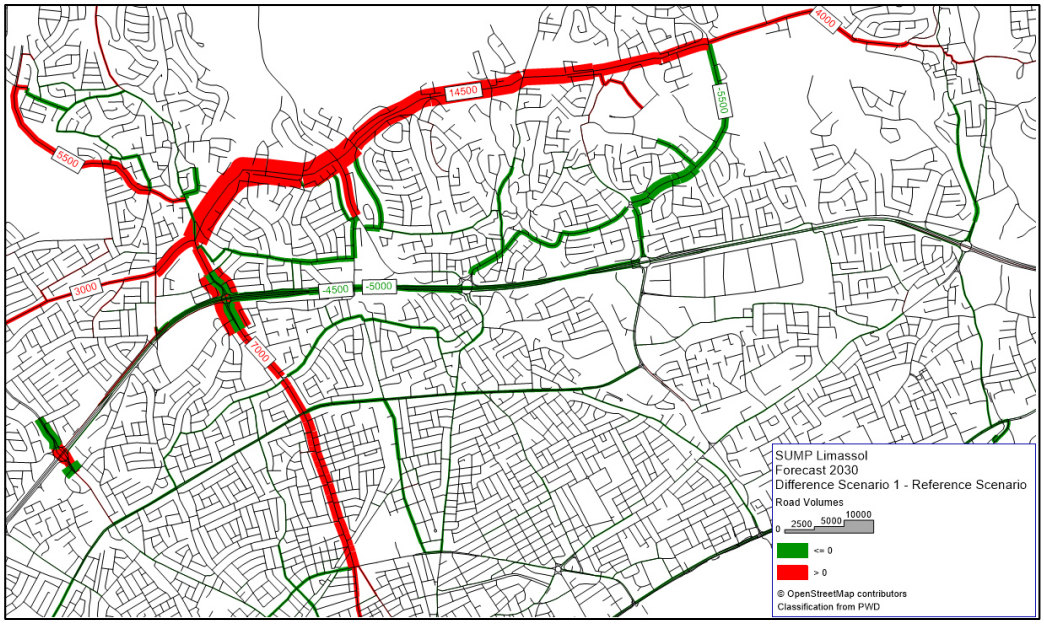


Figure 19: Average Weekday, Difference Road Volumes

The proposed road seems to attract an average daily traffic volume of 14,500 vehicles in both directions and instead reduces the corresponding volume on the A1 motorway and residential roads leading to it, from 4,500 to 5,500 vehicles, indicating a positive impact. This impact may not only be

due to the northern bypass, but also to other nearby projects included in the relevant scenario. The v/c ratio in the northern bypass is expected to be as high as 75%, while the corresponding ratio at Agia Filaxeos Street near to northern bypass will reach 125%,revelaing a critical traffic condition.

5.3.7.5 Aktea Odos (2W/1L per direction)

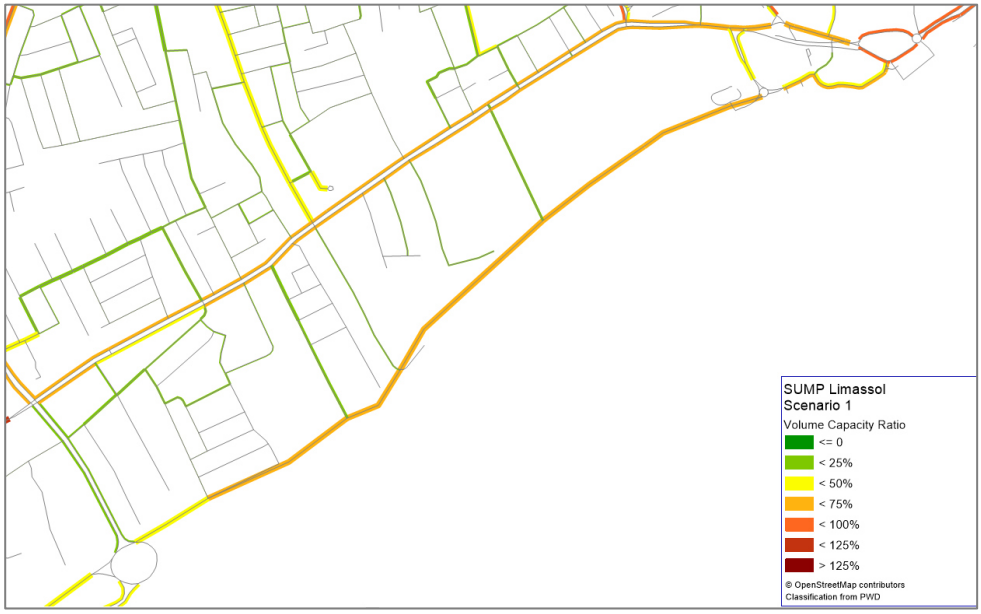


Figure 20: Average Weekday: volume capacity ratios

Aktea Road with 1 lane per direction is not necessary as a road for private traffic from a capacity point of view. In particular, with Aktea road open for motorised traffic, the parallel avenue i.e. Franklin Roosevelt Ave., will operate with a LoS slightly above 60% at some of its sections and even for the preferred scenario (i.e. without permitted private traffic in Aktea), v/c ratio will not exceed 75% along almost all its length. As a result, Aktea can adequately accommodate the current and future demand for motorised private traffic. Further to the above, a pedestrian/ cyclists' street with bus lane would be sufficient for Aktea Road (see figure below) as a measure adopted in the preferred scenario.

Opening a new road for traffic will not attract a lot of long-distance traffic, still, it will provide more capacity and in the long run induce more car traffic that will then add to the existing volumes on the waterfront boulevard and other central corridors. In view of reducing car traffic in the centre, reducing congestion and providing more space for non-motorised uses, this is to be avoided and as said above, the additional capacity is not needed and not justified by current and future demand.

Figure 21: Aktea Odos near KEO winery

6 Public Transport

6.1 Introduction

Amongst some others, the following key objectives of the SUMP Limassol were defined by the stakeholders

- The city needs a transport system, which will satisfy the increased travel demand
- Residents and visitors should adopt new behavioural models
- The city should adopt policies restricting the use of private vehicle
- The city should adopt solutions regarding the travel demand for work purposes (daily peaks)
- The city should adopt a mobility system accessible for specific target groups i.e. the elderly people and people with disabilities
- The city should focus on the infrastructure of sustainable transport modes

All of the above-mentioned objectives are comprehensively addressed by strengthening and improving the public transport system, aiming at significantly increasing the mode share of public transport (and the other environmentally friendly modes) thereby reducing private motorised transport.

6.1.1 Current Status

The general accessibility of public transport infrastructure (stops) is very good in central areas and still sufficient in remote areas. This is also confirmed by the household survey, where the majority of respondents' state to have a bus stop near their homes (average 2 minutes, maximum 6 minutes). Nevertheless, currently only few (6) lines operate according to a timetable at all, offering a frequency of two bus services per hour or more at least in the afternoon peak hours. All other bus lines do not have regular headways. Beyond the central area, public transport supply is irregular, incomprehensible and in consequence not attractive for potential users compared to the private car.

For potential public transport users, non-harmonised and infrequent services are unattractive, since people do hardly remember irregular timetables with different departure and arrival times for each service. Moreover, regular headways offer the chance to co-ordinate timetables resulting in reliable transfer options and short transfer times at designated transfer point.

Transfer options are rare and arbitrary within the bus network and are more or less restricted to

- transfers between the ring line 20 and the crossing radial lines
- the Circle line and radial lines at Leontiou station

6.1.2 Objectives of Public Transport Measures

The main objectives of the development of the proposed public transport system is to establish a reliable, convenient and fast alternative to private motorized transport. This means to enhance the connectivity between local potentials within the centres as well as between the centres. The proposed system helps, to improve the accessibility of potentials with high reliability and punctuality. At low costs and with high safety standards, passengers will be able to conveniently reach their destinations either with direct services or making use of optimized transfer options. This primarily helps to

- avoid unnecessary travel by motor vehicles, reducing noise and pollution, reducing environmental and social costs
- shift the trend of individual motorisation to safer, efficient and environmentally friendly transport modes, improving interconnectivity between public transport and walking/ cycling
- improve infrastructure and management of transport services by adopting cleaner, efficient and safer technologies and practices.

Cyprus made a commitment to the EU to reduce CO_2 emissions by 24% until 2030 (compared to 2005). In order to reach this target, mode shares of 20% for public transport are envisaged. Taking into account the very low current shares of approximately 1.8%, a reasonable assumption is to reach 5% to 7% by 2025. However, in the light of the 10% PT share calculated for 2030 in this study, further efforts have to be made to reach the 20% target by 2040 latest.

6.2 Key Strategies

Public transport as mass transit is the most energy efficient form of travel and consequently helps to reduce emissions. Public transport uses rare urban space more efficient than private motorized traffic in both, space to travel and even more so: space for parking. Also, public transport plays an important social role, ensuring that all members of society are able to travel, not only those with driving license and car availability.

The general aim of public transport development in Limassol and the five municipalities, is to enhance the connectivity between local potentials within the centres as well as between the centres. The proposed system helps, to improve the accessibility of potentials with high reliability and punctuality. At low costs and with high safety standards, passengers will be able to conveniently reach their destinations either with direct services or making use of optimized transfer options.

The key strategies to effectively increase the mode share of public transport are:

- Implementation of hierarchical network system with primary, secondary and feeder lines
- Optimization of line routes and simplification and consolidation of bus lines
- Comprehensive upgrade of operation hours and frequencies
- Integration of school bus lines in regular services where feasible
- Establishment of central bus terminal at Themistokleous street
- Hierarchical system of bus stops
  - Interchange bus stops
  - Multimodal transport hubs
  - Standard bus stops
- Park & Ride facilities
- Bus prioritisation measures (exclusive bus lanes)
- Appropriate vehicles
- Pre-Trip passenger information
- ITS and ticketing technology

6.3 Detailed presentation of measures/ interventions provided in the preferred scenario

6.3.1 Network Hierarchy

For the future public transport network and supply, a system of network hierarchy is proposed. This system is defined with three levels:

- **Level 1: Primary Bus Lines**
  Primary Bus Lines servicing main urban development axes of high demand by connecting Limassol's central business district with the sub-centres. Within the serviced corridors, they function as trunk lines for the complementary feeder network.
  Passenger demand on these lines is characterized as being "high" to "very high" compared to the other bus lines.
  The lines should have a direct routing, avoiding major detours to achieve short travel times. Their typical mode of operation is a conventional line service with defined bus stops and fixed timetables. On overlapping section with Secondary Bus Lines or Feeder Lines, the service can be upgraded to an express bus service stopping on selected bus stops only, whereas all intermediate bus stops are serviced by the complementing bus line. In order to provide sufficient capacity to cater for the passenger demand, standard buses (90 – 110 PAX per vehicle) are adequate on this level. Articulated buses (150 – 180 PAX per vehicle) could be appropriate for peak hour services along the coastal boulevard.
- **Level 2: Secondary Bus Lines**
  Secondary Bus Lines complement the main bus network together with the Primary Lines. They interconnect Limassol's sub-centres to each other and service main ring roads. The lines also provide basic public transport services for high density areas located away from Primary Bus Lines.

While being connected to the Primary Bus Lines, they also function as a high-level feeder service for the Level 1 network.
Passenger demand on Secondary Bus Lines is classified as "medium" to "high". As these lines servicing corridors complementary to the Level 1 lines, minor detours in the routing could be appropriate. Their typical mode of operation is a conventional line service with defined bus stops and fixed timetables. The typical vehicle is the standard bus (90 – 110 PAX per vehicle).

- **Level 3: Feeder Lines**
  Feeder Lines complement Limassol's future bus network. They provide basic public transport service for all areas off the Primary/ Secondary Line Network, especially low-density areas in the suburbs. In line with the low density in their service areas, passenger demand on Feeder Lines is rather low. The operational mode can be either a conventional bus service with stops at each bus stops along their route, or, if appropriate, an on-demand service (demand responsive = DR), i.e. the bus stops only at bus stops requested by the passengers. The typical vehicle seize depends on the passenger volumes and range from minibuses (PAX) to standard bus (14 – 20 PAX per vehicle).

The following table presents an overview summing up the typical characteristics of the three levels of the network hierarchy.

PT Network Level	**1 Primary Bus Lines**	**2 Secondary Bus Lines**	**3 Feeder Lines / On Demand Services**
Function	Trunk line Connecting CBD – sub-centres Servicing main urban development axes	Feeder service Interconnecting sub-centres Servicing main ring roads Basic PT service for high density areas	Feeder service Basic PT service for Low density areas (suburbs) All bus stops without Primary/ Secondary Bus Line services
Passenger Demand	High to very high	Medium to high	Low
Line routing	Direct routing No detours	Corridor service Servicing all stops	Area service Servicing all stops with boarding/alighting passengers
Mode of Operation	Conventional	Conventional	Conventional or On Demand (if appropriate)
Vehicles	Standard bus Articulated bus (if suitable)	Standard bus	Standard bus Minibus

Table 11: Network hierarchy in PT, definition of level profiles

Since they operate as a feeder service, Level 3 bus lines have a short line length compared to Primary and Secondary Bus Lines, and passenger volumes are much lower, especially during off-peak hours. In case the passenger volumes fall below a specific threshold per trip (i.e. vehicle) and passenger demand is fluctuating day by day or there a service trips without passengers aboard, demand responsive transport systems (DRT) might be appropriate to ensure flexibility in operation. In DRT systems, passengers must order a bus service in advance and the bus stops only on request (→ *call-a-bus)*. These on-demand services help to decrease public transport operation costs since they help to avoid services running without passengers. The decision whether a Level 3 bus line is appropriate for a DRT system or not depends (among other aspects) on the total passenger volumes of the line and its distribution during the operation hours. In addition, the total passenger volumes should not exceed 120 PAX per day and/or 8 PAX per vehicle as common thresholds. Usually, this decision cannot be made based on a transport model output but is rather a result of regular passenger counts/surveys following the implementation of the new services. However, DRT services as part of a subsidized public transport system (integrated PT tariffs apply) need to be distinguished from commercial "on-demand services" (e.g. uber).

For the assessment of a Bus Rapid Transit (BRT) for Limassol, please see **Annex III, Chapter 2**.

6.3.2 Bus Route Network

Since the current bus network in Limassol links all relevant origins and destinations within the city limits and beyond and broadly provides full area coverage, it proves to form a good basis for the future bus network development. The proposed improvements concern a moderate adaptation of existing bus lines to the network hierarchy, as in the following examples, e.g. line 30 (today) → line 1 (future), line 13 (today) → line 3 (future), line 18 (today) → line 7 (future) etc.

Both, the decrease in the number of bus lines and the re-routing aim at simplifying the bus network to achieve greater comprehensibility and adaptation to the urban development scenarios (e.g. new sub-centres). It includes:

- e.g. extending or shortening to sub-centres and to the new Central Bus Terminal (CBT),
- e.g. straightening of Primary Bus Lines to accelerate bus travel times.

The simplifying of the bus line network comes hand in hand with a simplification of the bus stop network, mainly to reduce stop times and to accelerate bus travel times respectively (see Ch. 6.3.6.1).

The proposed network concept introduces new bus lines on level 2 and 3 to service all the remaining bus stops which are not yet serviced by level 1 and level 2 lines:

- e.g. Secondary/Feeder Lines to cover remaining sections of re-routed bus lines,
- e.g. new Feeder Lines (level 3) that roughly match with current school bus services.

The proposed bus network comprises of the following bus lines (Table 12). The Primary, Secondary and Tertiary proposed future bus network for Limassol are illustrated in the Figures 22, 23 and 24 (see also **Annex III, Figure A-III 1 to Figure A-III 3** for details in the city centre) .

Line No.	Network Level	Direction	Routing
Circle	1	circle	Circle Line (Central Route in Limassol city centre)
1	1	tangential	My Mall – Agios Tychonas/Meridien Hotel 1
2	1	radial	Central Bus Terminal – Mouttagiaka
3	1	radial	Central Bus Terminal – Germasogia
4	1	radial	Central Bus Terminal – Agios Athanasios
5	1	radial	Central Bus Terminal – Palodia
6	1	radial	Central Bus Terminal – Kato Polemedia/General Hospital
7	1	radial	Central Bus Terminal – Ypsonas – Erimi
8	1	radial	Central Bus Terminal – Franklin Roosevelt – My Mall
70	1	tangential	Tsiflikoydkia – Neapolis
80	1	tangential	Trachoni – Enaerios
10	2	radial	Central Bus Terminal – Ariadnis
21	2	radial	Central Bus Terminal – Agios Athanasios
22	2	radial	Central Bus Terminal – Agios Athanasios
31	2	radial	Central Bus Terminal – Vasileos Konstantinou – 1st Apriliou (E)
32	2	radial	Central Bus Terminal – Kosti Palamo – 1st Apriliou (W)
40	2	radial	Central Bus Terminal – Pano Polemidia
50	2	radial	Central Bus Terminal – Vasileos Pavlou – My Mall
60	2	tangential	Pano Polemidia – Germasogia
90	2	tangential	Ypsonas – Germasogia
103	3	tangential	Ypsonas – Dionisiou Solomou
101	3	tangential	Ermogenis – Erimi
102	3	tangential	Kolossi – Griva Digeni
104	3	tangential	Ypsonas – Ilia Venezi
105	3	tangential	Ypsonas – Dionisiou Solomou
200	3	tangential	1st Apriliou – Agios Athanasios
300	3	tangential	Trachoni – Trachoni
401	3	tangential	1st Apriliou – Ilias
402	3	tangential	1st Apriliou – school_new
403	3	tangential	1st Apriliou – Pano Polemidia
404	3	tangential	1st Apriliou – Kato Polemidia
500	3	tangential	Kato Polemidia – Agios Georgios Havouzas Church
601	3	tangential	Pano Plemidia – Nikeas
700	3	tangential	Eleftherias – Moutagiaka
800	3	tangential	Makariou III Ipsonas – Ekalis
900	3	tangential	Petrompei Mavromichal – Apostolos Andreas Church

Table 12: Overview on proposed bus lines

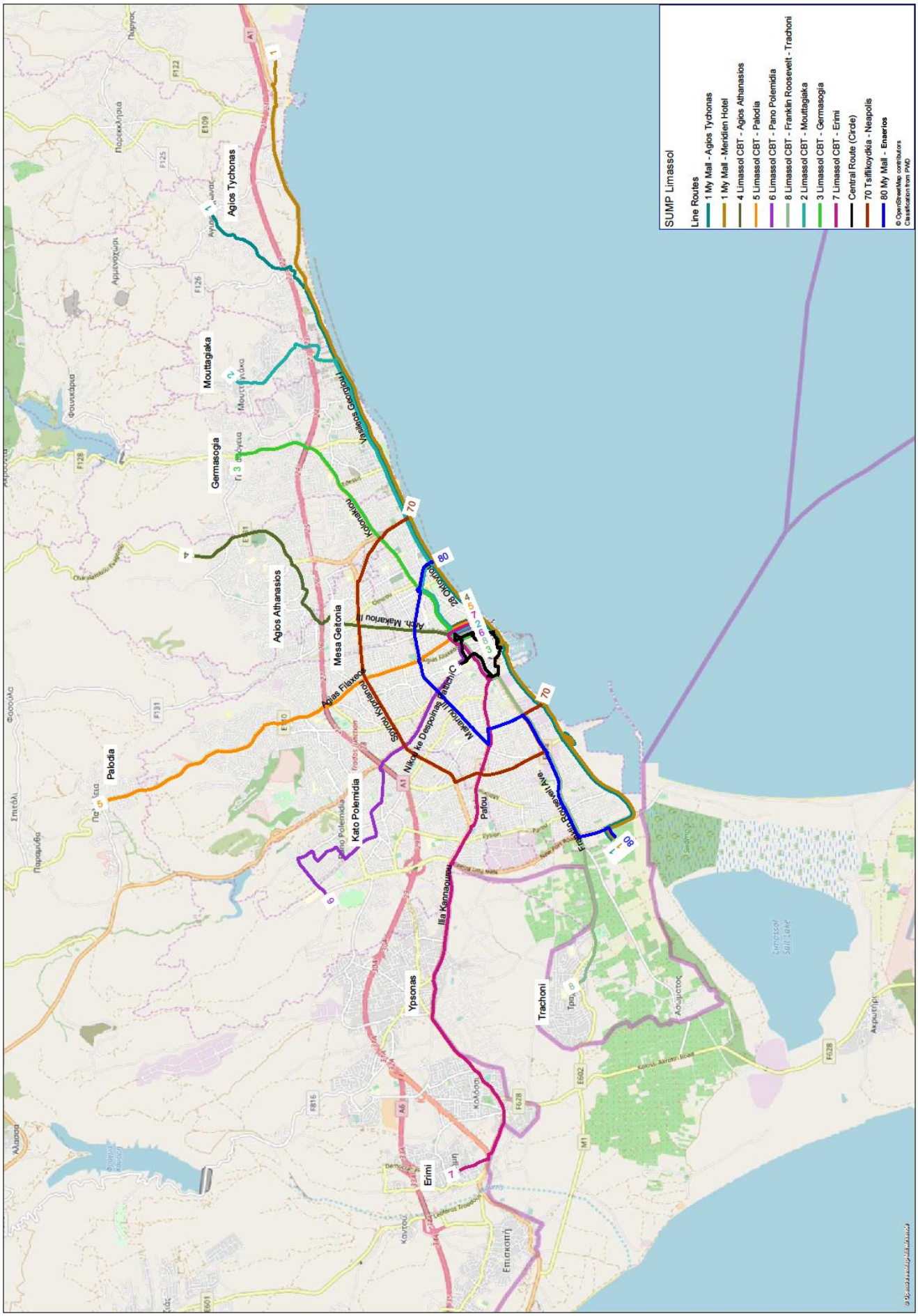


Figure 22: Strategic map: Proposed future bus network for Limassol (Primary)

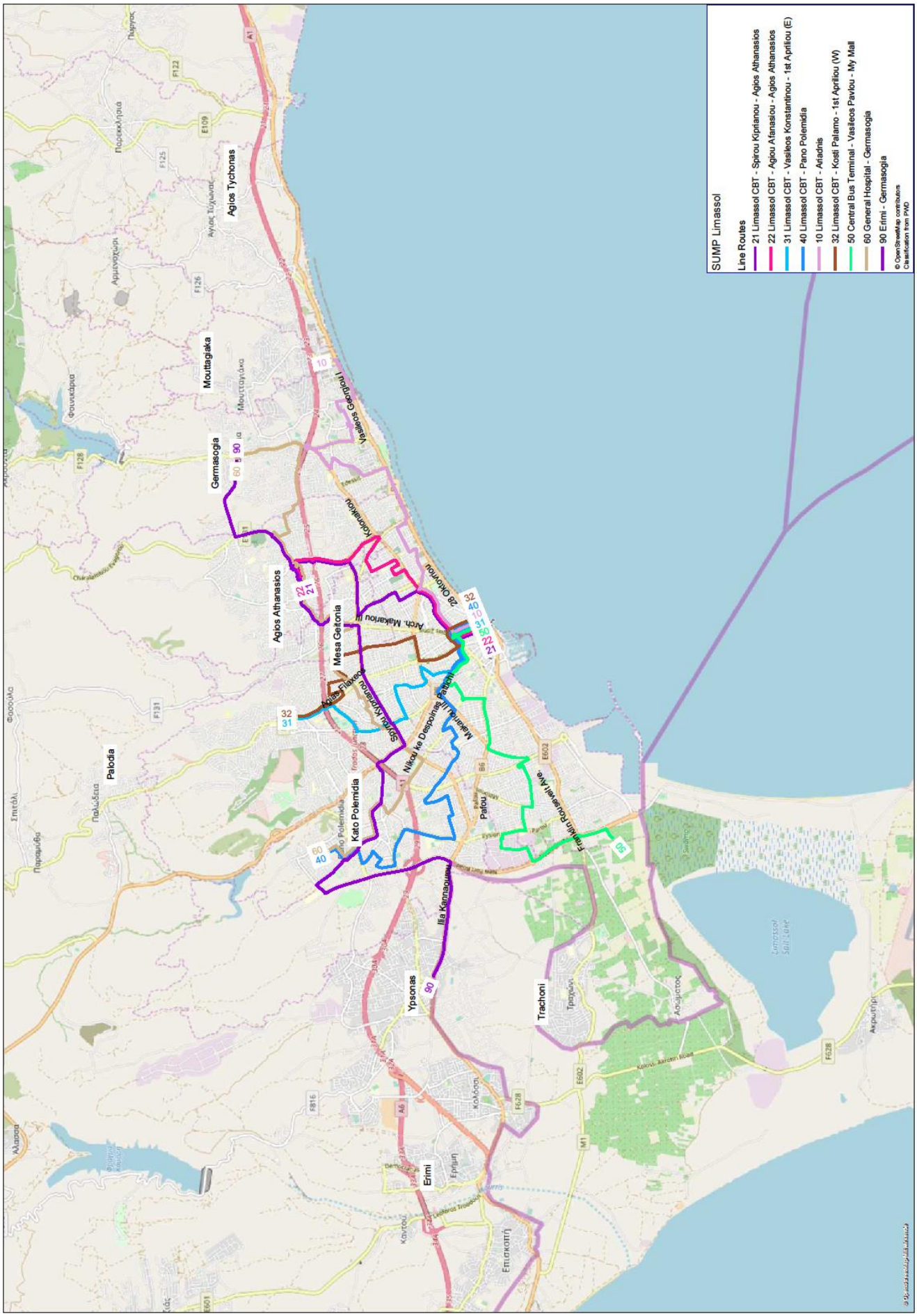


Figure 23: Strategic map: Proposed future bus network for Limassol (Secondary)

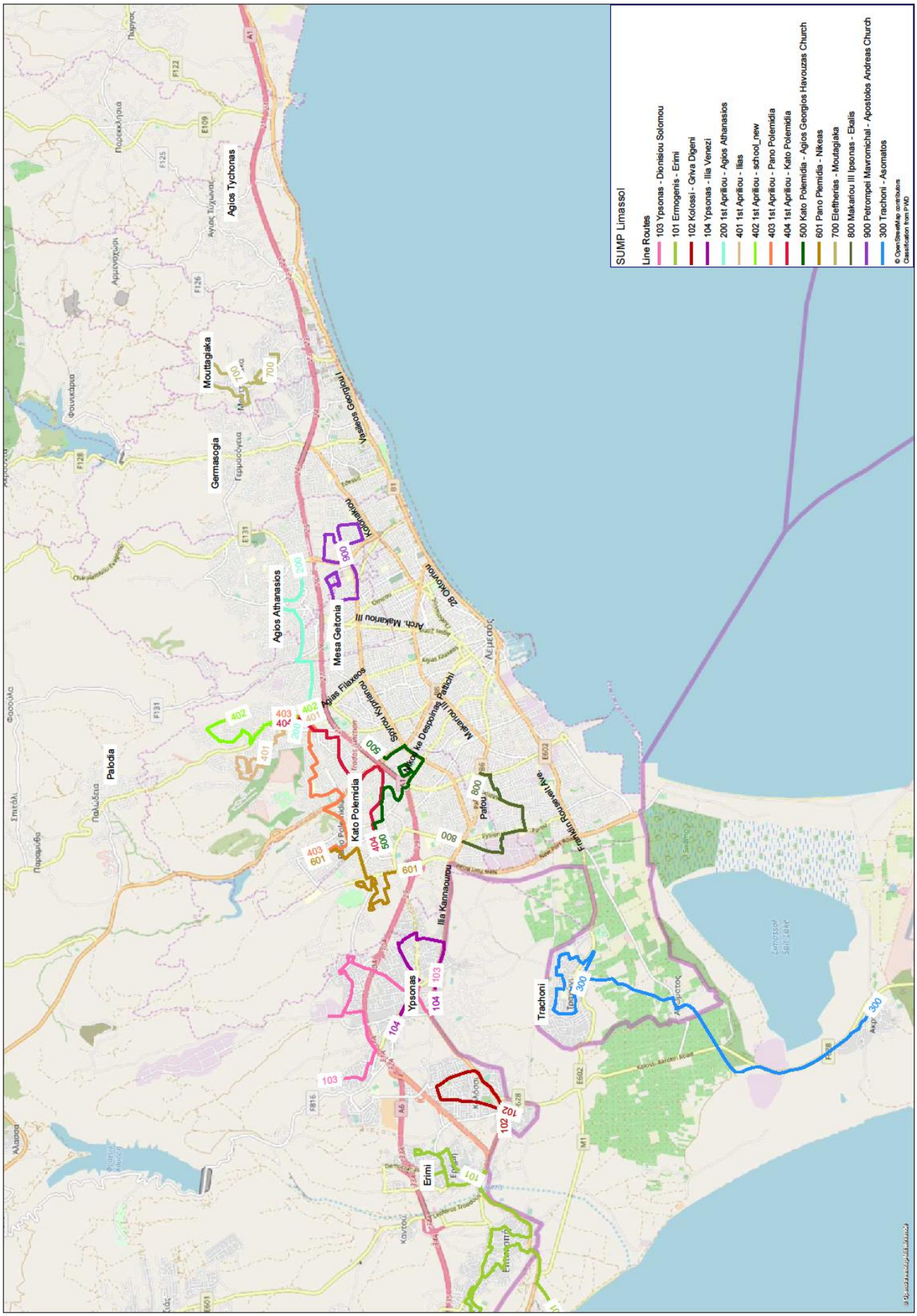


Figure 24: Strategic map: Proposed future bus network for Limassol (Tertiary)

6.3.3 Operation Hours and Frequencies

There are only few bus lines operating with regular frequencies in the current bus network and operation hours are broadly limited. Hence, a comprehensive upgrade of operation hours and frequencies will constitute a significant improvement in view of increasing the attractiveness of public transport in Limassol.

The proposed improvements comprise of (1) continuous operation hours from early morning (5:30 am) until midnight and (2) timetables with regular headways, frequencies of bus lines depend on the network level (passenger volumes) and the time of day.

A 20 min headway should be the minimum standard on all bus lines, to be increased up to a frequency of every 10 min during peak hours. This is an appropriate level of service for a city of the size of Limassol. Line 1, which is mainly connecting the hotel area at the eastern end of the coastal road to the city centre, should have an extended operation hour at night. The following tables (13-21) provide an overview on operation times and frequencies on an average workday.

PT network Level	1 Primary Bus Lines								
Weekday	Monday – Friday								
Bus Line 1									
Operation Hours	5:30 - 06:45	06:45 -09:00	09:00 - 13:00	13:00 - 15:00	15:00 - 17:00	17:00 - 19:00	19:00 - 22:00	22:00 - 24:00	00:00 - 1:30
Frequency every …	20 min	10 min	10 min	10 min	20 min	10 min	10 min	10 min	20 min
all other Primary Bus Lines									
Operation Hours	5:30 - 06:45	06:45 -09:00	09:00 - 13:00	13:00 - 15:00	15:00 - 17:00	17:00 - 19:00	19:00 - 22:00	22:00 - 24:00	00:00 - 1:30
Frequency every …	20 min	10 min	10 min	10 min	20 min	10 min	20 min	20 min	-/-

Table 13: Operation hours and frequencies in the proposed Primary Bus Line network

PT network Level	2 Secondary Bus Lines								
Weekday	Monday – Friday								
Operation Hours	5:30 - 06:45	06:45 -09:00	09:00 - 13:00	13:00 - 15:00	15:00 - 17:00	17:00 - 19:00	19:00 - 22:00	22:00 - 24:00	00:00 - 1:30
Frequency every …	20 min	10 min	20 min	10 min	20 min	10 min	20 min	20 min	-/-

Table 14: Operation hours and frequencies in the proposed Secondary Bus Line network

PT network Level	3 Feeder Lines / On Demand Services								
Weekday	Monday – Friday								
Operation Hours	5:30 - 06:45	06:45 -09:00	09:00 - 13:00	13:00 - 15:00	15:00 - 17:00	17:00 - 19:00	19:00 - 22:00	22:00 - 24:00	00:00 - 1:30
Frequency every …	20 min	20 min	20 min	20 min	20 min	20 min	20 min	-/-	-/-

Table 15: Operation hours and frequencies in the proposed Tertiary Bus Line network

PT network Level	1 Primary Bus Lines								
Weekday	Saturday								
Bus Line 1									
Operation Hours	5:30 - 06:45	06:45 -09:00	09:00 - 13:00	13:00 - 15:00	15:00 - 17:00	17:00 - 19:00	19:00 - 22:00	22:00 - 24:00	00:00 - 1:30
Frequency every …	20 min	20 min	10 min	10 min	20 min	10 min	10 min	10 min	20 min
all other Primary Bus Lines									
Operation Hours	5:30 - 06:45	06:45 -09:00	09:00 - 13:00	13:00 - 15:00	15:00 - 17:00	17:00 - 19:00	19:00 - 22:00	22:00 - 24:00	00:00 - 1:30
Frequency every …	20 min	20 min	10 min	10 min	20 min	10 min	20 min	20 min	-/-

Table 16: Operation hours and frequencies in the proposed Primary Bus Line network

PT network Level	2 Secondary Bus Lines								
Weekday	Saturday								
Operation Hours	5:30 - 06:45	06:45 -09:00	09:00 - 13:00	13:00 - 15:00	15:00 - 17:00	17:00 - 19:00	19:00 - 22:00	22:00 - 24:00	00:00 - 1:30
Frequency every …	20 min	20 min	20 min	20 min	20 min	20 min	20 min	20 min	-/-

Table 17: Operation hours and frequencies in the proposed Secondary Bus Line network

PT network Level	3 Feeder Lines / On Demand Services								
Weekday	Saturday								
Operation Hours	5:30 - 06:45	06:45 -09:00	09:00 - 13:00	13:00 - 15:00	15:00 - 17:00	17:00 - 19:00	19:00 - 22:00	22:00 - 24:00	00:00 - 1:30
Frequency every …	-/-	20 min	20 min	20 min	20 min	20 min	20 min	-/-	-/-

Table 18: Operation hours and frequencies in the proposed Tertiary Bus Line network

PT network Level	1 Primary Bus Lines								
Weekday	Sunday / Public Holiday								
Bus Line 1									
Operation Hours	5:30 - 06:45	06:45 -09:00	09:00 - 13:00	13:00 - 15:00	15:00 - 17:00	17:00 - 19:00	19:00 - 22:00	22:00 - 24:00	00:00 - 1:30
Frequency every …	-/-	-/-	20 min	10 min	10 min	10 min	10 min	10 min	20 min
all other Primary Bus Lines									
Operation Hours	5:30 - 06:45	06:45 -09:00	09:00 - 13:00	13:00 - 15:00	15:00 - 17:00	17:00 - 19:00	19:00 - 22:00	22:00 - 24:00	00:00 - 1:30
Frequency every …	-/-	-/-	20 min	10 min	20 min	10 min	20 min	20 min	-/-

Table 19: Operation hours and frequencies in the proposed Primary Bus Line network

PT network Level	2 Secondary Bus Lines								
Weekday	Sunday / Public Holiday								
Operation Hours	5:30 - 06:45	06:45 -09:00	09:00 - 13:00	13:00 - 15:00	15:00 - 17:00	17:00 - 19:00	19:00 - 22:00	22:00 - 24:00	00:00 - 1:30
Frequency every …	-/-	-/-	20 min	20 min	20 min	20 min	20 min	20 min	-/-

Table 20: Operation hours and frequencies in the proposed Secondary Bus Line network

PT network Level	3 Feeder Lines / On Demand Services								
Weekday	Sunday / Public Holiday								
Operation Hours	5:30 - 06:45	06:45 -09:00	09:00 - 13:00	13:00 - 15:00	15:00 - 17:00	17:00 - 19:00	19:00 - 22:00	22:00 - 24:00	00:00 - 1:30
Frequency every …	-/-	-/-	20 min	20 min	20 min	20 min	20 min	-/-	-/-

Table 21: Operation hours and frequencies in the proposed Tertiary Bus Line network

The operation hours can be adapted on those bus lines (or sections of bus lines) having very low passenger volumes in the early morning or the late evening. However, this should be the result of a passenger survey after the implementation of the new services. Another option would be to switch level 2 or level 3 lines with low passenger volumes to a DRT service to avoid bus services running without passengers.

The proposed bus network and the operation concept (operation hours and frequencies) correspond to the ideal situation and are the recommendation for the development of the future public transport system. As mentioned before, this is necessary for a paradigm change of transport in Limassol and can be seen as a compromise between public transport funding and the aim to significantly improve the service.

However, should budget restrictions apply to the first years of operation, i.e. 2020 and following, then a reduction of the proposed service kilometres can be envisaged. This could be a reduction of frequencies from 10 to 20 minutes in off-peak periods and on lines with lower demand. But one has to be aware that this reduction of supply not only comes along with a reduction of costs for subsidies but also reduces the attractiveness of the PT system considerably and therefore puts the whole concept of the new SUMP mobility concept in question.

6.3.4 School Bus Lines

The concept design of the future regular bus line network (see chapter 6.3.2) aims at covering and bundling as many trip purposes as possible, including education (pupils, students), since most of school and sites and sites of the Cyprus University of Technology (CUT) have bus stops with regular bus services in appropriate walking distance. The proposed operation hours and frequencies for the three levels of the regular bus services (see chapter 6.3.3) cater for needs of pupils and students to get to and from school/university. Additional services during the peak hours are mandatory. This concept is standard in many European cities with substantial bus services throughout the day and comparable with Limassol. As a result, pupils and students form a specific demand group, among other, in regular bus lines, and there is no need for extra bus school services which are expensive and would overlap with regular bus services.

Nevertheless, a small number of schools could not be integrated in the regular bus network, mainly due to their remote location or some specific origin-destination links are not suitably covered by regular bus lines. In these cases, designated school bus lines should complement Limassol's bus services. Theses school buses focus on the transportation of pupils and students. The lines usually operate on weekdays and for only few hours in the morning and in the evening.

To cater the demand for these school locations, three lines were taken from the existing bus routes and introduced into the bus line concept:

- School bus line 0001: 1st Apriliou - Charalambou Evagorou
- School bus line 0002: Kolossi Primary School
- School bus line 0003: Petrompei Mavromichal

The school bus lines have 20 minutes headways which refers to services provided around school start and end times plus demand responsive services in the intermediate intervals. The 20 minutes headways reflect average number of services on demand. Timetables need to be aligned with starting/finishing times of classes.

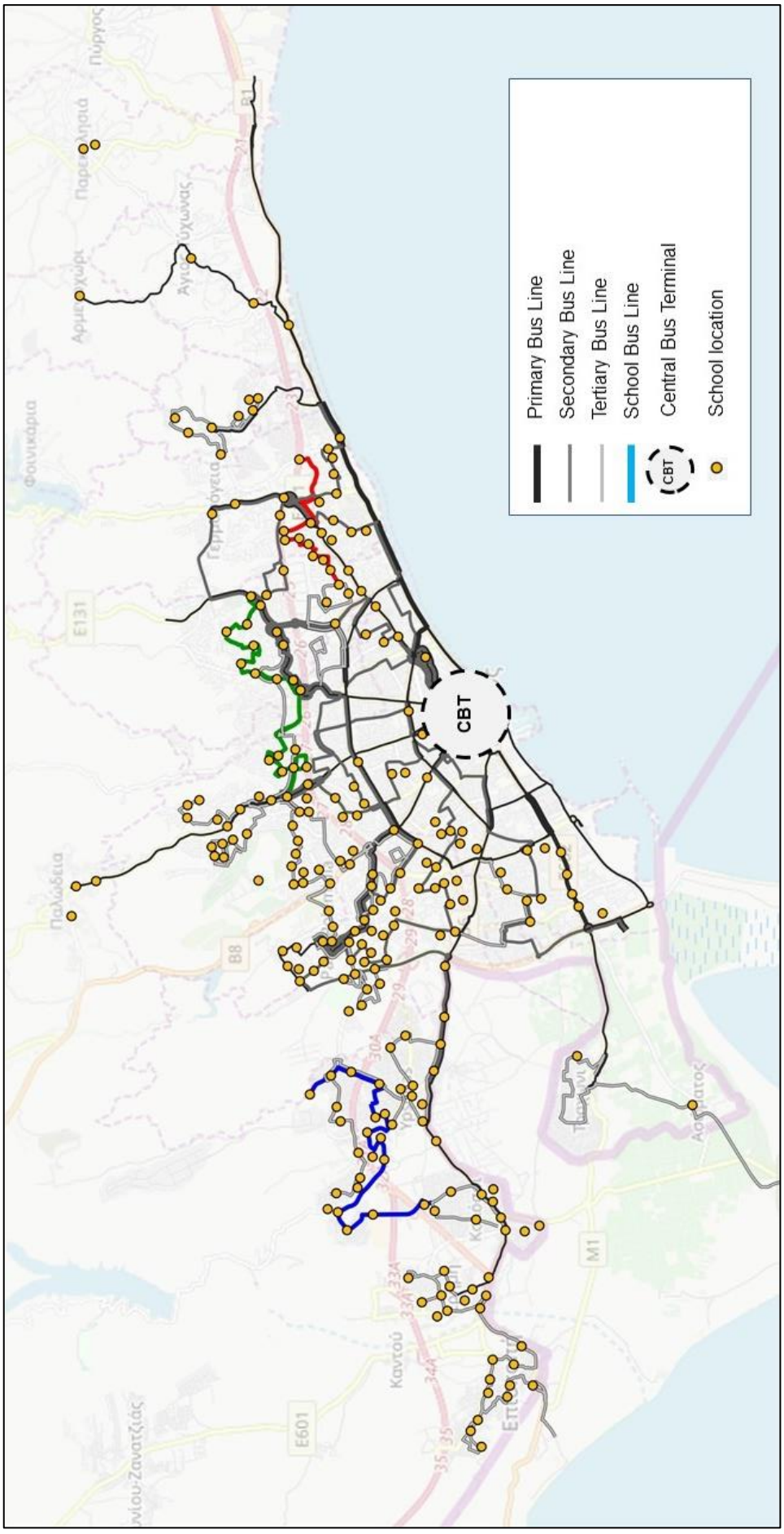


Figure 25: Integration of school locations into the public transport network

Figure 25 above represents the school and university premises and the line routes of bus services. As can be seen, all premises are within walking distance to bus services and stops

6.3.5 Bus Terminals

6.3.5.1 Central Bus Terminal (CBT)

Function

The Central Bus Terminal (CBT) will be located at Andrea Themistokleous St./Anexartisias St. in Limassol's historic city centre. The location currently hosts several bus stops already, mainly for rural lines and is in walkable distances from the university, Limassol's main shopping and district and the coastal road.

The following figure (Figure 26) shows the central bus terminal (CBT) at Themistokleous street and the walking distances to the most relevant attractions.

Figure 26: Walking times from CBT to selected destinations (minutes at 4km/h)

The CBT will be the terminus of 15 bus lines:

- Central Line
- Primary Lines 2 – 8, and
- Secondary Line (10, 21, 22, 31, 32, 40, 50).

All of these bus lines, apart from the Central Line, are radial lines terminating at the CBT. Hence, the volumes of passengers transferring between different bus lines will be rather limited, i.e. the CBT will not have the function of a transfer hub. However, it is an important gateway to public transport in Limassol given its specific location at the heart of the city centre providing access at a walking distance for a great number of public and private sector employees, the estimated 4,500 students of the Cyprus University of Technology (CUT), citizens visiting main destinations in the city centre, as well as many tourists visiting Limassol city centre.

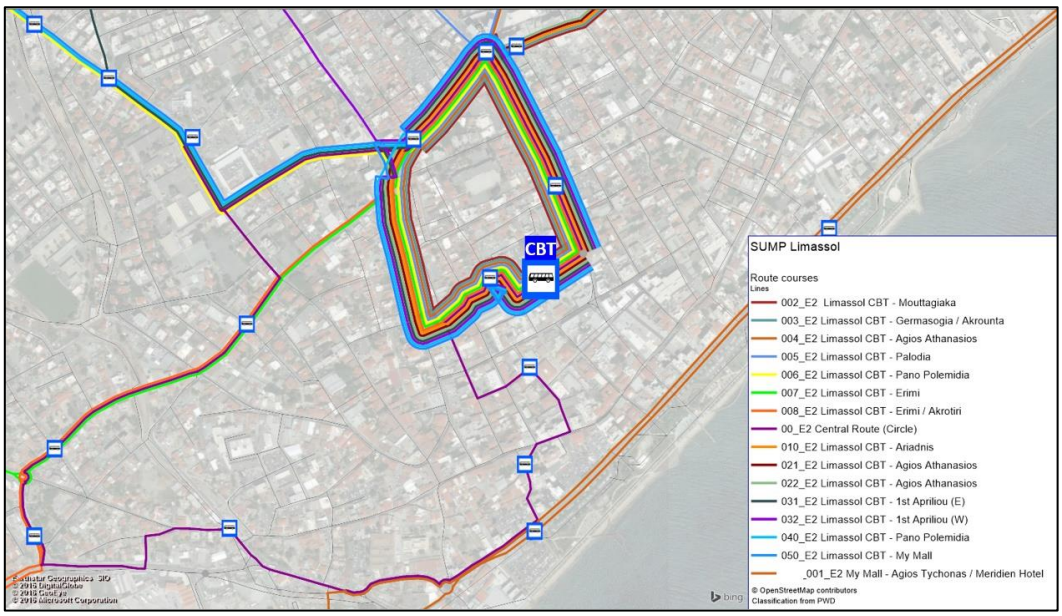


Figure 27: Bus services approaching and departing from CBT

From the figure above (Figure 27) , it becomes obvious, that access and egress roads to and from Themistokleous bus terminal need to be reserved for public transport to allow for free passage of buses. In the peak hours, up to 15 buses have to pass through the streets every 10 minutes. This hold true for both, access and egress roads, consequently, no private vehicles can be allowed in this part of the network.

Bus vehicles entering pedestrian zones are common throughout European cities (e. g. Münster (Westf.) (Germany), Warsaw (Poland) or Bologna (Italy)). Safety conflicts on Anexartisias St. between pedestrians or cyclists and busses can be minimised by setting a speed limit of 20 km/h for busses on the difficult sections of Anexartisias St.

Capacity

The required capacity of the CBT (i. e. the number of stop-points at the terminal) depends on how many bus vehicles stop simultaneously at the terminal during the peak hours. According to the line concept, 15 bus lines will service the CBT every 10 minutes. With respect to the timetable synchronization of radial and tangential bus lines at transfer points (see chapter 6.3.6.2) and the proposed frequencies in timetables, up to 12 bus vehicles will occupy the CBT concurrently.

Hence, 12 bus bays are sufficient to cope with the proposed service concept in public transport. All bus bays are needed for passenger boarding and alighting with short changing times between the preceding and the following vehicle, i. e. bus drivers cannot have their rest times at the bus bay. It is therefore recommended to allow for another 2 to 3 bus bays, if the space is available, to increase operational flexibility.

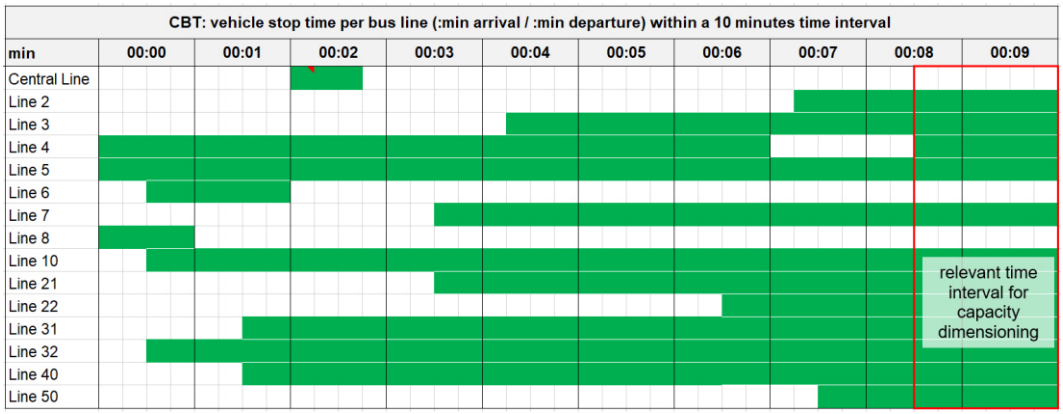


Figure 28: CBT: vehicle stop time per bus line (min of arrival/ min of departure) within a 10 minutes time interval

An alternative solution to reduce the number of bus bays and to minimize the space requirements, to fewer than 12 bus bays, would be to reduce the number of buses lingering simultaneously at the CBT by limiting the stop time per vehicle to 3 minutes and spreading the stops times of all lines evenly over the 10 minutes interval. This measure, however, would certainly result in the partial loss of optimized transfer times between radial and tangential bus lines along the ring roads in Limassol. Thus, with less than 12 bus bays, the bus operator would lose in terms of bus operational flexibility.

Bus Terminal Layout and Design

The following pictures (Figures 29 and 30) display an optional solution for the layout and design of the future Central Bus Terminal.

Figure 29: CBT: optional solution for the bus terminal layout and design

Figure 30: CBT: optional solution for the bus terminal layout and design from different perspective

The following figure (Figure 31) represents the functional design layout for the bus operation within the terminal as well as access to and departure from CBT (please take note that this preliminary design has no scale).

Figure 31: Functional layout plan CBT

The concept for the future bus route network presented above (see chapter 6.3.2) has the Central Bus Terminal (CBT) in the city centre at Andrea Themistokleous St./Anexartisias St. as the main bus terminal, where most of the Primary Lines (except Line 1) and some Secondary Bus Lines meet allowing a smooth transferring for bus passengers. The proposed CBT is a key element of the strategic bus concept and has the following advantages:

- Limassol is a relatively small city; a centrally located bus hub allowing passengers to change between most of The Primary Bus Lines and many Secondary Bus Lines is the most comprehensible and comfortable solution.
- The CBT allows passengers to transfer between two radial lines with a smooth one-stop-change. Changing between radial lines is also possible by avoiding the city centre and using the tangential lines 70 or 80. In some cases, this could be even slightly faster than travelling via the CBT. But it requires changing twice which is less comfortable. Even evaluations of the transport model proofed that most passengers are changing between the lines at the CBT as then they have to change only once.

There are, however, strong concerns about the number of buses per hour directed towards the CBT during peak times (up to 12 buses every 10 mins), which is a flow of buses in the city centre with its relatively narrow streets and dense population. These buses will create noise and pollution within the pedestrian area affecting residents and visitors. Should these concerns prove true, then a deviation from the ideal plan is possible to reduce the traffic impacts by relocating some lines away from the CBT. In this case or also for a phased implementation of the concept, the terminus stops of two Primary Bus Lines and of two Secondary Bus Lines could be moved from the CBT to a stop point on the seafront boulevard opposite to Anexartisias St., which is actually a 6 to 7 mins walk from the CBT. The suggested lines to be relocated, are:

- Line no. 2 (Primary) Mouttagiaka – Limassol Centre (New stop at seaside boulevard)
- Line no. 8 (Primary) My Mall – Limassol Centre (New stop at seaside boulevard)
- Line 10 (Secondary) Ariadnis - Limassol Centre (New stop at seaside boulevard)
- Line 21/22 (Secondary) Agios Athanasios - Limassol Centre (New stop at seaside boulevard).

This solution comes along with other advantages, e. g.

- Bus passengers will have a shorter access to destinations along the coastal boulevard.
- The relocated bus lines can use the segregated bus corridor along the coast.
- The terminal stop on the coastal road (which is already proposed as an intermediate stop of Primary Bus Line 1) is located only in a short walking distances (approx. 300 meters) from the CBT, and it is proposed to be connected by an excellent pedestrian infrastructure.

A major disadvantage of this solution are more traffic related impacts on the coastal boulevard and the fact, that a turning infrastructure for buses is required in a high-price downtown location.

6.3.5.2 Multipurpose City Terminal close to Leontiou street

Currently, rural buses stop at the Old Hospital bus stop on Leontiou. In the short future, a new Bus Station close to Leontiou street is proposed and designated to be the central bus hub for rural bus services in Limassol. In addition, the terminal can be used as a modern facility where the citizens will be able to:

- charge their private or car-sharing electric vehicles/ or swap their exhausted batteries,
- fill their special vehicles with alternative fuels (e.g. biogas),
- access bike and or e-bike sharing services or charge their private bikes,
- get access to a small shopping mall

This Bus Station will be connected to Limassol's Central Bus Terminal at Andrea Themistokleous St. by Primary Bus Line 6 and Secondary Bus Lines 40 and 50.

Intercity buses terminate at the new port, also to allow for convenient transfer to cruising ships. Also, Bus Lines 1 and 70 may serve tourists arrived in the port to reach the coastal avenue and interchange/transfer bus stops to travel in the whole city. In addition, a direct connection between some rural buses and intercity service is provided through interchange bus stops (see below). Alternatively, line 80 connects the rural buses and the intercity buses.
Since Themistokleous terminal will not be accessible for intercity buses and tourist coaches, primary line 1 passing the new port will serve as direct connection to the central city areas.

6.3.5.3 Bus Depot and Maintenance Facilities

The operation of enhanced bus services in Limassol requires a large bus depot and state-of-the art maintenance facilities to overhaul and clean the bus vehicles and to prepare them for the service. The respective facilities are space consuming and produce noise and other disturbing impacts resulting from maintenance work. Moreover, the bus vehicles produce traffic related impacts on the access roads to the depot site, particularly noise pollution and harmful emissions at least as long as the vehicle fleet is not fully electrified.

Therefore, the bus depot should be located outside of the city centre or other residential areas to avoid negative impacts on residential areas, preferably in an industrial area with short access to the bus route network, e. g. next to the Vertical Port Road. The future bus operator should be urged to propose an appropriate location in coordination with the municipality of Limassol.

6.3.6 Bus Stops

6.3.6.1 Bus Stop Locations

Simplifications of the current bus stop network were foreseen wherever there was a necessity for such an action, and it made sense. At present, there is an oversupply of bus stops in the city of Limassol, according to the recorded bus stops in the survey. Therefore, an abandoning or merging of current bus stops is proposed to achieve an average distance of 600 to 800 m between two subsequent bus stops, i.e. an access distance for public transport users of 300 to 400 m at the maximum (shorter distance in the city centre, longer distance in the suburbs). An average access distance of 400 m to the next available bus stop is a standard minimum value for cities of a comparable size and spatial structure to Limassol. In most cases, access distance will be much shorter.

Even with a reduced number of bus stops, a full area coverage in Limassol is guaranteed (see Figure 32 below).

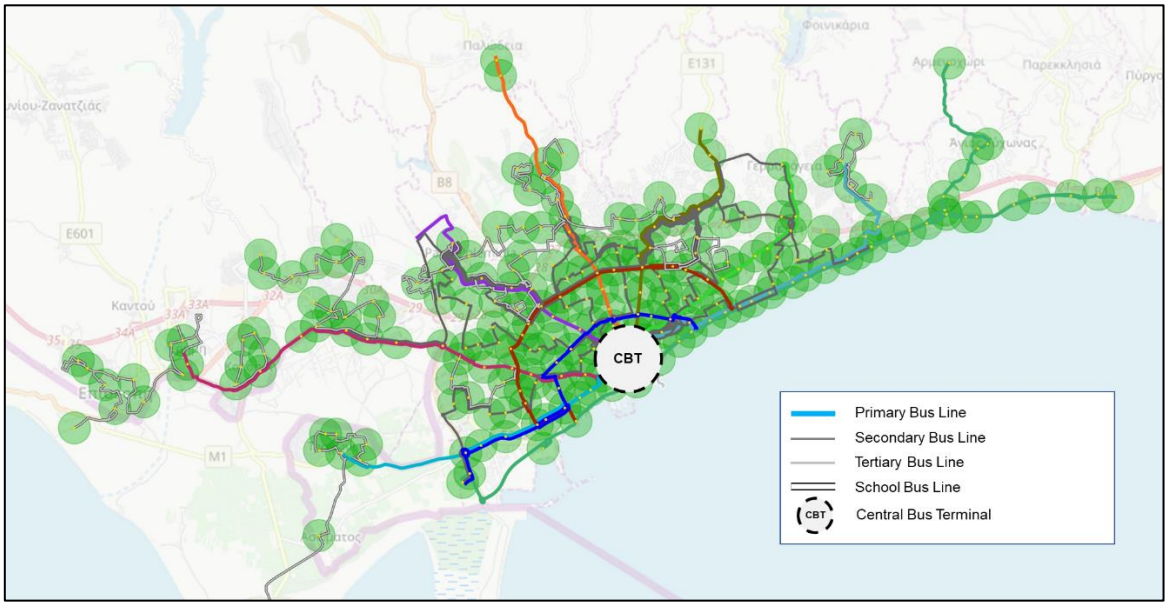


Figure 32: Area coverage of the proposed bus stop network (400 m stop catchment area)

A reduced number of bus stops in the public transport network will reduce the number of vehicle stops, speed up travel times in public transport and make public transport in Limassol more attractive and competitive to private transport.

The design and the equipment of bus stops should support an easy, attractive and informative access to a high-quality public transport system. Hence, the following equipment is recommended:

- paved waiting space and paved and paved access walkways
- elevated curbs for a barrier-free vehicle access
- tactile guidance system to ensure inclusion of people with visually impairments
- bus shelter providing protection from rain and sun (at least on more heavily frequented bus stops)

- lights
- seats
- waste bins
- basic information on public transport (timetable, line map, fare info)
- screen with real time information (at least on more heavily frequented bus stops)

A project to implement appropriate stop infrastructure is already in the pipeline for implementation in 2020.

6.3.6.2 Interchange/Transfer Bus Stops

Stop Location

Since transport demand in Limassol is not always targeting the city centre, the need for cross-links is obvious, e. g. between suburbs or between suburbs and different core parts of Limassol. Most of the cross-links are not covered by direct bus lines. Hence, optimised transfers connections at the cross points of radial and tangential bus lines are required.

The strategic location of an optimum number of transfer stops and stations in the public transport network are defined in the following Figure 33 and Table 22. Interchange bus stops are located between radial lines (Primary Lines) and tangential line 70 (Secondary Lines). Ideally, the transfer times at these stops between bus lines range between 3 and 5 mins, at least for the main transfer passenger flows.

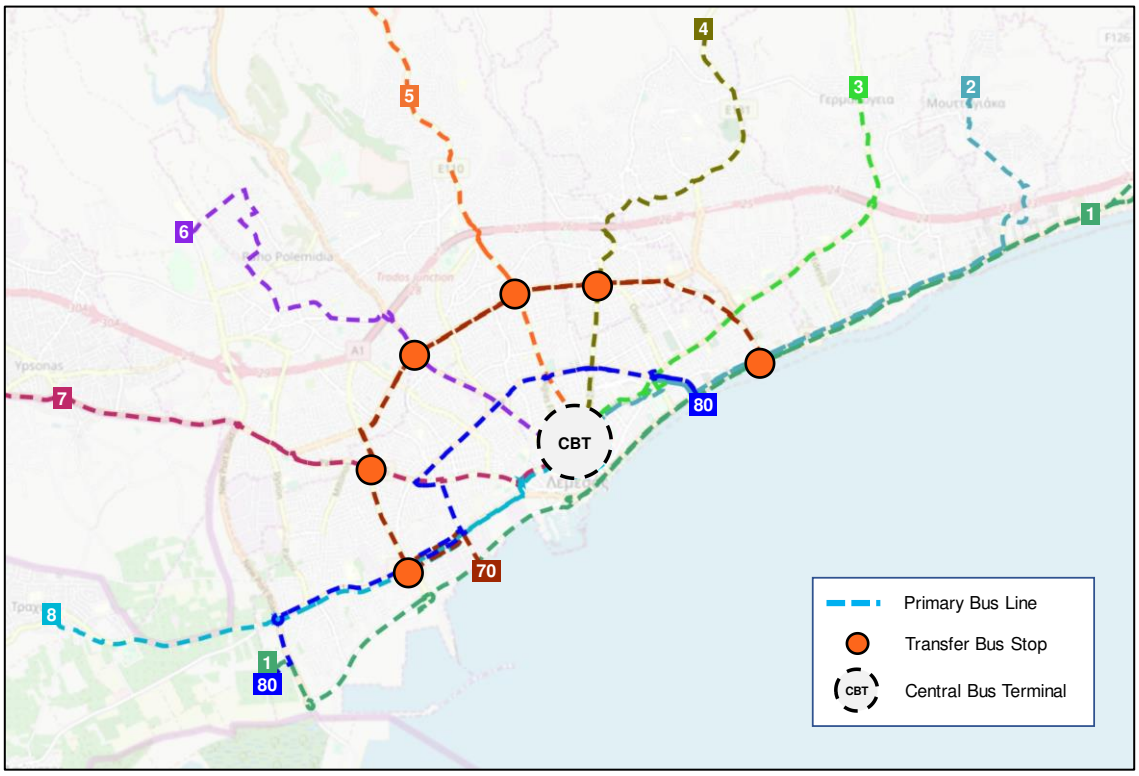


Figure 33: Interchange/Transfer bus stops in the future public transport network

Radial line no.	Interchange/Transfer bus stop with tangential line 70
Line 1/ 2	Griva Digeni IC (No. 72420)
Line 3	*## No appropriate transfer bus stop available ##*
Line 4	Spyrou Kyprianou IC (No. 54000)
Line 5	Spyrou Kyprianou IC (No. 53995)
Line 6	Spirou Kiprianou IC (No. 14630)
Line 7	Paphou IC (No. 11309)
Line 8	Fraglinou Rousvelt IC (No. 11323)

Table 22: Interchange/Transfer stops between radial bus lines and tangential line 70

6.3.6.3 Multimodal Transport Hubs

Hubs aim at connecting local urban (and, if applicable, intercity buses and rural bus line) with local "last mile" transport services and private transport means (car, bike). Thus, multimodal transport hubs play an important role in an integrated urban transport system. They ensure transfer opportunities between:

- Primary Bus Lines
- Feeder Bus Lines
- Rural Bus Lines (Village Lines)
- Intercity Bus Lines (if servicing sub-centres)
- Commercial on-demand services (e.g. ridesharing and ride selling like uber, etc.)
- Car Sharing and Bike Sharing systems
- Taxis
- Private Car and Bike

Beside their function as a visible (!) transport infrastructure to promote multimodal traffic behaviour, other services could be included into the hub, and hubs could be equipped with, e. g.:

- information on available transport options/alternatives and the respective terms of use;
- transport related services aiming at reducing obstacles for users of "unconventional" transport means, e. g. maintenance service for bikes or charging stations for e-cars and e-bikes;
- other services related to daily needs in order to avoid additional trips for the hub users, e. g. letter box, parcel box or kiosk with coffee and snacks.

Multimodal transport hubs should be implemented at the terminus of Primary Bus Lines (mostly in sub-centres to support last mile services in Limassol's outskirts) and at the Central Bus Terminal at Andrea Themistokleous St./Anexartisias St. The following Figure 34 represents potential locations of Multimodal transport hubs, following above mentioned concept.

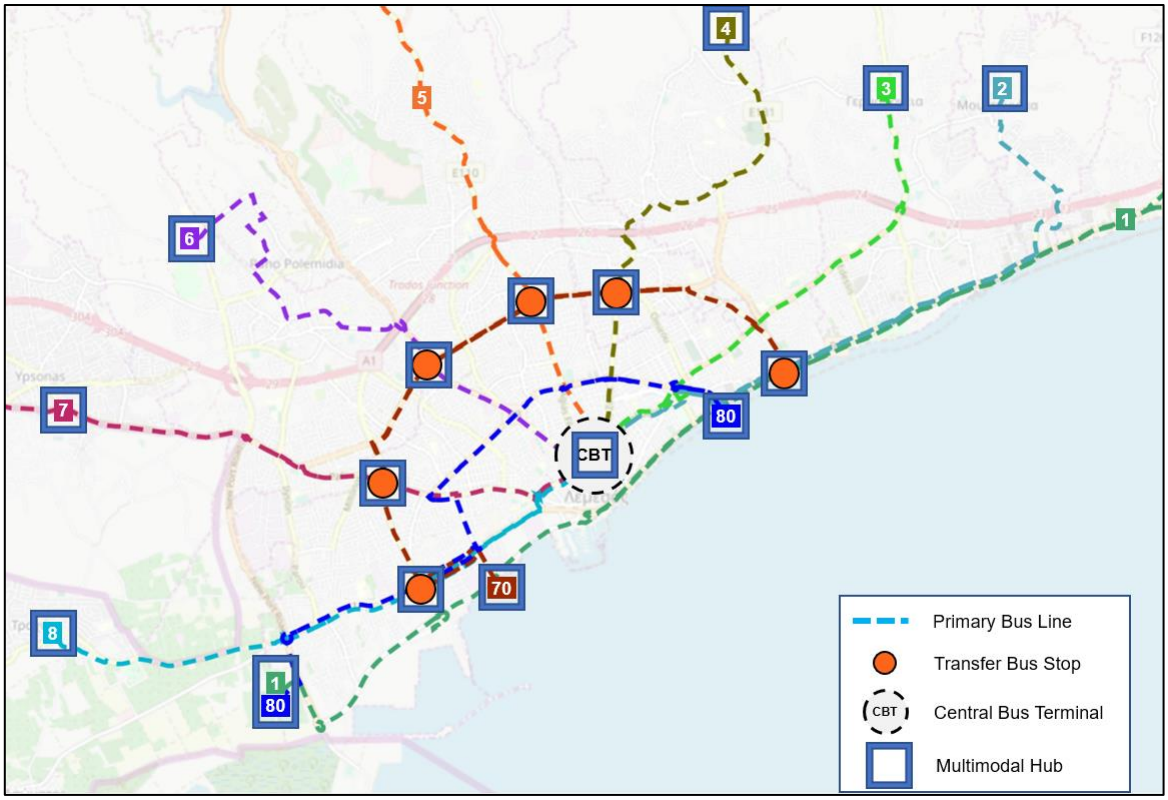


Figure 34: Multimodal transport hubs

The required space and the dimensioning of the hubs mainly depend on transport services available at the site (e. g. number of bus lines, car or bike sharing service, etc.) and their respective requirements. The following Figure 35 shows a typical layout of a small multimodal transport hub.

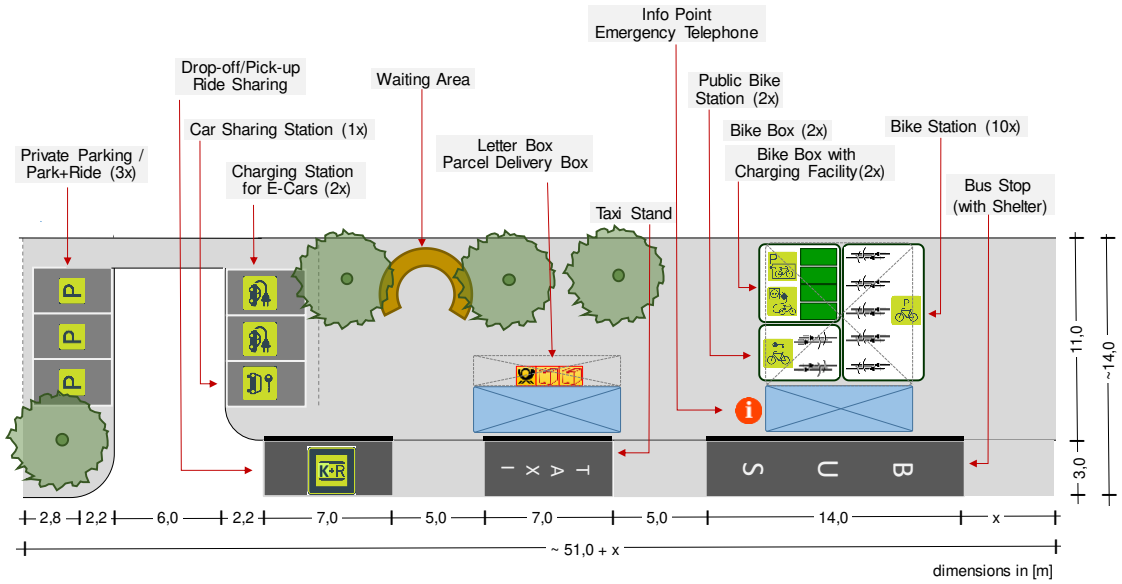


Figure 35: Typical layout of a small multimodal transport hub

For more details on design and requirements on the layout, please see **Annex III, Chapter 3**.

6.3.7 Park & Ride

Park and Ride (P&R) facilities are parking facilities with public transport connections that allow commuters and other people heading to city centres to leave their vehicles and transfer to a bus, a rail system, or carpool for the remaining section of their journey. They facilitate the access to the public transport system from the road network. The vehicle is left at the parking lot during the stay in the city until the owner returns. Park and Ride facilities mainly address commuters. The facilities are usually located in the suburbs of large cities or metropolitan areas.

According to the LLP, five locations along the bypass motorway and Omonoias St. are considered as P&R facilities for Limassol (see figures in **Annex III, Figure A-III 6**).

The following Figure 36 represents the optimized locations of P&R facilities in context of lines serving those places as well as taking into consideration the availability of space after personal field visits

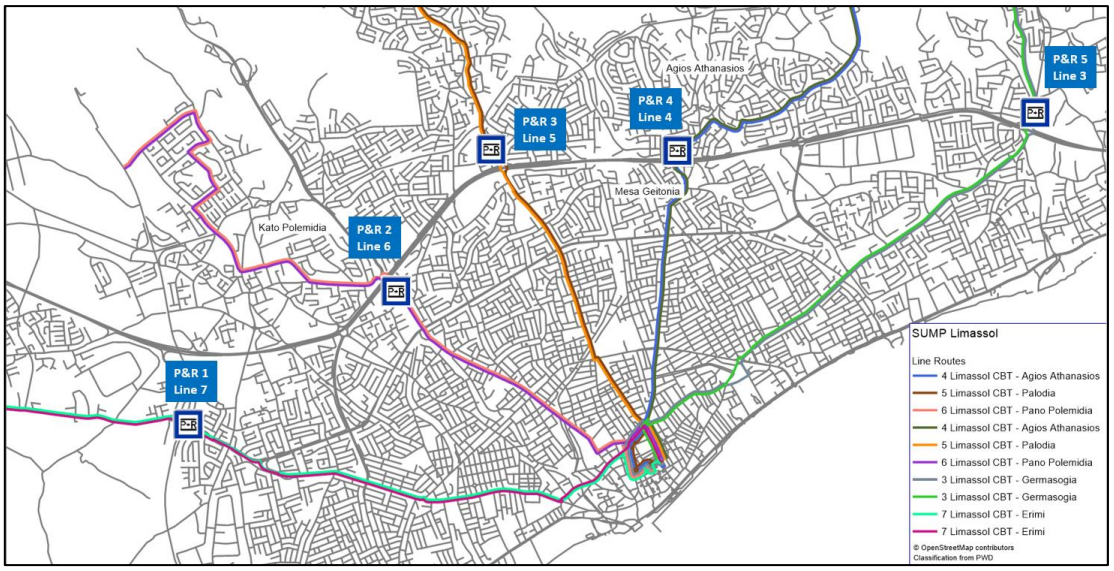


Figure 36: P & R places and primary bus lines

The spots were assessed and evaluated by team members. As a result, the locations 3 to 5 were considered reasonable and they are (by visual standards) available (see **Annex III, Figure A-III 6**). In contrast, location 1 is considered not feasible due to availability and high land prizes (according to Department of Land and Surveys data from 2013). Therefore, an alternative location for P&R 1 near roundabout Pafou/Vertical road is proposed (please see **Annex III, Figure A-III 6** for more details).

Location 2 was considered reasonable and available. Nevertheless, following discussions between the team and stakeholders, the primary line 6 serving the original location had to be re-routed. Therefore, the P&R site also had to be reallocated to an (by visual standards) available site near Despoinas & Nikou Patichi. The new location is included in the figure above (Figure 36). .

The proposed indicative positions relate to the following street intersections (the numbering of stations is from west to east). All P&R stations are integrated into the public transport network with short walking distances to the next bus stop with Primary Line service.

To encourage multi modal behaviour and the usage of bus P&R facilities, flanking measures should be implemented, e. g.:

- Real time user information provision in the approach of P&R facility on the number of available free parking lots, the next departures times of public transport means, the approximate travel times by bus to the city centre (possibly in comparison to the real time on congested roads), fares and offers, etc.
- Special fares integrating the parking fee and the public transport fare for a return or a day ticket: for PT pass holders, parking is generally free on P&R sites; for others, the purchase of a return or day ticket grants free parking for the time between departure by bus and arrival.

As noted above, P&R is usually applied in suburbs of large cities of metropolitan areas. Having said this, it has to be noted, that the demand for P&R in Limassol cannot be determined exactly. The size of the city may not be sufficient to attract P&R with respect to geographical dimension (distances to be covered) and potential (number of residents and in turn: trips). Both, the trips from home to the respective P&R station as well as the following PT trip to the final destination (and vice versa) are not always justifying a transfer between the modes, even assuming optimal and convenient connections. Having attractive services on all primary and secondary routes, a direct bus ride (or even one with transfer between different lines) within the study is probably preferred, unless the starting point is not within reasonable distance to attractive services at all.

Apart from local population, Cypriots and tourists from other parts of Cyprus approach the study area by private motorized transport from motorway A1 West (Paphos), B8 Giannou Kranidioti North (Troodos) and A1 East (Larnaca/ Nicosia). Therefore, it is proposed to implement P&R rather for long- and medium-distance trips although the demand is probably quite low. As a consequence, we suggest starting the implementation with the locations nearest roads towards major remote destinations, i.e. number 1 for Pafos (also Episkopi, Erimi, Kolossi), number 2 for the road towards Troodos and number 5 for Larnaca, Nikosia, Amochostos. While sufficient land should be reserved or even purchased, it seems advised to start implementation on smaller scales with the option to increase size according to (hopefully increasing) demand. It is estimated that a total of 50 parking places plus 20 bicycle stands would be the maximum capacity to be reached. The following Figure 37 represents a typical P&R place (one of five P&R in the city of Oberhausen).

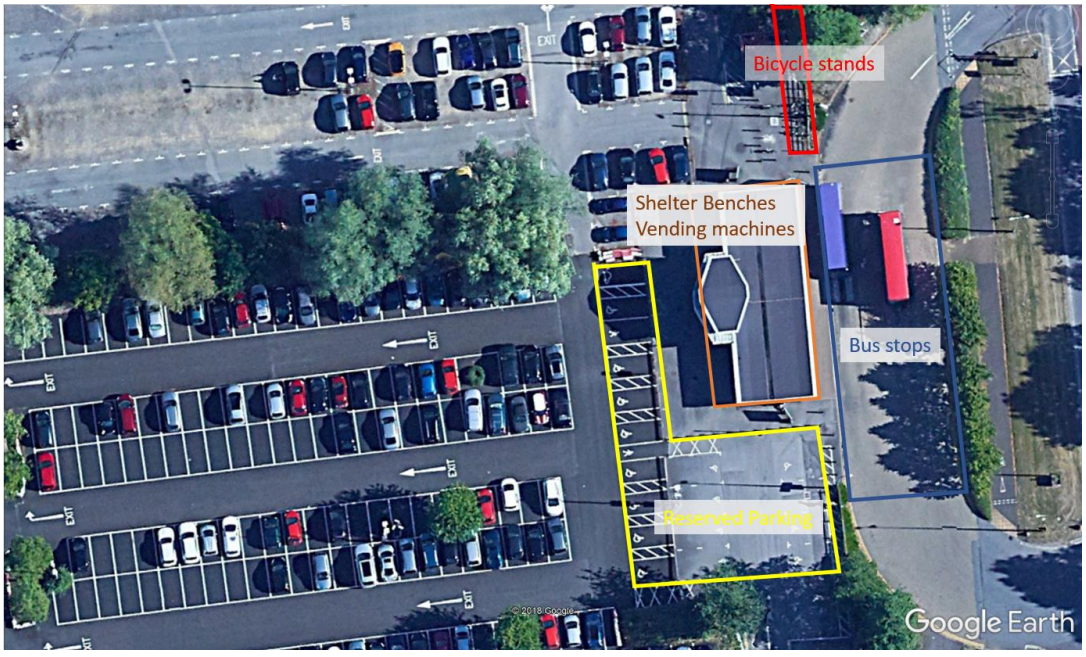


Figure 37: Park and Ride layout, example from city of Oxford, UK

As can be seen, about 10% of reserved parking places are over-sized to allow disabled persons convenient access to their vehicles. Those reserved spaces for disabled as well as the stands for bicycles are located nearest to the bus stops.

6.3.8 Bus Prioritisation Measures

6.3.8.1 Exclusive Bus Lanes

In order to reduce travel times in public transport and to provide more reliable bus services in Limassol, it is highly recommended to introduce bus prioritization measures. The following Table 23 and schematic maps (Figures 38 and 39) show where exclusive bus lanes should be implemented. Some of the bus lane schemes are combined with new pedestrian areas.

1	**Archiepiskopou Leontiou A'** (from Archiepiskopou Makariou III Avenue to 16th June 1943 str.), approximate length: 900.0m. One-way street (outbound for private vehicles) with two-way exclusive bus lanes. Minimum effective width 10.0m. Archiepiskopou Leontiou A' (from 16th June 1943 str. to Navarinou str.), approximate length: 170 m. Two-way street (for private vehicles) with bus lane only in inbound direction. More specifically, inbound: 2 lanes – 1 lane for private vehicles and 1 exclusive bus lane & outbound: 1 lane shared between bus and private vehicles. Minimum effective width 10.0m.
2	**Thessalonikis str.** (from Archiepiskopou Makariou III Avenue to Gladstonos str.), approximate length: 850 m. One-way street (inbound for private vehicles) with two-way exclusive bus lanes. Minimum effective width 11.0m.
3	**Agias Zonis str.** (from Archiepiskopou Makariou III Avenue to Gladstonos str.), approximate length: 800 m. Two-way street (for private vehicles) with bus lane only in outbound direction. More specifically, outbound: 2 lanes - 1 lane for private vehicles and 1 exclusive bus lane & inbound: 1 lane shared between bus and private vehicles. Minimum effective width 12.0m.
4	**Vertical Port Rd.** (from My Mall bus stop to Lady's Mile roundabout str.), approximate length: 650 m. Two- way street (for private vehicles) with two-way exclusive bus lanes. Effective width 18.0m (median inclusive).
5	**Aktea St.** on the Seaside Boulevard from Lady's Mile Roundabout St. to Limassol Marina / Old Port, approximate length: 1,800m. Bus-only street (no private vehicles). Two-way exclusive bus lane with pedestrian and cycle ways on both sides. Effective width at 21.0–22.0m.
6	**28th October Ave**. from Limassol Marina/old Port continuing to Georgiou A' St. up to Le Meridien Hotel bus stop, approximate length: 13,000m. Two-way (for private vehicles) with two-way exclusive bus lanes. Effective width 17.0–18.0m with median at 3.5m.
7	Pedestrianisation of streets combined with public transport right of way in the following streets: Koumandarias, Genethliou Mitella, Saripolou, Giagkou Potamiti, Kitiou Kyprianou, Kanari, Georgiou Gennadiou, Andrea Themistokleous, Anexartisias, approximate length: 1,400 m. **Bus-only pedestrian street** (no private vehicles) in inbound direction, with various effective widths.
For most cases above see indicative cross sections in Figures 40 to 42.	

Table 23: Overview on proposed exclusive bus lanes

Figure 38: Locations of proposed exclusive bus lanes

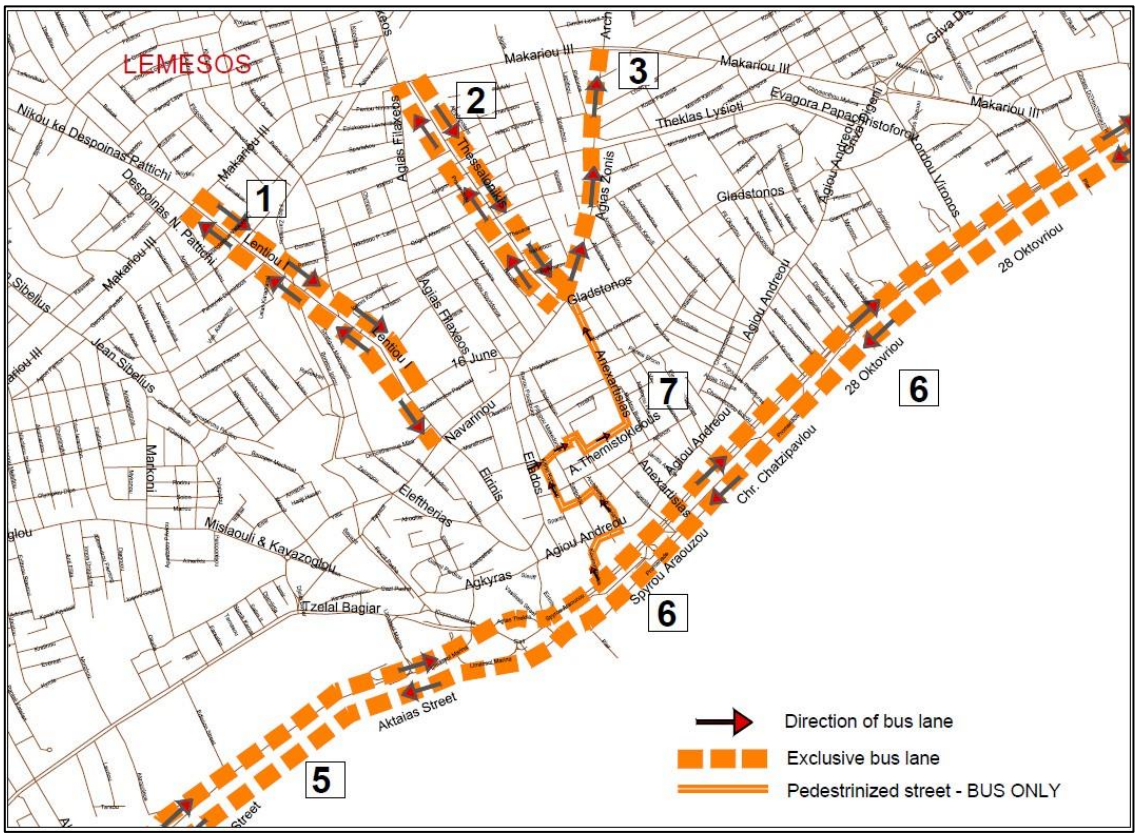


Figure 39: Locations of proposed exclusive bus lanes (zoom on the city centre)

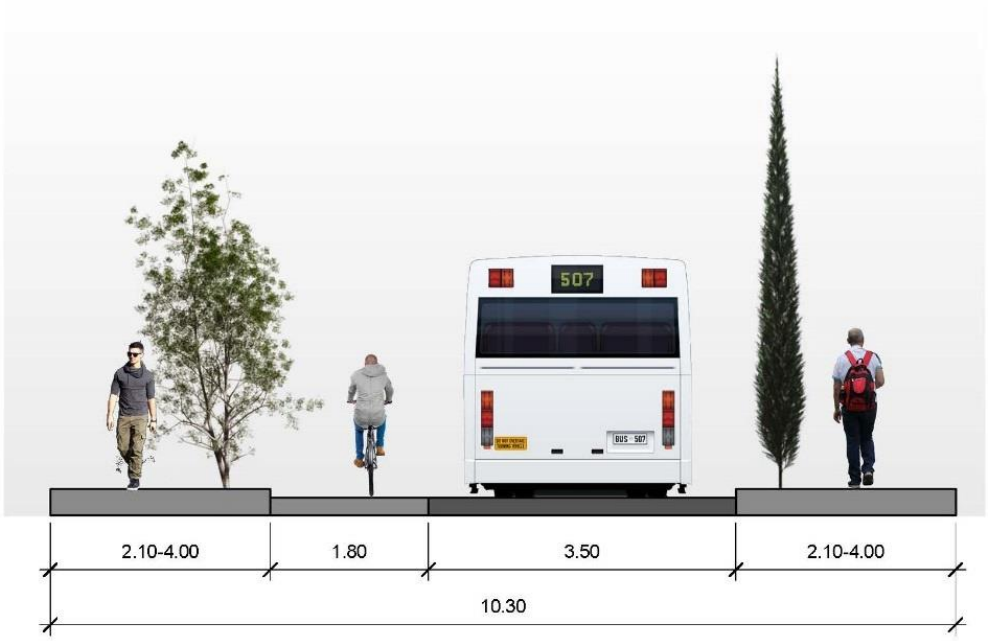


Figure 40: Cross section: bus-only road

Figure 41: Cross section: two-way road with bus lanes 2 directions

Figure 42: Cross section: one-way road with separate bus lanes 2 directions

Figure 43: Street conversion: Arch. Leontiou A' street

As specified in the implementation plan, the bus lanes in general and on the coastal avenue in particular will be implemented and converted in several phases. All bus lanes will be marked on the road and appropriate signage will be installed. The exclusivity of bus lanes applies all day and night. Where appropriate in terms of width, bus lanes will be opened for cyclists (see section 4). In case private and commercial motorized traffic is obstructing bus operation on (selected) road sections also in the northern parts of Limassol, an extension of dedicated bus lanes should be envisaged.

The exclusive bus lanes according to the proposed implementation plan are to be realised in 2022-2023 and 2026-2027 (Please see sections 2.6 and 2.7 as well as Appendix B of D.11-1).

6.3.9 Vehicles

Type of vehicles

Bus operators aim at achieving a balance between the provision of sufficient transport capacity to cater for the passenger demand on the one hand side, and their operation costs on the other hand side, mainly influenced by the driver costs. This aim can be reached by a vehicle fleet comprising of a mix of vehicle types with different capacities.

It is therefore recommended for Limassol to gradually set up a vehicle fleet comprising of the following vehicle types:

- **Articulated buses** have a capacity of 150 – 180 PAX per vehicle. They are suitable for bus lines with a high passenger demand, i.e. could be appropriate for peak hour services of bus line 1 along the coastal road depending on passenger volumes at long term.
- **Standard buses** have a capacity of 90 – 110 PAX per vehicle. Theses vehicle can be characterized as "all-around", serving a wide range of passenger demand levels in an efficient way. Standard buses will form the core supply of the vehicle fleet.
- Minibuses usually have a capacity of 14 – 20 PAX per vehicle. They are suitable for low demand services, e. g. demand responsive transport (DRT) and are flexible enough to service small lanes in the city centre as well as narrow and winding streets in Limassol's outskirts, where standard buses would be too large and not flexible enough.

A major aim of this SUMP is to support sustainable and environmentally friendly transport in Limassol. It is therefore highly recommended to gradually replace the existing Diesel-powered bus fleet with buses using alternative drive technologies (biofuel, gas, electric or hydrogen powered or hybrid technology).

Fleet Size

The required number of vehicles to provide the proposed public transport services depends, amongst others, on the operational concept of the bus operator (i. e. how flexible bus vehicles can switch from line to line to achieve an optimal turn-around) and the drive technology (e. g. the length of the period per day electric buses are occupied for recharging). Assuming that the vehicles are assigned to a specific bus line and ignoring the needed time for recharging, a **fleet of 164 bus vehicles** is required in order to operate the public transport concept and cater for the expected demand during peak hours. An optimised fleet operation concept allowing for a maximum flexibility in terms of vehicle deployment can help to reduce the required number of vehicles up to 10 percent.

Requirements on the Vehicle Equipment and Comfort

The bus fleet should only encompass vehicles which possess an attractive state-of-the-art equipment and comfort, allow for fast and comfortable passenger access and egress, and are accessible to persons with disabilities. This includes the following minimum equipment and characteristics:

- Intermodal Transport Control System corresponding with the PT Telematics project (ITCS: enables vehicle tracking and tracing, driver guidance, operation control and monitoring) and devices (ticket printer/reader, displays, mobile radio/communication network)
- Consistent and easy-to understand on-trip passenger information system:
  - Outside displays on the vehicle front over and over the front door: line number, terminus, important intermediate stops
  - In-vehicle screens/displays: line number, terminus, next and following stops, additional real time information (e.g. status of service, delay, temporary interruption, detours, suspension etc.)
  - Audio system with bilingual stop announcement
  - Bus network plan
  - Basic tariff information
- 2 – 3 wide doors (depending on vehicle size/capacity) for fast and smooth passenger access and egress, thereof at least one door completely barrier-free
- Multi-purpose space (for luggage, strollers, walking frames, wheelchairs, bikes, etc.)
- Low-floor access
- Upholstered seats
- Stop call buttons
- Air-conditioning
- Wi-fi (as an additional incentive for the passengers)

All bus vehicles should follow the "Limassol Public Transport" corporate design features, both internally and externally.

6.3.10 Pre-trip Passenger Information

With printed timetables and web-site services (http://limassolbuses.com) and the web-site 'www.cyprusbybus.com' with countrywide information on public transport and electronic trip planner (also available as mobile app), up-to-date solutions for the pre-trip passenger information are already available.

Regarding the electronic trip planner (website/mobile app), it is suggested to offer users an option of an **address-based trip planning** instead of selecting bus stops from a scroll-down list like right now. On one hand, the actual planner requires the knowledge of the correct names of bus stops, which are presumably widely unknown particularly to the non-regular user. On the other hand, many potential public transport users know the address of their starting point (or they are being localised automatically by the GPS feature in their smartphone) and where they want to go.

The roll-out of "PT-Telematics-project" is under way for providing the necessary prerequisites for real time services. In terms of passenger information (pre-trip and/or on-trip), the system includes:

- Web and mobile applications (the latter called Cyprus buses) for all public transport services in Cyprus providing trip planning and estimated time of arrival at bus stops. The application is directly accessible and via adequate links, which will be installed at all operators' and the Ministry's websites;
- SMS application and smartphone application for receiving real time information on bus arrival on the move;
- Integration with existing front and back LED displays and voice announcement systems within buses and bus stations;
- Installation of 30 LED displays at major bus stations & central locations subject to further expansions in the years to come.

The pre-trip **service of real time information on bus services** would allow bus users to early organise alternative transport options if the virtual connection is delayed or cancelled.

6.3.11 Technology

The on-going countrywide PT Telematics project aims at endowing both buses and bus stops with vending and validating machines and allows the introduction of **electronic ticketing options (travel cards)** and **web and mobile app-based ticket services**. The use of digital technology (e.g. based on a special debit card or on mobile apps) delivers numerous advantages for both bus passengers and operators:

- Mobile apps or travel cards (with charging option at vending machines) allow bus passengers to purchase bus tickets regardless of conventional "analogue" distribution channels and opening or service hours. As a side effect, digital service eases stress from bus drivers, allowing them to focus more on their actual driving tasks.
- When public transport users can conveniently check in and check out in a bus, they produce individual data. These data provide important information to bus operators and support them in the optimisation of their services (transport planning) and operation procedures, e.g. with data on occupancy of vehicles or specific mobility patterns of the passengers (length of in-vehicle stay, transfers between bus lines, typical activity pattern etc.).
- E-ticketing makes the boarding of buses faster since bus drivers do not need to sell tickets. Both passengers and drivers do not have to handle with change anymore. As a result, stop times will be reduced, buses will become faster and travel times shorter. Bus passengers benefit from an earlier arrival at their destination, whereas bus operators are potentially able to optimise the number of vehicles required per line making the whole PT system more efficient.

The choice of the correct ticket for the best price is an access barrier for many public transport users, especially for occasional users. Currently, they need to consider soundly in advance for which and for how many trips they will use public transport before deciding on a specific ticket/tariff, which they do not know if it is really the appropriate one or not. The introduction of an electronic ticketing system offers the chance to lower this barrier since it will be possible for bus operators to offer a „Pay As You Go" option. The optimal fare from the tariff scheme (best price) is automatically calculated depending on their trips undertaken within a specific time interval. The passengers' travel card, smartphone app or bank account are automatically charged with this 'best price' fare.

7 Pedestrian Measures

7.1 Introduction

Walking is the most natural as well as the most social form of mobility. It is available to almost everyone at any time, is free of charge, saves resources, does not cause emissions and requires comparatively little space. In addition, walking is good for your health.

The great importance and the clear advantages of pedestrian traffic are clearly disproportionate to the reality in Limassol. In most parts of the city's network, only leftover areas are designated to pedestrians in contrast to the sufficient or even generously dimensioned roadway space. A convenient and safe footway network with high amenity values is, with few exceptions, rarely found in Limassol city but also in most of the municipality centres. This is particularly worrisome in the light of demographic development, having an increasing share of active elderly population with potentially more disabilities.

The integrated pedestrian network plan aims to:

- Improvement of safe pedestrian infrastructure
  - Provide adequate and wide pedestrian pavements along all urban roads
  - Extend share of pedestrian areas
- Pedestrianisation of commercial streets
- Reduction of road capacities

7.1.1 Current Status

An assessment was conducted on selected network elements in Limassol and five municipality centres to analyse the quality of the pedestrian network. The assessment was based on a set of performance indicators of the walking network's components and was conducted on some major corridors, as well as on selected sections in Limassol city centre and the five municipalities. Quality criteria for the assessment comprised of:

- Existence of separate (raised) sidewalk
- Sufficient width (minimum 1.5 metres)
- Accessibility of sidewalk (height of curb, ramps)
- Existence of obstacles (e.g. trees, pillars and traffic signs or other installations) that limit the effective width
- Parked vehicles (beyond short term)
- Quality of surface (paved/cobbled, damaged)
- Road traffic (low/medium/high volumes, effective speeds)

Based on the indicators listed above, six respective Levels of Service were defined:

A	1	safe and wide, good surface
B	2	safe, wide, deficient
C	3	no facilities, convenient
D	4	seperate, narrow, deficient
E	5	no facilities
F	6	no facilities, dangerous

Figure 44: Walking network: Levels of Service

The detailed results of the pedestrian network assessment are described in detail in Deliverable D5.1 Problem Analysis Report, section 3.5.1.

In general, it can be said that the infrastructure for pedestrians is - with some exceptions - rather inconvenient, poor and partly even unsafe. Apart from the waterfront park, some designated and renovated sidewalks and some more or less isolated Pedestrianised areas, walking infrastructure is

underdeveloped and does not cater for walking to be constituted as a convenient and safe mode of transport.

In Limassol city and in the municipalities, good examples can be found for pedestrianised areas. Some of them are open in the morning hours for loading and unloading. However, they generally lack consistency with respect to connectivity. Furthermore, where pedestrianised areas are intersected by streets, the entrances are very often blocked by illegally parked vehicles, also at night-time.

Some sidewalks along streets are designed in an appealing way with good surface. Nevertheless, sometimes street furniture and trees significantly hinder walking along those roads.

When sidewalks are not protected from vehicle parking (e.g. by bollards) they are usually blocked by vehicles. If they are protected by bollards, quite often the resulting width is very low. The majority of streets though either do not have sidewalks at all or the sidewalks are in an insufficient or even dangerous condition.

The seaside park with good facilities for walking (and cycling and other recreational activities) is separated from the city centre by the 4-lane Spyrou / Christodoulou / 28th of October Avenue with rather high levels of traffic crossing at high speeds. Although there are a number of signalized crossings and a footbridge (with an elevator, mostly not in operation), the road is considered as a serious obstacle.

7.1.2 Objectives of Pedestrian measures

The overall objective of this key aspect is to provide pedestrian infrastructure that can be used conveniently and independently by people with different resources and competencies. The share of walking as competing mode of transport needs to be increased significantly. Specific main targets for the concept were defined to be:

- High Technical and Social Safety standards: pedestrians are the most vulnerable road users, therefore conflicts with other road users need to be minimized, ideally by separating pedestrians from (mainly motorized) traffic. Appealing design, avoiding underpasses or bridges and lighting increase social safety and sense of security.
- Direct connections with minimized detours: walking is quite detour sensitive, therefore origins and destinations for pedestrians should be kept as short and direct as possible (e.g. with respect to crossing roads or intersections). Appropriate signposting helps to reduce searching and detours.
- Appropriate dimensioning: pedestrians need to be able to walk comfortably (possible even in pairs) without conflicts with other pedestrians, cyclists or other obstacles. This includes walking with buggies/ walking frames/ wheelchairs or with some luggage.
- Minimization of obstacles: trees/ tree pits, street furniture, high curbs are hindering all pedestrians and even more so affecting persons with limited mobility. Therefore, besides appropriate dimensioning, arrangement or if necessary, prevention of potential obstacles is crucial.
- Attractive design: appealing design makes walking not only socially safer but also more attractive as a competing mode for short-distance trips. Moreover, consistency of appealing design has a highly positive impact on both, short- and medium-distance trips.
- Requirements of persons with disabilities: apart from the physical accessibility, consistent design and appropriate guidance measures support traveling of persons with limited mobility also in context of interchange between walking and public transport.

7.2 Key Strategies

Walking is the most natural as well as the most social form of mobility. It is available to almost everyone at any time, is free of charge, saves resources, does not cause emissions and requires comparatively little space. In addition, walking is good for your health. Walking does not only serve to cover distances but also comprises aspects of communication and abidance in public streets and places.

It is of utmost importance, to provide pedestrian infrastructure that can be used conveniently and independently by people with different resources and competencies. The share of walking as competing mode of transport needs to be increased significantly.

The key strategies to enhance the extend, safety and quality of pedestrian infrastructure are:

- Adequate and wide pedestrian pavements along all urban roads
  - Sufficiently dimensioned and safe pedestrian infrastructure needs to be implemented successively along all relevant urban roads, convenient usability has to be guaranteed if necessary, with strict law enforcement
- Extension of pedestrian areas in Limassol and the Municipalities
  - The existing pedestrianised areas mainly in the city centre and the core areas of the 5 municipalities need to be extended, seamless and safe walking within the pedestrianised areas has to be guaranteed
- Pedestrianisation of commercial streets with high pedestrian traffic flows
  - Anexartisias street will be converted from a commercial two-way traffic street into a pedestrian zone with buses operating in one direction
- Administrative and policy measures
  - A number of measures to help creating, promoting and maintaining convenient pedestrian infrastructure aims to support the plan to get Limassol pedestrian friendly

7.3 Detailed presentation of measures/ interventions provided in the preferred scenario

With respect to pedestrian measures, the preferred scenario of SUMP Limassol is (amongst others) including:

- Improved safe pedestrian infrastructure (based on design criteria and standards)
- Adequate and wide pedestrian pavements along all urban roads
- Extension of pedestrianised areas in Limassol and the Municipalities
- Pedestrianisation of commercial streets with high pedestrian traffic flows
- Reduction of road capacities to main areas to/ from and passing the city centre

The extension of pedestrian areas in Limassol and in the municipalities is described above in detail in section 5.3, the figures in that section clearly show the proposed situation.

7.3.1 Adequate and wide pedestrian pavements along all urban roads

Sufficiently dimensioned and safe pedestrian infrastructure needs to be implemented successively along all relevant urban roads. The Streetscape Manual[2] produced in the context of the Integrated Nicosia Mobility Plan describes standards for 'Footway Zones'.

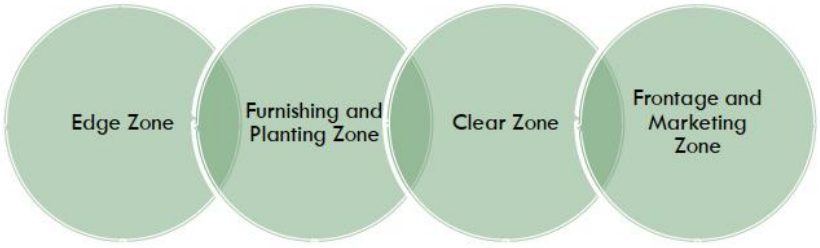


Figure 45: Streetscape Manual: possible segmentation of footways

The zones are described in the manual as follows (see Figure 45):

- **Edge Zone:** This area is immediately adjacent to the kerb (edge of the carriageway) and provides space between vehicles and pedestrians. This area provides a safety buffer against the opening and closing of vehicle doors.
- **Furnishing and Planting Zone:** The Furnishing & Planting Zone functions as a space to contain street furnishings, trees and other objects. Decorative or special footway materials may be used to delineate this zone. This zone provides an essential comfort "buffer".
- **Clear Zone:** The Clear Zone functions as the pedestrians'" unobstructed pathway within the footway". The Clear Zone is essential to safely allow for pedestrian movement, especially for those

[2] Final Report, Maser Consulting P.A. – Ioakim Loizas Architects, Nicosia, 11/2010

with disabilities. Where a footway is 2 metres or less in width, the Clear Zone will be the only zone permitted.

- **Marketing Zone:** This area is directly adjacent to the building and/or property line. Offering a location for outdoor dining, footway displays and/or landscaping is the main purpose of this zone.

The German FGSV research council published a study[3] 'Empfehlungen für Fußgängerverkehrsanlagen' (recommendation on pedestrian facilities), which presents minimum requirements for footways depending on road characteristics.

Road characteristics	Footway width [m]	Land use
Residential street	2,1	Loose housing construction
Urban city street	2,5	Residential use, contiguous development
Urban city street,	3,3	Mixed residential / commercial use, contiguous development
Urban city street with frequent public transport services	4	Mixed residential / commercial use, contiguous development

Table 24: Footway requirements

The proposed widths correspond very well to recommendations from the aforementioned Streetscape Manual: for residential roads, minimum/preferred widths are 1.5/3.0 meters, for (primary) main roads 2.2/ 4.75 meters are suggested.

The following Figure 46 represents an exemplary standard footway cross section in an urban street with mixed use that is designed following the FGSV and Streetscape Manual principles. A selection of the above-mentioned detailed design suggestions with respective requirements were implemented (see **Annex IV, Figure A-IV 1 to Figure A-IV 3** for more examples).

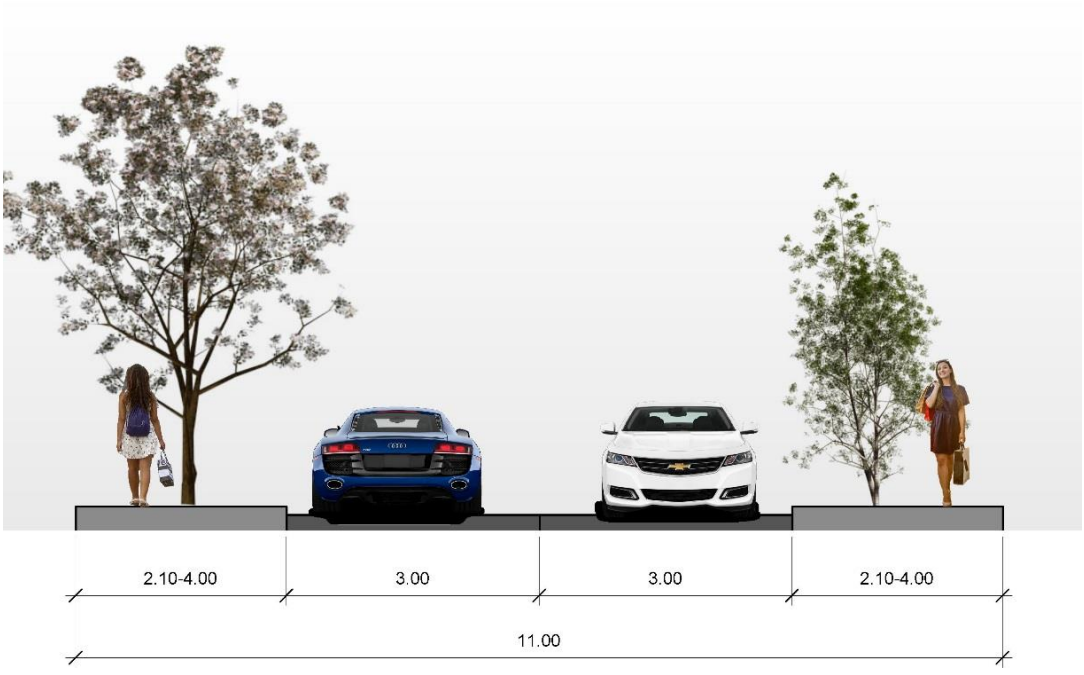


Figure 46: Cross Section Footway

In some cases, the footway is already in place and prevention of (illegal) parking achieves the target. If necessary, bollards may be used to permanently prevent parking, but the bollards themselves should not become the new obstacles. In addition, removing or optimizing location of obstacles such as street furniture, traffic signs/ signposting, billboards, rubbish bins etc. can help to provide adequate walking infrastructure without major constructional effort.

Apart from mere existence and minimum width of sidewalk, the pavement obviously needs to be in an appropriate state so as to allow for safe passage also with walking sticks or frames. Tactile pavers

[3] Forschungsgesellschaft für Straßen- und Verkehrswesen (FGSV), Köln

complement the comfort for visually impaired people and should be implemented at least in the vicinity of crossings or PT platforms.

7.3.2 Extension of pedestrian areas in Limassol and the Municipalities

In SUMP Limassol preferred scenario, pedestrianised areas are foreseen for the entire environmental zone with the exception of some one-way schemes to allow for accessibility of motorized private and commercial traffic.

To guarantee seamless and safe walking within the pedestrianised areas, some (one-way) roads and in case of the coastal area the 2-lane Coastal Road and the bus lanes have to be crossed safely and conveniently. In the preferred scenario, all roads mentioned above have a speed limit of 30kph or less.

All one-way roads within the environmental zone have traffic volumes of less than 200 vehicles per direction in the peak hour. Given also the speed limit of max. 30 kph, no facilities for crossing the streets are necessary. Nevertheless, zebra-crossings can be introduced to increase social safety.

The Coastal Road reaches traffic volumes of approximately 800 vehicles per direction in the peak hour. According to the German guideline mentioned above, this is a combination where either a sufficiently wide island and/ or raised crossings or a signalized crossing can be implemented. A combined option would be alternating simple and signalized crossings. The latter would create sufficient discontinuity between the platoons to allow for safe crossing at the non-signalized crossings.

Figure 4 in section 5.3.1 shows a map with the pedestrianised area in the Limassol environmental zone in the city centre.

As that Figure 48 below shows, the majority of the streets within the core city centre is pedestrianised. Moreover, the pedestrian streets provide access to the most important attractions (PoI, see section 8.3) on foot. In general, pedestrianised streets will be signed with traffic sign 'No motor vehicles' (see Figure 47). Auxiliary signs will be used to define exceptions such as 'Residents only'. In general, access to private off-street parking will be permitted while on-street parking in pedestrianised streets is prohibited apart from parking places for handicapped persons. Where needed, time-restricted permissions will be imposed for freight and delivery vehicles.

Figure 47: No motor vehicles: Pedestrianised street, open for bicycles and Residents only (UK)

Similarly to the Limassol city centre, pedestrianised areas were developed for the municipalities as well. Detailed solutions for the municipalities are presented in section 5.3.5.

Apart from the footways along all urban roads and the pedestrianised streets, signposted recreational walkways will complement the network for pedestrians and more sportive oriented hikers. The medium-distance scenic walkways will connect the city of Limassol with some of the municipalities, the touristic areas in the north-east and a number of cultural/ historic sites. Since the recreational walkways are running mostly in parallel with cycle routes, activities can be combined where desired.

Figure 48: Street conversion: Athanasiou Diakou Street

7.3.3 Pedestrianisation of commercial streets with great pedestrian traffic flows

The most important example is a fully pedestrianised commercial street i.e. Anexartisias shown in Figures 49-51.

Figure 49: Anexartisias street with bus lane

Figure 50: Anexartisias street south of Athinon

Anexartisias street is closed for motor traffic between the Coastal Road and Gladstonos. All buses exiting from the Themistokleous bus terminal go through the section north of Andrea Themistokleous street up until Gladstonos.

Supply and waste disposal services for commercial premises on Anexartisias will be possible either during specified hours before morning peak hour or during night time. Also, facilities on Anexartisias can be accessed from the rear side from Ellados and Georgiou Malekidi at specified hours with specified vehicles (see also section 10)

Figure 51: Anexartisias street near Coastal boulevard

7.3.4 Associated administrative or policy measures

The most important measure to provide safe and convenient infrastructure is to implement appropriate regulations into all planning processes that may affect walking. Establishing adequate regulations with minimum requirements is crucial to end the prevailing current practice of disregarding pedestrians as equal road users. Beyond the regulations, a strict law enforcement is needed to keep existing and future walking infrastructure free from parking vehicles and to remove hindering obstacles. Specific administrative and policy measures to increase (public) space, safety and quality of pedestrian infrastructure are:

- Provision of (public) land for the creation of footways as well as green and quiet places to serve for rest and recreation
- Provision of land and regulations for safety measures to provide adequate space for pedestrians with all types capabilities to access public transport facilities
- Request of provision of land for pedestrian infrastructure as part of residential/ commercial development tenders
- Promotion of walk-to-school schemes in public and private schools (incentives for winning schools)

8 Cyclist Measures

8.1 Introduction

All over Europe, cycling is becoming more and more popular with respect to recreational and sportive activity but also as a convenient mode of transport for serving every-day trips such as commuting.

- Cycling is healthy, improves fitness and reduces stress
- Cycling is a low-priced mode of transport with respect to purchasing a bike and operational costs
- Cycling is faster on short and medium distances compared to public transport and even the private car
- Cycling serves climate and environmental protection, it does not consume fossil energy and is emission free
- Cycling relieves roads, reduces congestion and has lower demand for parking space
- Cycling supports local trade and inner cities since cyclists' shop rather close to their homes
- Cycling means reduced costs for the city (e.g. less investment into road infrastructure despite growing population)

8.1.1 Current Status

The household survey conducted for the SUMP Limassol revealed a share of 0,4% of trips by bicycle! In a city where pleasant weather conditions (apart from summer months when temperature is quite high) prevail throughout the greatest part of the year and which has rather favourable (flat) terrain.

Similar to the pedestrian network, an assessment of the cycling infrastructure was conducted on selected network elements in Limassol and the five municipalities. A set of indicators was developed to analyse the usability and quality of the network:

- Existence of separate cycle paths (raised/ next to road or clearly marked on the road)
- Sufficient width (minimum 1.5m if separated, 2m otherwise)
- Existence of obstacles (e.g. trees, pillars, and traffic signs or other installations) that limit the effective width
- Parked vehicles (short term and beyond)
- Quality of surface (paved/cobbled, damaged)
- Road traffic (low/medium/high volumes, effective speeds)
- Bicycle parking facilities in the vicinity

From the indicators listed above, six respective Levels of Service were defined:

A	1	seperate bike path
B	2	coloured bike lane
C	3	no facilities, good surface, safe
D	4	no facilities, good surface
E	5	no facilities, rough surface
F	6	obstacles, dangerous, heavy traffic

Figure 52: Cycling network: Levels of Service

The detailed results of the pedestrian network assessment are described in detail in Deliverable D5.1 Problem Analysis Report, section 3.5.2

The analysis revealed that apart from the recreational cycling infrastructure along the sea-front park and some river beds, almost no separate infrastructure (dedicated cycle ways or marked cycle lanes) exists. Consequently, the levels of service were rated mainly from 3 to 6, with the best level (rated as 3) mainly attributed to streets characterized by low traffic volumes and good surface so that cycling on the road is convenient and rather safe.

8.1.2 Objectives of Cycling measures

The objective of the cycling measures concept is to provide a framework for the promotion of everyday, as well as recreational/ tourist, cycling. This should help to significantly increase the importance and consequently, the modal share of cycling.

The key targets are:

- To improve the quality of connectivity between the quarters' and/ or municipalities', which could attract people to choose the bicycle for medium-type distances. The longest bee-fly distance between one of the five municipalities (e.g. Ypsonas or Germasogia) and Limassol city centre is less than 8km. By choosing a convenient route, the distance would be maximum 10km which takes up approximately 30 minutes by bicycle.
- To improve the accessibility of social, educational, administrative, commercial, cultural attractions for all person groups, thus allowing almost all people to travel independently almost cost-free to any desired destination in reasonable vicinity (e.g. within the study area).
- To improve interconnectivity with other sustainable modes of transport provides the opportunity to cover also longer distances, for example by combining cycling (own or rented bicycle) with public transport. To a lesser degree the interconnectivity to motorized transport helps to reduce car traffic in central areas by using P & R facilities to change from car to (rented) bike.
- Establishing cycling as an independent and safe mobility mode for children and youngsters caters for their health, also offering greater independency to attend sporting activities or other social pursuits when their parents are not available to transport them. This in turn helps to significantly reduce drop and fetch trips or the need for dedicated school bus services.
- For older people, being able to cycle safely means more freedom to attend social and recreational events, access services when other transport options are not available.
- For people who are economically disadvantaged or do not drive cars, being able to cycle safely facilitates their search for work, access to services and also to retain social connections.
- To improve traffic safety for cyclists and other road users is of utmost importance to establish cycling (and walking) as an every-day mode of transport for short and medium distance trips.
- The promotion and support of cycling helps to reduce motorized traffic and in turn improves quality of life by reducing emissions of pollutants and noise specifically in central, densely populated and used areas.
- By promoting cycling and consequently short- and medium-ranged activities, the city development target towards 'city of short distances' is supported.

8.2 Key Strategies

For bicycle riders, cycling as a low-priced mode of transport is healthy, improves fitness and reduces stress. Specifically in cities, it can be faster on short and medium distances compared to Public Transport and private cars. For the society, cycling serves climate and environmental protection, does not consume fossil energy and is emission free. It significantly reduces congestion and demand for parking space and consequently means reduced costs for the city. For the local economy, it supports local trade and increases accessibility.

The proposed concept aims provide a framework for the promotion of everyday, as well as recreational / tourist, cycling. This should help to significantly increase the importance and consequently, the modal share of cycling.

The key strategies in detail are:

- Development of a coherent, comprehensive and safe bicycle network
  - Implementation of sufficiently dimensioned cycle lanes along all major roads
  - Separate cycle tracks where road space is not sufficient for cycle lanes
  - Dedicated cycle tracks for combined every-day and sportive / leisure cycling
- Associated Bicycle infrastructure
  - Supplementing infrastructure for bicycle parking at or near relevant locations (potentials) such as schools, university, cultural, touristic or retail facilities, public administration
  - Establishment of regulations and guidelines to provide appropriate infrastructure

- Bicycle renting systems
  - Enhancement of current rental systems, implementation of e-bike rental schemes
- Associated administrative and policy measures
  - Creation and provision of adequate infrastructure for cycling and supplementing infrastructure
  - Adoption of cycling requirements into LLP
  - Provision of land for cycling infrastructure
  - Promotion of cycling with regards to commuter (including education) cycling, provision of incentives
  - Promotion and support of bicycle rental operators and facilities

8.3 Detailed presentation of measures/ interventions provided in the preferred scenario

With respect to cyclist measures, the preferred scenario of SUMP Limassol is (amongst others) described

- Development of a coherent, comprehensive & safe (based on design criteria and standards) bicycle network:
  1. Bicycle lanes along all major corridors (LLP - first and second priority axes)
  2. Bicycle only roads for fast bicycle connections (LLP along streams/ rivers) - "greening urban arterials"
  3. Safe and weather-protected bicycle stands at all major destinations

People want cycling infrastructure. Many people say they would like to cycle more, especially if separated cycling infrastructure was provided. There is evidence from around the word: an increased number of people cycling was observed after cycling infrastructure had been built.

More people cycling may also constitute roads much safer. There is evidence that more people cycling may reduce the rate of risk of serious injury and fatality per bike rider from accidents involving motor vehicles. This so-called ‘safety in numbers’ phenomenon is due to factors like:

- greater expectation amongst motorists that bicycle riders will be present
- greater awareness of bicycle riders who are present
- more motorists knowing what it is like to be on a bicycle and behaving more safely around them, and
- motorists’ attitudes improving towards people who ride bicycles.

As a consequence of all the above, the SUMP Limassol aims to significantly increase the extent of cycling infrastructure, obviously beginning from an extremely low level.

8.3.1 Approach

There is a controversial discussion whether to plan and implement segregated cycle facilities. The controversy is mainly about safety. We are clearly on the side of promoting segregated (also referred to as designated) infrastructure, preferably the on-road types (see below Figure 53).

John Forester (born 1929) is a noted cycling activist and known as ‘the father of vehicular cycling’. ‘Vehicular cycling’ in this context means that the cyclist is acting as driver of a vehicle, just as traffic law requires. Forester concludes: “Cyclists fare best when they act and are treated as drivers of vehicles”. Consequently, Foresters’ motto is “The bicycle is a vehicle and belongs on the road.”

We share this idea but combine it with dedicated cycling infrastructure, namely cycle lanes on roads, in contrast to separated cycle ways (or ‘cycle tracks’) usually hidden behind parked cars or other obstacles, often sharing the available space with pedestrians (footways). Apart from potential conflicts between pedestrians and cyclists and adverse cycle conditions due to exits, mainly intersections pose a serious risk for cycling on ‘hidden’ cycle tracks.

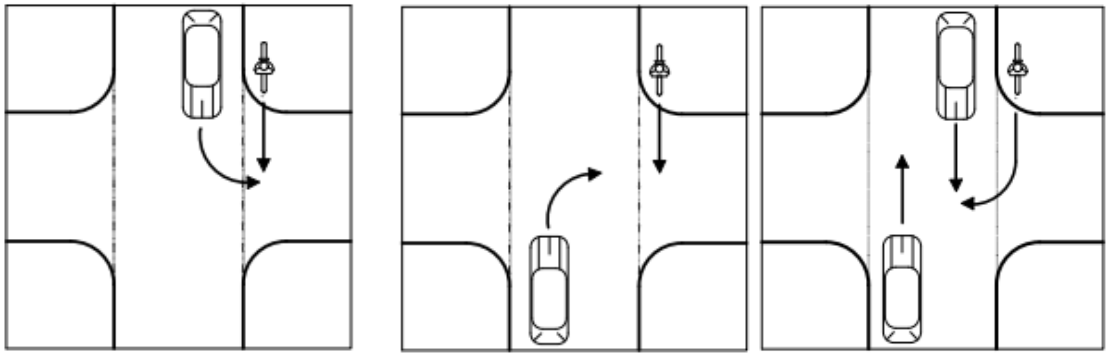


Figure 53: Potential conflicts for cyclists on separate cycle tracks at intersections

For our proposal, we distinguish the following on-road cycle facilities

I. Marked and reserved

II. Marked but not reserved

III. Shared facilities

The description and usage of the two different approaches differs from country to country. Usually they have in common, that I) is separated by a broad solid (white) line while II) is marked with a dashed (white) line. In most countries, I) is reserved for cyclists and must not be crossed by motorized vehicles under any circumstances. Consequently, the marking has to be made in a way so as to consider all necessary crossings by breaking the line where required. A special form of this type of bike lane is the so-called 'protected bike lane'. Here, the actual bike lane is separated from the road by a wide safety area (> 0.85m) or even physical barriers. This increases safety (actual and perceived) but also creates small risk for cyclists to crash in it and fall over. Also, barriers may become an obstacle for pedestrians and specifically handicapped persons that want to cross a road with protected bike lane.

For II) applies, motorists have to give way to cyclists on the marked lane but can cross it in case of necessity. This includes to stop for dropping someone off, or picking someone up, entering or leaving a premise. However, according to the Cyprus Bicycle Regulation from 2018, it is still not allowed to park on any dedicated cycle lanes, be it I) or II)!

An alternative to bicycle lanes would be shared cycle facilities III). In our proposal this is applied in shared bus and cycle lanes.

In case on-road cycle facilities cannot be implemented, separate infrastructure needs to be considered. Cycle tracks, often shared with footways are distinguished

IV. Along the road, usually in parallel alignment either directly besides the carriageway or behind parked vehicles/ trees. With appropriate width, bicycle-only lanes should be preferred over shared facilities

V. Independent from roads as separate right-of-way infrastructure. With appropriate width, bicycle-only lanes should be preferred over shared facilities

For the Limassol SUMP the following specifications (illustrated in Table 25), derived from international regulations and recommendations, for the cycle facilities are proposed:

	Specification	Characteristics
I	➨ Marked with solid line (width 0,25m) ➨ Width inclusive line: 1,8m (minimum 1,5m) ➨ Painted in contrasting colours at least on intersections or major access' ➨ Remaining road lane width: 3,25m (minimum 2,75m) ➨ Obligatory to use for cyclists ➨ May not be used by motorized traffic in driving direction	

	Specification	Characteristics
	➡ Lane be crossed to turn, to access premises, to access parking places	
II	➡ Marked with dotted line (width 0,15m) ➡ Width 1,5m (minimum 1,25m) ➡ Remaining road width: 5m (minimum 4,5m) ➡ Optional (advised) use for cyclists ➡ Can be used exceptionally by motorized vehicles to let pass ongoing vehicles ➡ Lane be crossed to turn, to access premises, to access parking places	
III	➡ Marked with solid line (width 0,25m) ➡ Width > 4,75m allows for passing within the lane OR ➡ Width 3,5m (minimum 3m) ➡ Optional (advised) use for cyclists ➡ Bus and Bike only, may not be used by any other motorized traffic in driving direction ➡ Lane be crossed to turn, to access premises, to access parking places	
IV	➡ Marked with sign bicycle only or shared bicycle/ footway ➡ Width 2m (minimum 1,6m) bicycle only ➡ Width 3m (minimum 2,5m) shared bicycle / footway ➡ Safety distance to parked vehicles: 0,75m ➡ Not applicable with frequent intersections / driveways ➡ Shared bicycle / footway not applicable in case of high pedestrian volumes	
V	➡ Marked with sign bicycle only or shared bicycle / footway ➡ Width 2m (minimum 1,6m) bicycle only ➡ Width 3m (minimum 2,5m) shared bicycle / footway ➡ Sufficient width for shared bicycle / footway in case of high pedestrian volumes (4 to 5m)	

Table 25: Specification of cycle infrastructure

According to the Cyprus Bicycle Regulation (2018):

- Motorists have to adapt the speed and course of their vehicle in such a way as to facilitate the movement of the cyclist
- Motorists passing cyclists have to maintain a safety distance of at least one meter from the cyclist
- On cycle lanes, cyclists have absolute priority over motorists
- It is forbidden to place at any point on a bicycle or bicycle track any obstacle that prevents or is likely to interfere with the free and safe riding of a cyclist

Following the aim to improve cycling infrastructure and taking into account that there is a very dense road network already in place, we propose to establish bicycle lanes along all major roads (see the following Figures 54, 55 and 56 for examples of cross sections and Figure 57 for street conversion).

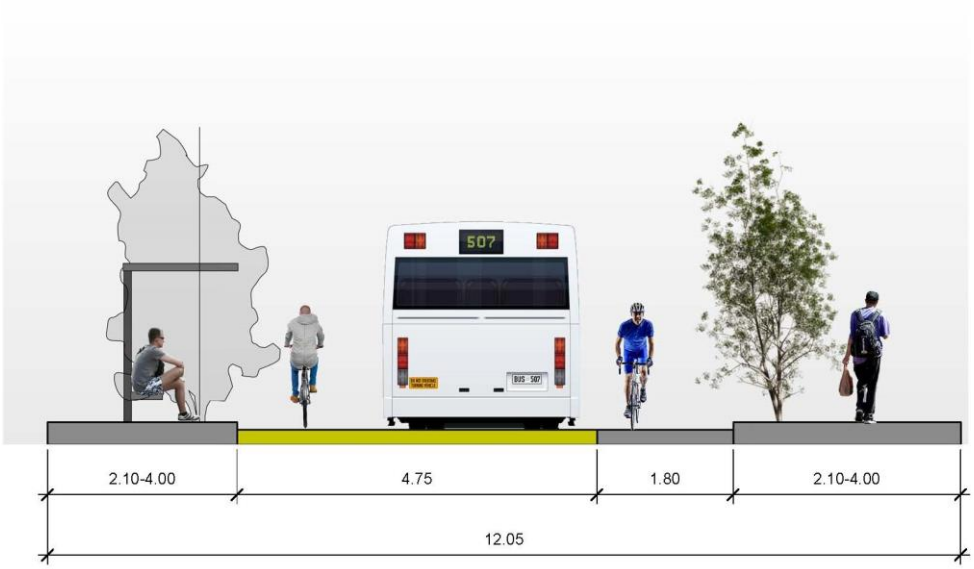


Figure 54: Cross section: one-way street with cycle lane

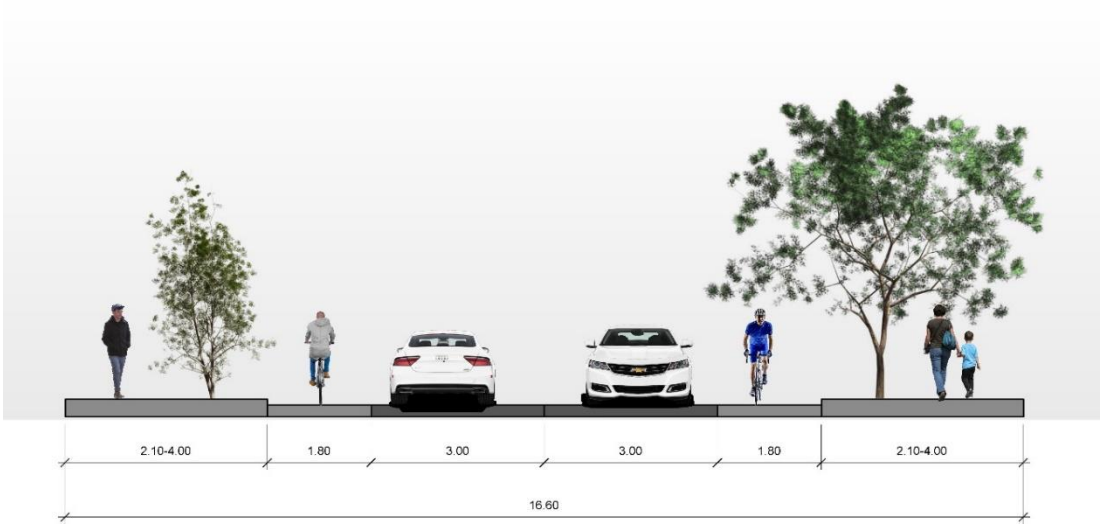


Figure 55: Cross section: road with 2 lanes plus 2 cycle lanes

Figure 56: Cross section: road with 2 lanes plus 2 shared bus/ cycle lanes

Figure 57: Street conversion: Makariou street with cycle lanes

Only under circumstances where this would pose a serious risk on cyclists (and motorists) or an undue obstacle for the traffic flow, separate (shared) cycle ways along the roads will be considered. To guarantee safety for cyclists but also for motorized vehicles and buses, specific design solutions at intersections and bus stops are required. The following figures 58-60 represent some solutions in this respect.

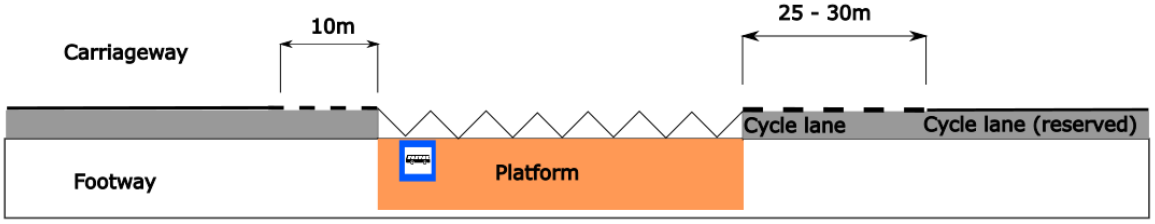


Figure 58: Reserved cycle lane at bus stop

Reserved bike lanes turn into non-reserved bike lanes approximately 25 - 30m before and 10m after the actual stop to allow buses to cross the lane respectively let cyclists pass the buses while buses are stopping for boarding/alighting.

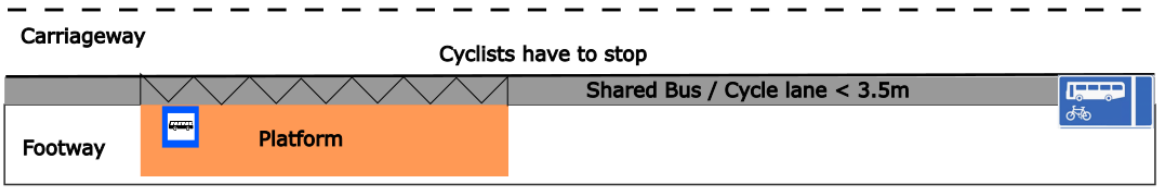


Figure 59: Shared bus/ bike lane < 3.5m

In the solution above, cyclists have to wait at bus stops as while buses are stopping for boarding/alighting.

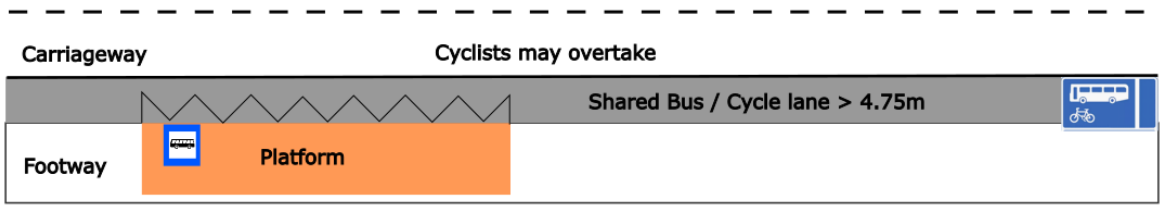


Figure 60: Shared bus/ bike lane > 4.75m

In the solution above, cyclists can pass the bus at bus stops while buses are stopping for boarding/ alighting.

In residential streets, no designated cycle infrastructure is envisaged. Specifically in the environmental and buffer zone, realised speed (significantly lower compared to design speeds) of motorized traffic are assumed to be lower than 30km/h and motorized traffic volumes are certainly below 400 vehicles per hour. On those streets, cyclists can ride their bikes jointly with motorized traffic on the carriageway, where they are clearly visible also approaching intersections.

In the environmental zone, the proposed one-way streets will have cycle lanes and form the backbone of the local cycle network. In the mostly pedestrianised streets, pedestrians have the right of way, but bicycles are also allowed to pass those streets.

Besides on-road cycle facilities and in few exceptions separate cycle ways or shared footways, dedicated separate cycle tracks are already in place, more are planned, and additional ones be proposed. They are mainly following the coastal front and the rivers. Since there is limited potential with respect to regular/ every-day trips such as commuting or errands along those alignments, they also serve for recreational cycling.

In pure residential areas and on small minor roads where there are predominantly very low traffic volumes, cyclists can and should share the road with motorized vehicles (vehicular driving).

8.3.2 Cycle network

A cycle network was developed to improve the local connectivity between quarters, between Limassol city centre and municipalities as well as between the municipalities. Moreover, the focus was on the local accessibility of social, educational, administrative, commercial and cultural attractions.

To reach the targets, a set of attractions in form of Points of Interest (PoI) was developed. The area under consideration for cycle measures covers the city of Limassol with its numerous central facilities, such as service, retail, education and touristic facilities. There is therefore a concentration of important trip potentials in the area. A differentiation to source and destination points does not occur, since destinations always also represent starting points of cycle trips.

In addition to the city centre, there are the adjacent municipalities where sources and destinations are located. This is the case around the municipality centres, which hold great importance for the local activities. Here, for example, short distances are taken to the nearest bakery or supermarket. Of course, the residential quarters, which extend over almost the entire area under investigation, are also important starting points of cycling trips.

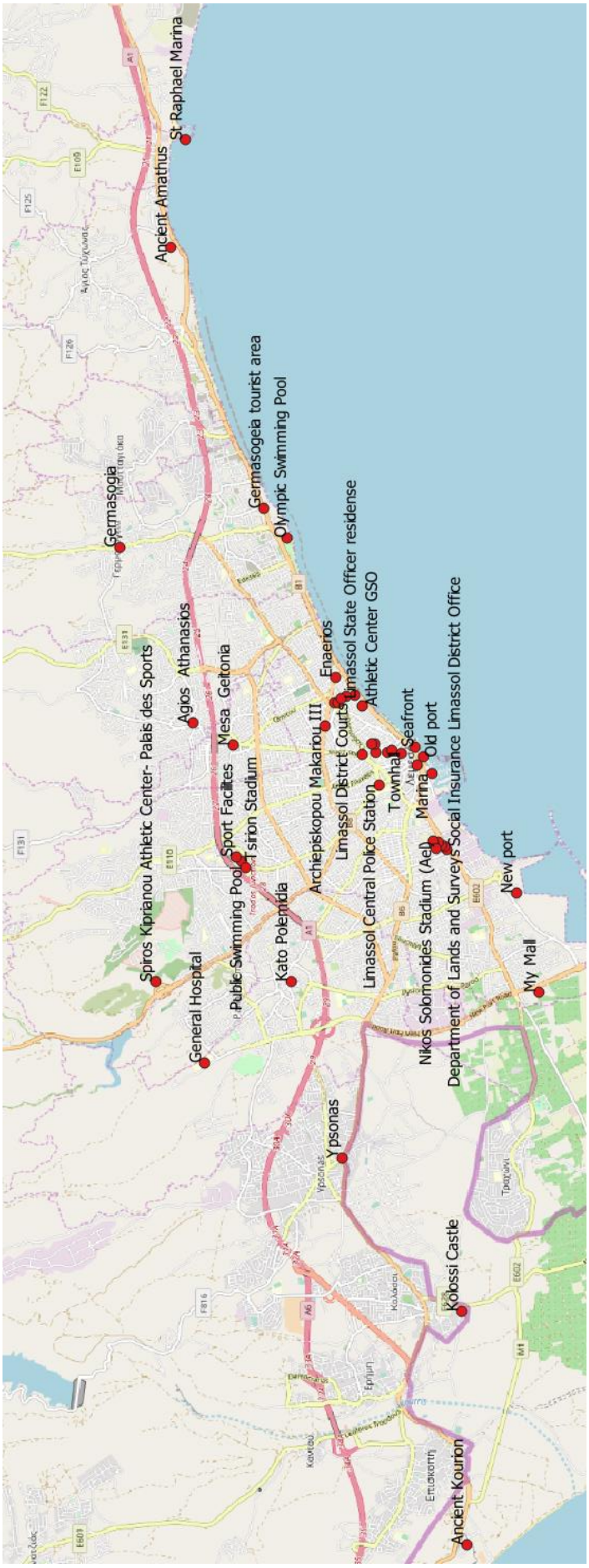


Figure 61: General PoI: study area

Other important sources and destinations for cycling traffic are (or will become) schools, social infrastructure facilities such as administrative facilities, ecclesiastical and cultural institutions, touristic places as well as recreational (e.g. sport) facilities.

Figure 61 represents the Points of Interest (PoI) that were considered relevant for the SUMP Limassol.

Specific attention was given to school locations in order to allow for safe accessibility for all pupils.

The following figures represent the proposed cycle network at different levels of detail. It is structured in:

- Existing cycle ways: mainly separate cycle tracks along the sea front and following the rivers
- Planned cycle ways: mainly extension of existing tracks and some road connections
- Proposed cycle way: to complement the existing and planned cycle way system (mainly along the rivers and along the sea front), an extension towards the north is proposed also to consolidate local traffic and allow for convenient crossing of Motorway A1 near Mesa Geitonia
- Proposed cycle lanes: the scheme described above, comprising of marked and reserved, marked not reserved and shared bus/cycle on-road cycle lanes. In exceptional cases it can be complemented by separate cycle infrastructure, shared with pedestrians or without
- Proposed cycle routes mainly follow rather quiet roads with low traffic volumes. They will have no dedicated cycle infrastructure but will be well signposted (see Figure 62 and 63).

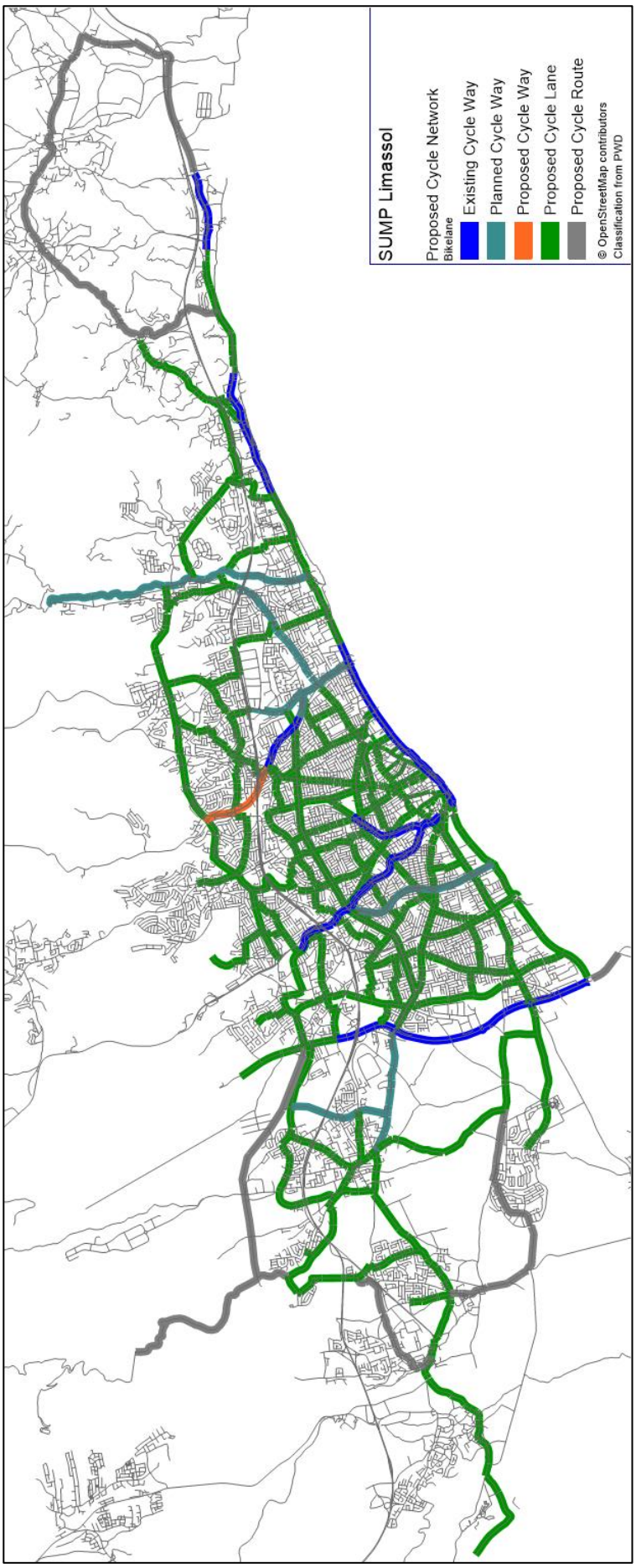


Figure 62: Existing, planned and proposed cycle network: Study area

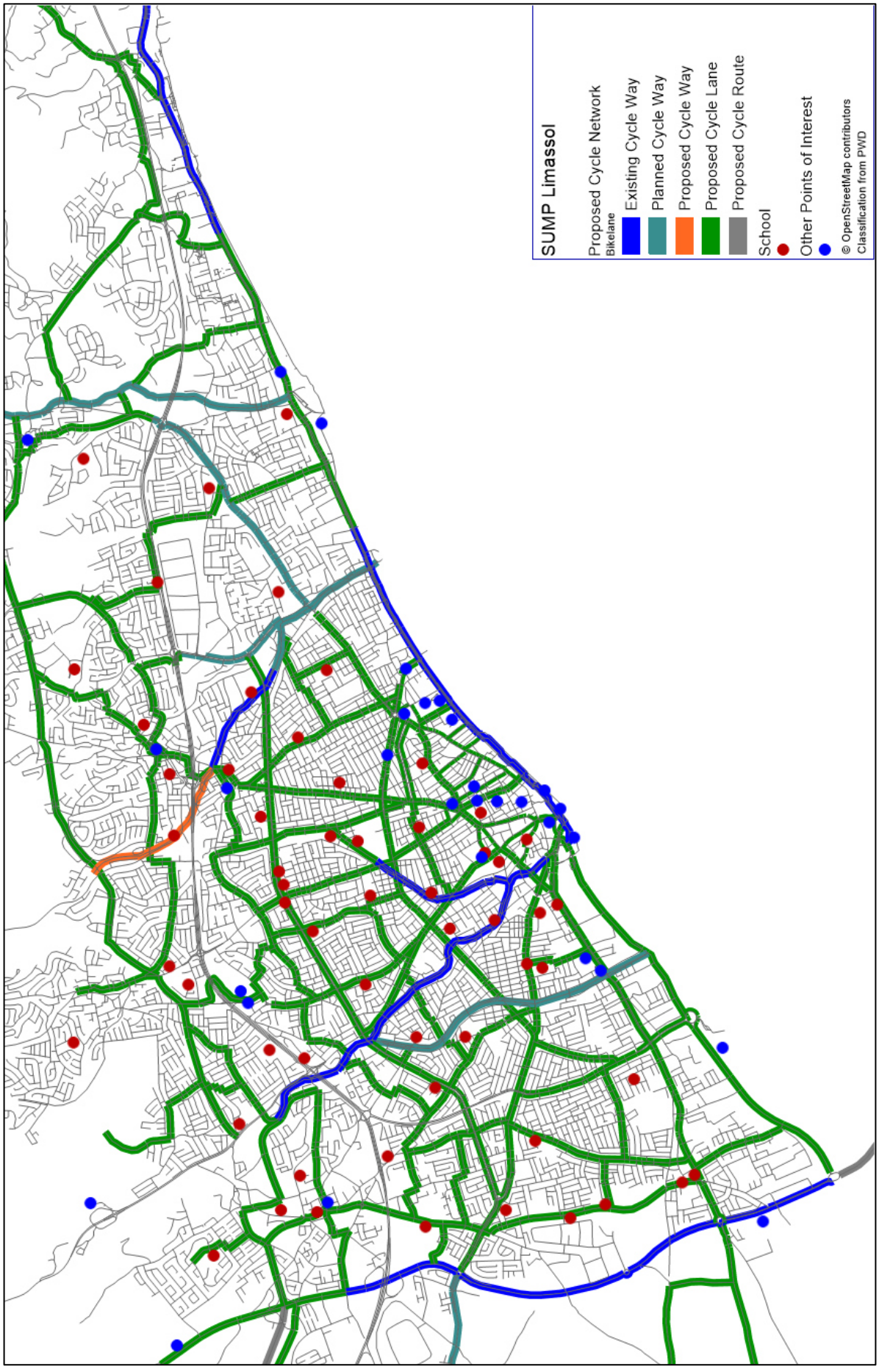


Figure 63: Existing, planned and proposed cycle network: Limassol and municipalities

At the study area level it can be seen that all municipalities concerned are well connected by cycle infrastructure to the city centre of Limassol as well as between each other. In most cases the route can be selected between rather direct connections mainly on cycle lanes along the major roads or alternative routes such as the cycle tracks or cycle lanes on minor roads. Moreover, well signposted cycle routes will form the basis for trips to tourist destinations from the Limassol city centre, from the tourist areas in the North-East as well as from the municipalities.

At the city and municipalities level, it becomes evident that a dense network will provide access to and interconnectivity for cyclists between the major destinations represented by the PoI. In addition, almost all school locations are situated in the vicinity of dedicated cycle infrastructure.

Taking into account that most of the streets in the environmental zone are pedestrianised and open for bicycles, in the Limassol city centre a very dense network allows for riding bicycles safely almost anywhere.

To guide cyclists to their respective destinations, two approaches are distinguished: destination-oriented vs. route-oriented. In the city of Limassol, in the municipalities and between the municipalities (or even quarters), destination-oriented signposting is important for all types of trips. The system can be differentiated hierarchically: main destinations may be municipalities, medium destinations can be quarters and destinations with local context would be of lowest hierarchy. The hierarchical system is in turn reflected in the total distance that it consistently covers for a specific destination. While signposting municipalities may be necessary through the entire study area, a local police station is sufficiently signposted within a radius of few hundred meters.

Route-oriented signposting is mainly used for tourist and weekend bicycle trips (see Figure 64). This type of signposts needs to be complemented with orientation maps and/ or navigation apps to clearly indicate the route and to guide non-locals through unknown environments.

Figure 64: Signposting in Limassol

Figure 65: Example for signposting on quarter / municipality level

In Limassol and the municipalities, a combined signposting system needs to be implemented. On the one hand, relevant local destinations (see PoI above) will be signposted for cyclists and pedestrian likewise as is already now the case in some places. The destinations on this level would be classified under the lowest hierarchical level and need to cover the area of the respective centre only.

It is suggested to amend the local signposting by using colours to differentiate between different types of destinations, for example touristic, administrative, cultural facilities.

The other levels of destination-oriented signposting concern the municipalities and quarters. If those are sufficiently signposted for motorized traffic, a complementing bike-specific signposting could be applied, where the cycle route to the actual destination differs from the route for motorized traffic (see Figure 65). This may be the case where a designated shorter or more convenient cycle route is available compared to the general route.

For the route-oriented approach, one or more appropriate routes connecting the relevant destinations have to be defined. Those can be the historic, cultural, recreational and social facilities and the routes may be assigned to different themes. An example would be the historical route from Kolossi castle via Limassol castle to the Amathus archaeological site along the sea front (see Figure 66).

Figure 66: Example for signposted cycle route Kolossi - Amathus

8.3.3 Associated Bicycle infrastructure

Apart from the infrastructure directly related to the actual bicycle riding activity, supplementing infrastructure mainly for parking and increasing needs for e-bike charging needs to be provided. In many cases, bicycle stands were found only in very few locations, while often even those locations were hardly accessible by bicycle at all (for bicycle stands see also **Annex V**).

For the future, to cater the demand of bicycle parking, appropriate facilities with respect to quantity and quality need to be provided for instance at or near the following potentials:

- Educational facilities such as schools, University premises
- Cultural facilities such as museums, theatres, cinemas
- Retail facilities, malls
- Public administrations

In 2012, a German research council published a study[4] 'Hinweise zum Fahrradparken' (Advice on Bicycle Parking) where amongst others the quantitative demand for parking facilities on the basis of characteristic values was estimated. Moreover, the study reflects on good-practise examples for design and location of parking facilities.

8.3.4 Bike rental system

Numerous shops in Limassol offer bike and e-bike rental. Nevertheless, apart from guided tours where the bikes are transported to or returned from specific locations, the rented bikes must be returned to the shops where they were obtained from.

Currently, from the free-flow operators only Nextbike is renting bicycles in Limassol. The service is station-based currently only at 22 locations (see Figure 67).

Since no data could be obtained , site visits showed that the bikes rented are used for recreational purposes and regular trips by locals and tourists. Following the recreational use, students at the Cyprus University of Technology (city campus at Athinon street) also make frequent use of Nextbike. Although the charging fee for students is reduced (currently EUR 10,- per month), no cooperation between the University and Nextbike is envisaged. On average, about a third to half of the bikes of one bicycle stand is rented simultaneously. For the future, the number of locations should be increased in general. Most

[4] Forschungsgesellschaft für Straßen- und Verkehrswesen (FGSV), Köln

crucial locations will be the P&R places and some major bus stops and of course the Themistokleous terminal needs to have sufficient number of bikes on offer.

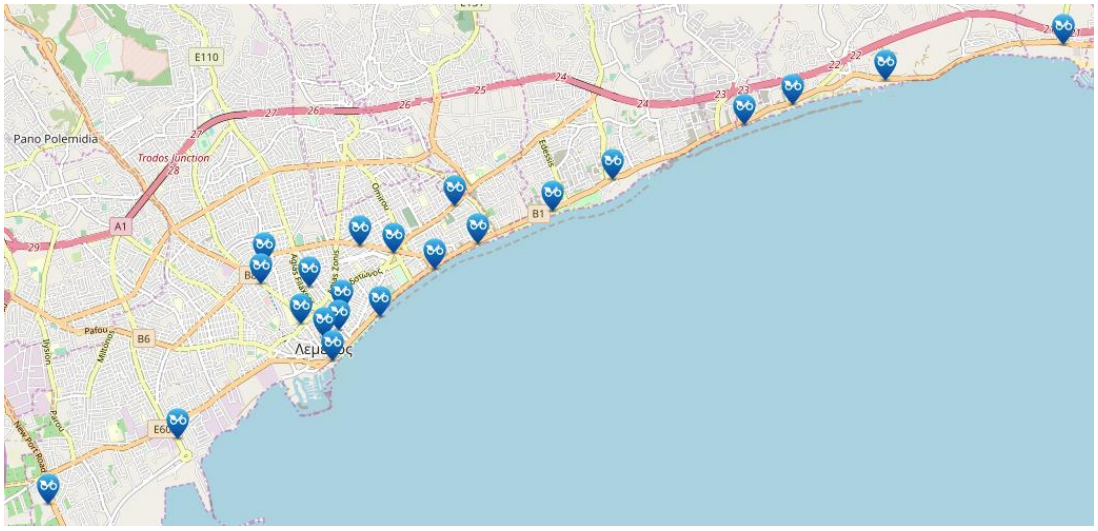


Figure 67: Nextbike rental locations

Currently, no free-flow e-bikes are available, but this need to be envisaged for the future. Specifically for tourists who would like to visit cultural sites such as Kolossi castle or the Amathus archaeological site, the distances within the greater Limassol area (up to 25km from East to West) can easily be covered by e-bikes. Specifically, so by providing convenient cycle tracks along the entire length of the sea front. In this context again, it has to be noted that the existing track is quite narrow in some places. Once the track will be shared by standard bicycles and faster e-Bikes, the width will have to be adopted accordingly.

The estimation of investment and maintenance costs is part of the Cost – Benefit – Analysis (CBA). The LLP includes provisions for cycling infrastructure. Our approach for the SUMP Limassol though has adopted some of the details and proceeds beyond with respect to the extent and level of detail.

8.3.5 Associated administrative or policy measures

Most importantly, creating appropriate facilities for cycling (mainly cycle lanes and cycle tracks) but also creating associated infrastructure (see above) or just providing space for those is considered the best administrative measure to promote cycling. In addition to the actual creation of cycle infrastructure, the implementation of strict requirements and regulations into local planning policies provides opportunities to significantly improve conditions for cycling and consequently for sustainable change of mode of travel preference. Possible interventions in this regard are:

- Adoption of bicycle parking infrastructure requirements into the LLP (e.g. conditions for granting permits to new developments)
- Provision of land for and co-operation with bicycle rental companies to increase the market
- Request of provision of land for cycling infrastructure as part of residential/ commercial development tenders
- Promotion of cycle-to-school schemes in public and private schools (incentives for winning schools)
- Promotion of cycle-to-work schemes in public administration and private commercial entities with financial incentives for participation in respective programs
- Promotion of and incentives for bike leasing schemes in public administration and private commercial entities to provide employees with personal company bicycles that can be used also for commuting and private trips
- Permission to use showers in public entities (e.g. sports facilities) for cyclists

9 Parking

9.1 Introduction

This chapter aims at describing the general principles for a sustainable integrated parking policy in downtown Limassol , which are in line with the sustainability principles and measures of the Limassol Sustainable Urban Mobility Plan (SUMP). The levels of analysis for the proposed parking policy presented in the following sections are the traffic zones, as they have been defined in the transport modelling activities elaborated in the context of the SUMP. The parking policy implementation area corresponds to the 33 traffic zones surrounded by the streets of Omonoias Av. – Roosvelt - Dimokratias – Makariou III and the seafront (Figure 68 below).

The selection of this level of analysis provides a number of benefits, the most important of which being data availability and comparability at spatial, as well as at temporal levels (base year and 2030 time horizon). Indeed, the forward-looking character of policymaking requires for a vision of the future transport system that is based on evidence and is forecast through relevant methodologies. Also, the zones can be aggregated and further analysed in order to inform policy and evaluate the benefits and impacts of the proposed policy choices. Therefore, the figures and calculations presented throughout this chapter are based on the SUMP traffic zone classification, OD data, GIS calculations and the parking survey.

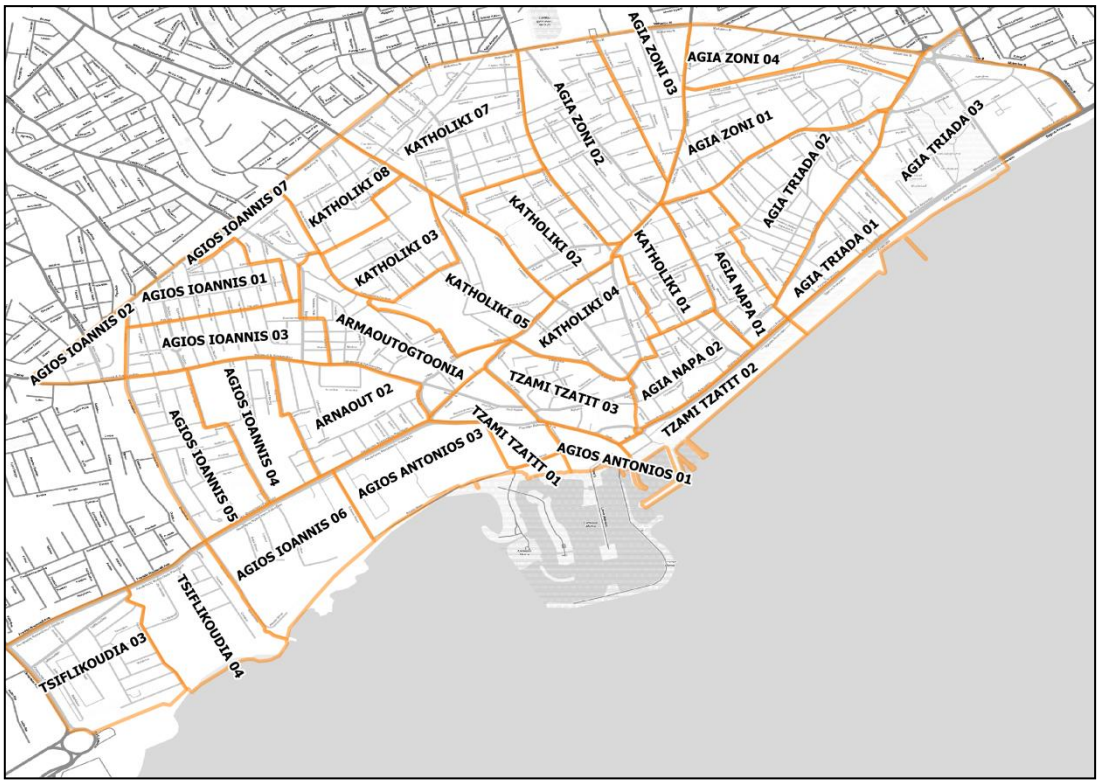


Figure 68: Traffic zones under study for the Integrated Parking Policy

9.1.1 Current status

The current status in the 33 traffic zones that constitute the integrated parking policy study area, exhibits a total population of 20,830 inhabitants, which using an estimated value of 2.6 persons per household, is translated into around 8,158 households. This value was estimated based on the average household values observed for years 1992, 2001 and 2011 and the respective decreasing trend. Car ownership index lies on the high side, meaning that car dominance is existent in Limassol and that there is room for change towards a more sustainable mobility reality.

Estimated parking demand is classified as resident and non-resident demand, with the latter referring to the demand that is attracted to the traffic zones under study. It can be seen in Table 26, that non-resident parking demand is slightly higher than resident demand, which can be explained by the diverse land use characteristics that the study area entails. Total parking demand accounts for more than 27,700 parking places, while the respective number for the estimated supply is a little more than

24,200. This results in a parking balance that currently shows deficit of a bit less than 3,500 parking places. This supply comprises of on-street parking places, resident off-street parking places and off-street parking establishments that include free and paid open air or closed parking areas.

	Base Year (2017)
Population	20,830
Average Household size (estimated)	2.6
Number of Households	8,158
Car ownership index	592
Total Resident Parking Demand	12,331
Non-resident Parking Demand	15,371
Total Parking Demand	**27,703**
Resident/Non-resident Parking Demand Ratio	0.80
On-street parking supply	8,585
Resident Off-Street parking supply	5,832
Sum of On-street& Resident Off-Street parking supply	14,417
Off-street parking supply	9,828
Total parking Supply	**24,245**
Parking Balance [SUPPLY - DEMAND]	**-3,458**

Table 26: Current status parking profile

9.1.2 Objectives of this area of intervention

Mobility is widely acknowledged as a public good that according to sustainability principles, is to be protected not by allowing people to extend the use of their private cars but rather by providing them the necessary options to use Public Transport and the active modes. To the other end, high parking availability, not to mention free parking supply, is obviously against these principles and should be managed in such a way that in the time frame of the SUMP implementation (2019-2030) is fully controlled and rationalized.

Parking supply is in general terms the trigger for a driver to make his/her final decision on how long and how close their car is parked in relation to their final destination. To this equation we now have to add high quality alternatives with Public Transport, walking and cycling.

Taking into account the strong car dependency of Cyprus, this task is obviously not an easy one and has to be gradually implemented and well defined. As any other regulatory framework cannot be achieved – at least in its first implementation steps – without effective enforcement that will be enhanced and supported by innovative ITS solutions proposed for implementation in the relevant ITS supporting systems described herewith.

The Limassol SUMP should among others to be regarded as a Master Plan for changing the city's mobility patterns towards sustainability. Although safety and security for any large city is obviously very important, it is not directly tackled by interventions related to mobility aspects of our daily life. To this end the project suggests an integrated parking policy structure with separate divisions for residential parking permit administration and on street design and enforcement. The extended use of Intelligent Transport Systems (ITS) will allow efficient enforcement through sensors, minimising the time allocated to patrolling to the benefit of their other duties (public order, access control to pedestrian ways, noise levels, health and safety regulations in restaurants and night clubs etc.). Leaving parking offenders to act without control provides the wrong message to the citizens and poses questions on the level of safety and security they enjoy.

9.1.3 General approach – the principles

The basic principles of the proposed parking policy for Limassol are the following:

- Residential parking for those already living in the central areas of Limassol, ensuring at least one (1) parking space per household
- Reserved parking spaces for the Disabled and other special categories of users (e.g. banks, public authorities etc)

- Adequate parking space for loading/unloading for retail stores, restaurants etc.
- Paid on-street parking spots for the public, that should be adequately priced in the years to come, to allow gradual abandonment of the private car
- Paid off-street parking spots which should be rational and fully controlled, taking into account that off-street parking impact is permanent and costly
- Finding a balance between well-defined legal parking options and effective enforcement is a crucial objective. Returning a share of these revenues to the local community can/will raise social acceptance levels
- Land Use policies such as the minimum parking requirements have a strong impact on parking supply and should be re-thought and re-designed in order to achieve sustainability objectives
- Public Transport operations such as Park & Ride as well as specific incentives for enabling modal shift and high-quality services, are deemed essential and should be closely co-ordinated in a central manner.

The Limassol SUMP should among others to be regarded as a Master Plan for changing the city's mobility patterns towards sustainability. Although safety and security for any large city is obviously very important, it is not directly tackled by interventions related to mobility aspects of our daily life. To this end the project:

1. Suggests an integrated parking policy structure with separate divisions for residential parking permit administration and on street design and enforcement. The extended use of Intelligent Transport Systems (ITS) will allow efficient enforcement through sensors, minimising the time allocated to patrolling to the benefit of their other duties (public order, access control to pedestrian ways, noise levels, health and safety regulations in restaurants and night clubs etc.). Leaving parking offenders to act without control provides the wrong message to the citizens and poses questions on the level of safety and security they enjoy.
2. Having a complete master plan in place is one thing, implementing and monitoring its deployment is another. This is the reason behind the formulation of the Limassol SUMP implementation team that is to be formulated in parallel to the SUMP adoption process and will undertake the task to monitor the progress of the interventions and regularly evaluate its performance. This new entity will have members from the Municipal Authority and other key stakeholders in order to ensure seamless operations.

9.2 Key strategies

Figure 69 below describes the proposed structure for implementing a sustainable parking policy for Limassol. In detail, each key strategy is presented in the followings.

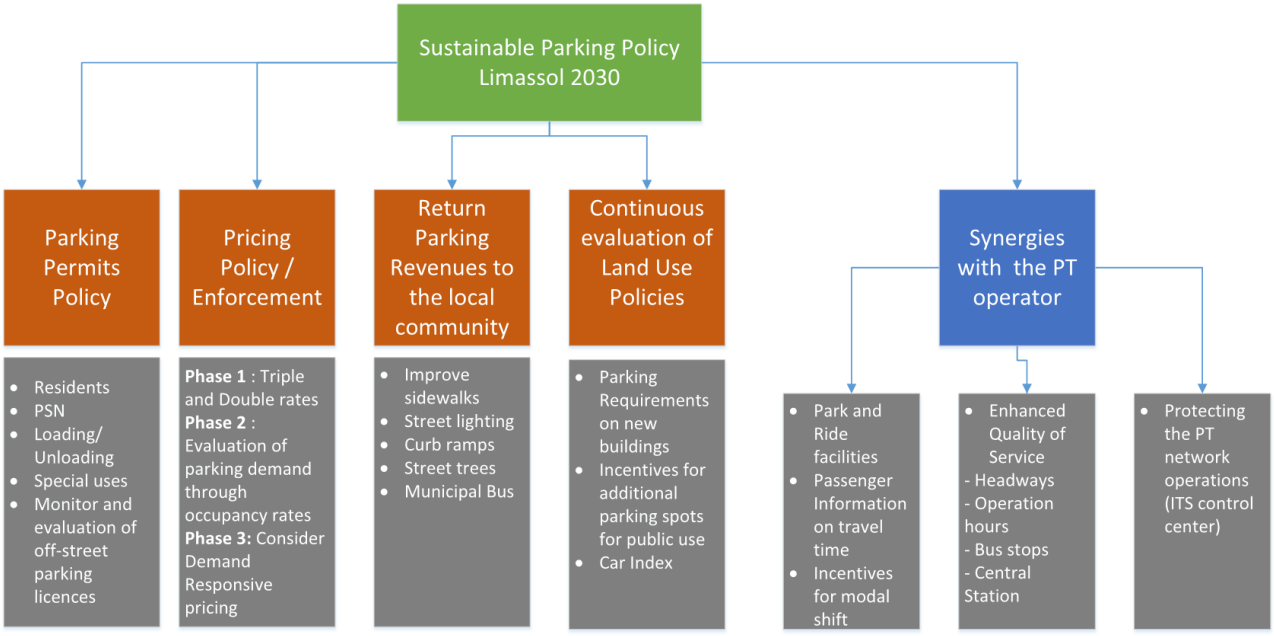


Figure 69: Sustainable Parking Policy for Limassol 2030

9.2.1 Parking permits policy

During the period of migration to new era of sustainable mobility, it is deemed essential to satisfy as much of the residential parking demand as possible. Extended areas of the CBD below Gladstonos str. will have to cope with the new pedestrianized scheme in which more than a thousand (1000) on-street parking spots will be no longer available and new set-ups will have to take place especially in the transitional period.

Parking Permits office is envisaged as a core function of the new municipal parking authority that will have to:

- Receive and evaluate parking permit applications from the citizens for acquiring the parking permit
- Applications for Persons with Special Needs (PSN) parking and other special arrangements based on medical records and other credentials
- Take municipal decisions to create loading/unloading parking spots in the urban network based on type and levels of demand and supply in the corresponding parking zone
- Use a geo-referenced software application to monitor and control supply and demand attributes of on- and off-street parking
- Receive, evaluate or re-evaluate off-street parking license procedures in all controlled areas.

9.2.2 Set the right pricing/enforcement policy

Implementing market prices to parking, is without doubt a very efficient tool for controlling parking demand and should be receive special attention by the Municipal authority. Limassol's strategy on parking was until now based on providing a substantial percentage of the total public parking spots free of charge, a fact that is well justified as a trigger for promoting extensive car use. The new parking policy to be implemented is based on the following main actions:

- Tripling the parking fares in CBD area/ doubling it in Buffer 1 constitutes the starting point for the city.
- An Advanced Parking Payment System should be procured in the next couple of years, enabling collection of dynamic data on status of each parking spot in terms of availability, turnover and overtime parking. The Municipal authority is already searching adequate ICT solutions through Public Private Partnerships.
- Evaluate parking balance per parking zone and make informed decisions on the level of meeting residential demand (issuing more parking permits or not)
- Evaluate the implemented pricing scheme in terms of average occupancy rate/ average parking time per vehicle during peak hours and off-peak.

Consider Demand Responsive Parking options as a means to control demand. The idea behind this system is to be flexible on charging rates based on availability and levels of demand on- and off-peak hours as well as guiding drivers to use underutilized parking spots in a larger distance from the city centre. The city of San Francisco (San Francisco Municipal Transport Authority) has tested this new parking management system between 2009-2011 at 7,000 of San Francisco's 28,800 metered spaces and 12,250 spaces in 15 out of 20 City-owned parking garages with very promising results.

Although sustainable mobility is primarily based on changing behaviours, obviously that change cannot be achieved from the beginning. Any parking regulatory scheme, has to achieve a number of important goals as follows:

- To make clear to all users that we have entered a new phase in our social life
- To make clear that illegal, non-paid on street parking is deemed an anti-social behaviour that is not against the local authority but rather against the local community
- Charges have to be relevant to the time frame, proximity to the core CBD area and overall level of comfort they offer to the user (not too high so no one is using it, not too low to work as a "trigger" for the decision to use their car).
- The average price of 1 Euro/ hour for on-street parking is to be tripled for parking zones in Environmental Zone and doubled for the traffic calming zones. This pricing scheme has been tested by the transport model of the SUMP and found to have a positive impact to the drivers' behaviour if accompanied by all other measures included in the proposal.

- To be simple and logical in order to be comprehended by the users in little time (through informational leaflets, but also through information signs on- the-sport close to the curbs).
- To provide incentives for the users to park for more time and less charge if they are willing to park at a larger yet reasonable distance from the CBD area
- An effective enforcement scheme is essential to get everyone's support (retail store owners, residents and visitors alike) especially if part of the revenues is returned to the local community.
- The users usually decide to take the risk to park either illegally or overtime if current enforcement scheme is loose and their chances to get a fine are less. ITS smart parking solutions proposed in the ITS chapter, substantially minimize the need for on-the-sport enforcement, thus consolidating the need to obey the law.
- Fines for overtime parked vehicles should not be very high, probably giving a second chance by not charging anything to first- or second-time offenders. Fines should not be regarded as a financing mechanism or a punishment mechanism.

9.2.3 Return Parking Revenues to the local community

In many occasions the public debate suggests that we as citizens have been heavily taxed though the years for building the streets, so questions are raised as to whether we have to pay again for parking along them. The idea of using a share of the municipal income from paid parking or fines from illegal parking is a step to the right direction, as it could eventually receive the full support of the residents living in the area, the retailers working in the area and the visitors alike. It is reasonable to say that parking supply (on- and off-street) will not be eliminated due to SUMP's interventions, but rather should be balanced to the extent possible mainly through managing demand and controlling supply.

Dedicating part of the revenues in a transparent way for improving everyday life for everyone in the area, is an important driver for getting citizens' support and also an attractive policy intervention to the benefit of the society. The municipal authority could through this budget to announce and gradually finance:

- Improvements to sidewalks
- Better street lighting
- Planting street trees
- Constructing curb ramps
- Putting Electricity wires underground
- Finance cultural activities.

9.2.4 Continuous evaluation of Land Use Policies affecting parking supply

Defining a strategic goal for sustainable parking management should be to minimize the demand rather than increase supply. To this end, current provisions of the Cypriot land use law for new buildings having to provide minimum number of on-site parking spots seems outdated most likely resulting in more vehicle trip by car for work, leisure and shopping and eventually in new demand for new private parking.

Incentives given to new building investments through Decisions of 22/10/2013 and 29/05/2014 of the Ministerial Council should be re-thought under the light of sustainability principles and changed probably from minimum parking requirement to maximum parking requirements as a starting point.

It is probably the planning and policy tools suggested in this report that should enhance the works of the Special Technical Evaluation Committee (formulated under a Decision recently made (29.07.2015) in order to make informed decisions on evaluating proposals for new high-rise developments taking into account:

- Their location in the road network/ impact on local traffic conditions
- The real parking needs of the area – by avoiding off street oversupply
- Ease of traffic congestion at local level
- Other similar developments in the area.

The existing Parking Incentives Scheme which supports the creation of extra public parking spaces through the increase of the allowable plot ratio expired in January 2019 and it is not suggested for

extension in the future. Controlling parking supply and demand in the greater area of Limassol is deemed crucial in order to implement the Limassol SUMP in the best way possible.

9.2.5 Promoting Synergies with Public Transport Network

A crucial momentum is taking place in Cyprus with regards to the Public Transport Networks and services:

1. The Fleet Management telematics, electronic fare collection and passenger information systems have been successfully launched and are in full operation
2. The new international tenders for all PT concessions in Cyprus, are to be announced within the second quarter of 2019, thus the new contracts are expected to be signed in 2020. New buses and new terminal stations will give a clear sign of change to the new era.
3. Limassol being the first city in Cyprus to complete its SUMP, will provide to the new contract documents an enhanced bus network
4. 100% of the new bus fleet everywhere in Cyprus and in Limassol will be accessible by persons with disabilities
5. The Ministry of Transport is taking all necessary preparatory steps to upgrade the bus stops around the state, as well as other necessary infrastructures such as the central Bus Station in Limassol.

Building synergies and establishing seamless cooperation between the Parking Authority and the Public Transport operator is absolutely necessary in order to get the most out of the raised Bus ridership the soonest possible. Points of mutual interest include:

- Decision of adequate placement of Park & Ride stations along A1 as suggested by the SUMP but to other locations, had both members of this cooperation decide for more
- Gradual deployment of supportive ITS measures for enhancing PT operational efficiency (exclusive bus lanes, bus priority schemes, bus lane enforcement systems, real time passenger information at bus stations, terminals etc.)
- Taking advantage of PT data from the telematics system to design new features at selected bus stops (i.e. bicycle stands, bicycle sharing stations, e-Skates etc.)
- Mutual design of new incentives enabling modal shift towards PT and active modes of transport (abandonment of unnecessary practices like free parking during holidays and introduction of other interventions that do not harm public transport ridership).

9.3 The detailed description of measures

9.3.1 General

The following sections provide an overview of the basic parking management principles and strategies, as well as the methodology used in order to quantify and define in detail the first two (2) key strategies of sustainable parking policy for Limassol Table below sums up the Origin-Destination data used for the parking demand calculation in terms of share, destination and purpose (commute, business, other). It is clear from the table that a modal and car trip purpose shift is expected for year 2030, compared to the base year.

	Total trips	Trip w/Parking Policy Study Areas Destination	%of Total Trips	%of Trips to Parking Policy Study area
Base Year	**553,531.00**	**95,555.43**		
Car Commute	177,086.51	37,997.77	21.5%	39.8%
Car Business	15,484.32	1,994.23	12.9%	2.1%
Car Other	360,960.17	55,563.44	15.4%	58.1%
2030	**560,209.27**	**51,697.42**		
Car Commute	172,882.82	25,885.82	15.0%	50.1%
Car Business	17,877.77	2,326.04	13.0%	4.5%
Car Other	369,448.68	23,485.56	6.4%	45.4%

Table 27: Origin-Destination by car data (base year and year 2030)

It is clear from the table above that car trips to parking policy area will almost half compared to the base year. It also important to highlight that the car trips to the parking study area are almost half despite the fact that the total car trips in 2030 increase slightly.

9.3.2 Methodology & discussion of analysis results

The proposed methodology for the development and implementation of an integrated parking policy in the central area of Limassol is structured upon the consideration of: a) SUMP parking and mobility demand survey data, b) existing and future parking supply estimations, c) land use, d) development of new mobility strategies through new infrastructure and traffic management, e) the current parking regulation and supply in the Limassol CBD, f) the functional characteristics transportation system and g) the estimated for the future (2030) characteristics of mobility patterns after the implementation of the SUMP measures.

The figure below shows the set of methodological steps for the development and implementation of the Limassol integrated parking policy. Detailed description of each step can be found in **Annex VI.**

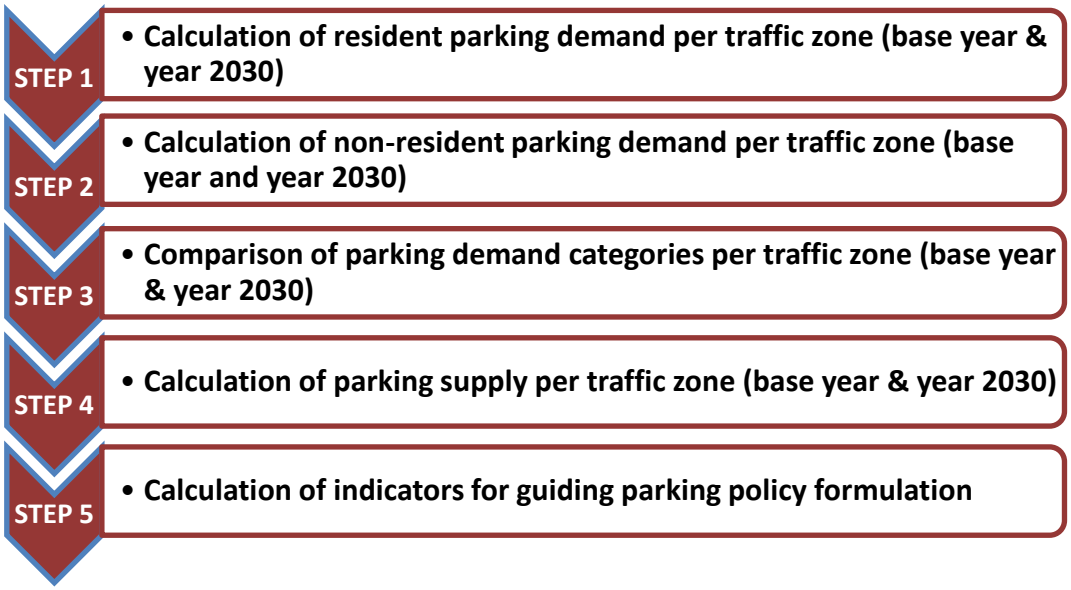


Figure 70: Methodological steps for Limassol integrated parking policy

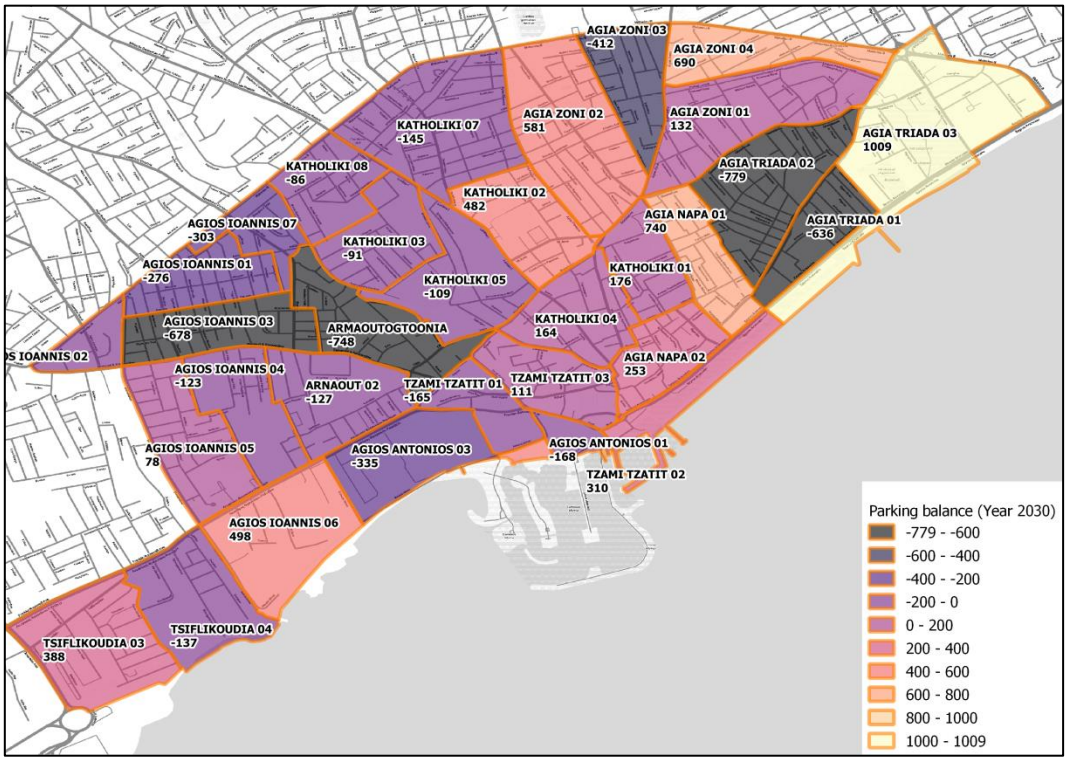


Figure 71: Parking balance per traffic zone for year 2030

As it can be seen in Figure 71, parking balance shows totally different characteristics prior and after the parking policy interventions. This means that although base year shows a total negative parking balance of around 3.400 parking places, by year 2030 this condition is completely reverted, and a positive balance is estimated. In parking policy terms this means that there seems to be no need for additional parking for year 2030, based on the methodology and assumptions presented earlier in this chapter (for more information please refer to **Annex VI**).

Moreover, from a policy perspective, sustainable planning means prioritizing sustainable mobility and environmentally friendly transport modes. Thus, in this context, one should take into consideration that any shortage in parking places does not necessarily mean that policy measures should be adopted in order to satisfy the remaining parking demand, but within a framework of a sustainable modal mix, more people should be attracted into using Public Transport and active transport modes. To sum up, introducing policy measures that provide more parking spaces for private car, results in higher private car usage, which does not align with the objectives of a smart and sustainable modern city.

On the other hand, alternative transport modes can only challenge the car dominance status quo through high quality alternative modes and disincentives for using private cars, especially in a culturally, historically and functionally sensitive area, such as the city centre of Limassol.

9.3.3 Proposals for integrated parking policy in Central Limassol

Taking into account cluster of zones, current and future parking balance and the policies applied by SUMP, five (5) parking policy zones are proposed. The zones are presented in Figure 72 below and the general parking strategy proposals are summarized hereinafter in Table 28.

Parking Policy Zone	**A**
Description	Includes the heart of the CBD and the area where vast pedestrianization is foreseen for 2030. Currently, it is considered having very low resident demand and low on-street supply, however due to the concentration of many off-street parking places, the off-street supply is high. In the future, it is estimated that balance will be achieved between parking demand and supply, with increased ratio of resident over non-resident demand.
Traffic zones included	KATHOLIKI 01, KATHOLIKI 04, TZAMI TZATIT 02, TZAMI TZATIT 03, AGIA NAPA 02, AGIOS ANTONIOS 01, TZAMI TZATIT 01
Proposed Parking Policy	1. Subsidy for residents to use off-street parking, cross-subsidized by non-resident parking fees. 2. Extended on-street parking prohibition, except for special parking places needed for loading/unloading etc 3. Limited on-street parking places along one-way commercial streets for short-term parking of less than two hours. 4. Increase of parking fees.
Estimated balance of supply & demand for year 2030	**By considering the parking balance in each zone (176 + 164 + 310 + 111 + 253 – 168 – 165 = 681), as estimated by the methodology, in this parking zone total supply and total demand show a surplus.**

Parking Policy Zone	**B**
Description	This area near to the core of CBD, along the seafront, is characterized by high residential demand. Non-residential parking demand is expected to be halved by 2030and is also characterized by efficient parking supply, mainly off-street. Although the parking balance is negative in the current situation, it will be improved in the 2030 horizon and will show a slight surplus, mainly due to the high parking supply in Agia Triada 03.
Traffic zones included	AGIA TRIADA 03, AGIA TRIADA 01, AGIA TRIADA 02, AGIA NAPA 01
Proposed Parking Policy	1. On-street paid parking places along the major streets for short-term parking of less than two hours. 2. Increase of on-street parking fees. 3. 30% of on-street parking allocated to residents through resident parking permits with or without fee.
Estimated balance of supply & demand for year 2030	**By considering the parking balance in each zone (740 – 779 - 636 + 1009=334) as estimated by the methodology, in this parking zone total supply and total demand shows marginal surplus.**

Parking Policy Zone	**C**
Description	This parking policy zone consists of five traffic zones, which have three common characteristics (high residential demand, high non-residential demand, and high on-street supply). Regarding the availability of off-street parking, two of the traffic zones have medium off-street supply (AGIA ZONI 01 & 02), while KATHOLIKI 07 and AGIA ZONI 03 have low off-street parking supply. A common parking policy for all zones is proposed to achieve counterbalance between zones. The application of a common parking policy for this aggregation of zones is justified also by the position and function of this area in overall CBD function. The major streets for accessing the CDB area are here and with the SUMP proposals, the role of these streets for city centre accessibility is further increased in the time horizon of 2030.
Traffic zones included	AGIA ZONI 01, AGIA ZONI 02, AGIA ZONI 03, AGIA ZONI 04, KATHOLIKI 07
Proposed Parking Policy	1. On-street paid parking places along major streets for short-term parking of less than two hours. 2. Increased on-street parking fees. 3. Strict enforcement of parking regulation, also including technological solutions. 4. Resident protection from parking demand spill-over: Protective buffer extended to 2-3 building blocks adjacent to the streets where on-street paid parking is implemented and where parking places dedicated to residents is provided.
Estimated balance of supply & demand for year 2030	**By considering the parking balance in each zone (581 – 145 + 690 + 13 – 412 = 846) as estimated by the methodology for 2030, in this parking zone total supply and total demand shows considerable surplus.**

Parking Policy Zone	**D**
Description	This parking policy zone includes traffic zones which in the current situation are characterised by high resident and off-street parking supply, reinforced by resident off-street open-air parking areas. In the 2030 horizon, demand and supply characteristics of all traffic zones in this area are expected to keep the base year profile be normalised and be stabilised to low-to-medium demand and supply conditions. The parking balance in the current situation is negative but manageable, around -150 parking places per traffic zone, and it is expected to be doubled in year 2030. The negative effect to the parking balance of these zones is the result of the increase of resident population. KATHOLIKI 02 traffic zone constitutes an exception, showing important positive parking balance for the time horizon 2030 because of the decrease of non-resident trips performed by car.
Traffic zones included	ARMAOUTOGTOONIA, KATHOLIKI 05, KATHOLIKI 02, KATHOLIKI 08, KATHOLIKI 03, AGIOS IOANNIS 07, AGIOS IOANNIS 01, AGIOS IOANNIS 02, AGIOS IOANNIS 03
Proposed Parking Policy	1. Resident protection from parking demand spill-over: Protective buffer extended to 2-3 building blocks adjacent to the streets where on-street paid parking is implemented and where parking places dedicated to residents is provided. 2. With strong enforcement to ensure the implementation of the resident permit parking system. On-street paid parking places along commercial routes and resident protection buffer zones, especially in KATHOLIKI 02 traffic zone.
Estimated balance of supply & demand for year 2030	By considering the parking balance in each zone (-748 - 109 + 482 - 86 **- 91 – 303 – 276 – 150 - 678 = -1959) as estimated by the methodology for 2030, in this parking zone total supply and total demand becomes slightly deteriorated than existing deteriorated conditions.**

Parking Policy Zone	**E**
Description	This zone includes traffic zones that hosts non-residential land uses and is under development and expansion, both at the level of road infrastructure and land use development. This is therefore a zone where parking policy should be adaptable to the rhythm of the development that will be implemented in the area. This zone includes also one of the major off-street parking of Limassol, near the Marina area, which makes AGIOS ANTONIOS 03 zone to offer high off-street supply. In 2030, the resident parking demand will be increased from low to medium, producing considerable negative parking balance in the area.
Traffic zones included	AGIOS ANTONIOS 02, ARNAOUT 02, AGIOS IOANNIS 04, AGIOS IOANNIS 05, AGIOS ANTONIOS 03, AGIOS IOANNIS 06, TSIFLIKOUDIA 04, TSIFLIKOUDIA 03

Proposed Parking Policy	1. Limited restrictions to on-street parking near supra-local land uses, also for facilitating traffic management. 2. Legislative framework imposing construction of necessary parking facilities to new buildings and real estate developments. 3. Incentives related to (2) above. 4. Strict enforcement of parking regulation, also including technological solutions for doing so.
Estimated balance of supply & demand for year 2030	**By considering the parking balance in each zone (588 – 127 – 123 + 78 - 335 + 498 - 137 + 388 = 830) as estimated by the methodology for 2030, in this parking zone total supply and total supply shows surplus.**

Table 28: Parking Policy Zones A-E: Description, Traffic Zones, Proposed Parking Policy, Supply & Demand for 2030

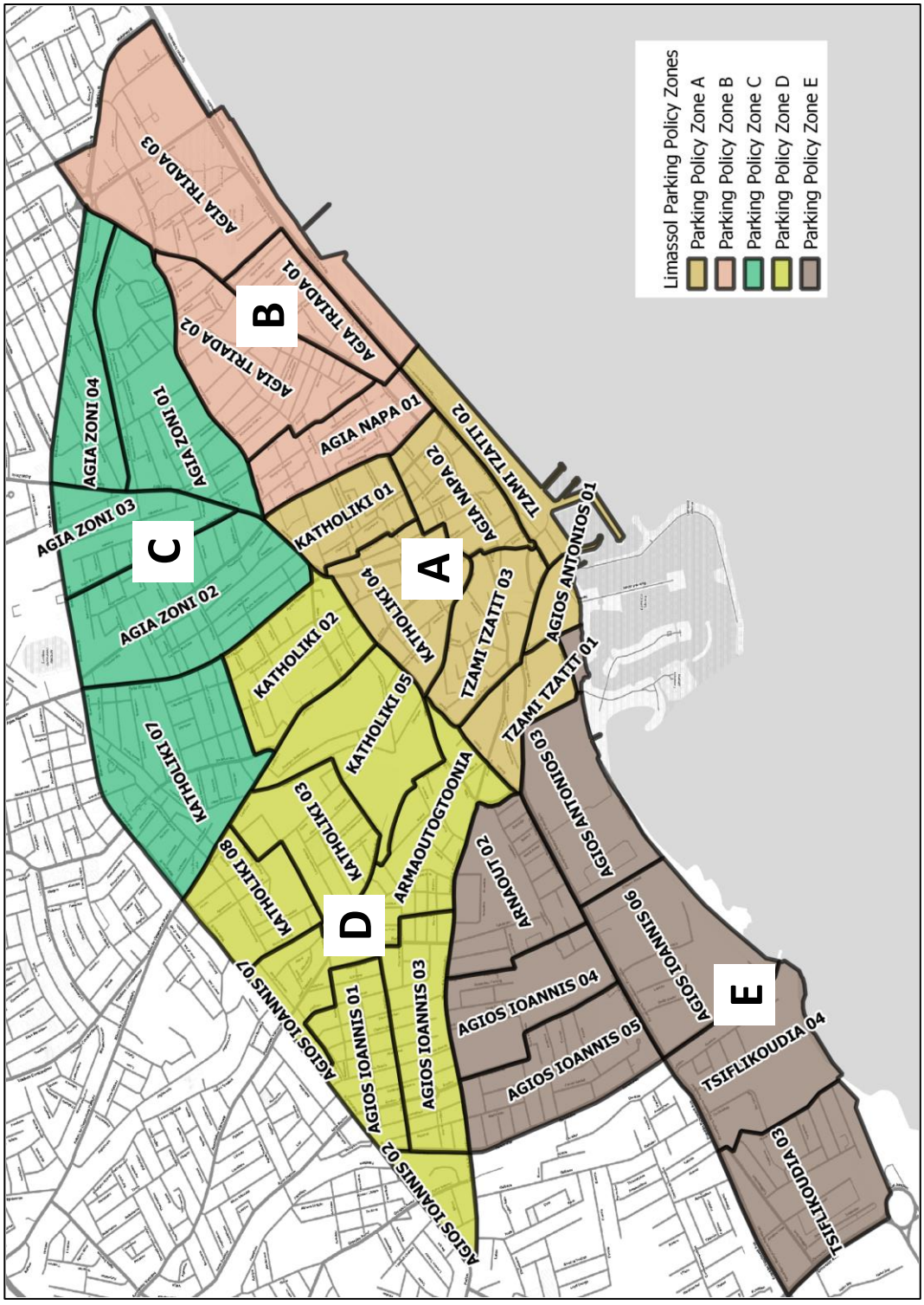


Figure 72: Parking Policy Zones

9.3.4 Resident Parking Accommodation Test

As mentioned earlier, integrated parking policy is based on the efficient use of the existing parking supply, which should also take into account the sustainability objectives set for the city. The distinction between resident and non-resident supply and the estimations presented in this chapter, allows for a closer investigation of the demand per se, as well as the policy directions for each of these parking users.

The different parking characteristics and needs should be taken into account when developing parking policy and protection measures should also be taken, whenever necessary. Parking duration is one of the main differences between the two categories and is directly linked to the trip purpose.

For this reason, non-residents usually park for shorter time than residents, that for longer periods and in locations usually closer to their house. Thus, high parking turnover rates are desired in commercial areas and along commercial streets since it is a measure that supports the financial viability of the system.

However, the spill-over effect of non-resident demand may strongly affect resident parking demand, which means that certain policy measures should be taken, such as secured resident parking though a parking permit scheme. The following Table shows the accommodation of each parking demand type by the three parking demand types, namely on-street, resident off-street and off-street parking, in a phased way, for year 2030.

One proposed policy measure is the implementation of a controlled parking scheme along the main commercial corridors, where pricing policy will be adopted on the basis of a trade-off between incentives for increased turnover and affordability. For this reason the total on-street supply is reduced by the on-street parking places that are destined for use by non-residents and that account for around 1,062 places.

Another policy measure that protects resident parking demand is the allocation of one secure parking place per household, accommodated firstly by the remainder on-street parking supply. As it can be seen in the Table, all five parking policy zones show a deficit, meaning that the remainder on-street parking supply is not sufficient to cover total resident demand. This issue can be considered in detail at the stage of implementation through a specific study.

The remainder of the secured resident demand is expected to be accommodated by off-street resident parking supply, and in such a case, calculations show that parking policy zones A and B exhibit shortage. When considering the supply provided by off-street parking facilities for the remainder of the secured resident parking places, the secured resident supply is covered, which means that special arrangements should be made to ensure that off-street parking establishments accommodate resident permit owners through (cross)subsidization. Remaining non-secured resident demand can be accommodated in resident off-street and/or off-street demand.

As far as non-residents are concerned, the remainder of the off-street capacity can accommodate all remaining non-resident demand that is not accommodated along commercial streets, and the balance is positive in all parking policy zones, except for parking policy zone, that shows a deficit of a bit less than 2,000 parking places to accommodate non-residents.

9.4 Conclusion on Parking Management

This chapter provided an analysis of parking needs in the central area of Limassol, using a methodological approach that, based on data derived from field surveys, transport modelling and statistical analyses, and under certain assumptions, allowed for the calculation of a theoretical parking balance, initially at the traffic zone level. It should be noted that field studies were performed in selected parking routes, covering a small representative part of central Limassol, but the results established the adopted methodological assumptions so as to assess parking surplus or deficit in a much larger area (whole broader city centre) and for two-time horizons, namely base year and year 2030. This parking balance shows large variance among traffic zones, with negative balance ranging from rom 0 to -200 and -400.

As it was seen in Table 26 and based on the calculations presented in this chapter and the respective assumptions (e.g. car ownership, parking turnover etc), base year shows a total negative balance of around 3,400 parking places, while by 2030 the balance is positive. The latter indicates that there

seems to be no need for additional parking for year 2030 (see also Deliverable D5.1). Thus, these calculations that provided insights about potential parking needs, constituted major input for the development of a parking policy that identified the similarities and differences between traffic zones and aggregated them into Parking Policy Zones.

It is very important to point out that, from a policy perspective, parking deficit does not necessarily mean that policy measures should satisfy the remaining parking demand, because this consideration is not in line with the sustainability objectives of a smart modern city that is prepared to address the future mobility challenges in the most environmental, social and economic way. More precisely, the solution lies mostly in convincing more people to use Public Transport and active transport modes through high level mobility services, top quality infrastructure and efficient reallocation of public space. Indeed, the extended pedestrianization of the central area serves such a purpose, but a holistic parking policy should also adopt mitigation measures in favour of affected users.

However, due to the loss of on-street car parks due to pedestrianisation (21% reduction) and the probable loss of private off-street car park areas in the city centre due to new building activity, some flexibility could be given to replace this probable loss of private off-street parking spaces outside the pedestrianized area and maybe more specifically in Parking policy zone D, where a deficit of almost 2000 spaces is identified for 2030. Such a policy measure is also in line with the feedback received from a shop-owners group and the Limassol mayor about the possibility of including these parking areas at least outside the pedestrianised area.

10 Freight logistics

10.1 Introduction

The city of Limassol is a place of great concentration of economic and social activities with logistics being of highest importance for the sustainability and the economy of the city but also the entire region. With the goal to optimize city logistics while preserving the environment and increasing the attractiveness of the city, various measures have to be taken.

Apart from general measures affecting also freight transport, no specific urban logistic related interventions were included in the scenario development. This is mainly due to the lack of detailed input data that would be required in order to generate a dedicated freight model, reflecting realistic transport movements. Nevertheless, interventions such as new roads and road upgrades on the one hand, speed and capacity reductions and even road blockings on the other hand do have an even more severe impact on LGV and even more so on HGV traffic.

The key issues identified for the SUMP Limassol logistics section are:

- The city logistics with respect to the central city area
- The heavy freight traffic caused by the Limassol port's commercial activities

10.1.1 Current Status

As stated in Terms of Reference and as it is obvious in the city, the current logistics system is not based on an integrated concept. Consequently, urban logistics in Limassol is inefficient and causes various negative impacts such as congestion, air and noise pollution.

In the city centre (besides illegally parked cars) urban freight traffic affects residents, shoppers, tourists, cyclists as well as pedestrians but also private motorized traffic.

Especially on the roads towards and from the port of Limassol, heavy freight traffic uses roads that are partly not suitable for trucks. Besides hindering private and even more so public transport, pedestrians and cyclists, residents, shopper/ shop owners, tourists and passers-by are severely affected by the heavy trucks.

Having sea containers loaded, it is quite obvious that a significant share of LGV on Omonoias and also other urban roads use shorter connections to and from the port despite the fact that the generously dimensioned Vertical road was meant to handle port traffic. Permanent traffic counts revealed almost equal HGV volumes on the Omonoias and Vertical road in 2017. This might have been partly caused back then due to road blockings and construction works at the intersection of the Vertical road with motorway A1.

10.1.2 Objectives of Freight Logistics

The most severe problems caused or significantly aggravated by urban commercial traffic are:

- Traffic flow/ congestion issues caused by large traffic volumes, traffic incidents, inadequate driver behaviour
- Noise and pollutant emissions
- Issues resulting from parking and loading/ unloading

Consequently, the main targets of an urban freight logistics concept have to be

1. Minimising the number of vehicle trips by optimizing urban freight transport
   - With optimal routes
   - Consolidated efficient loading
2. Minimising the impact of the traffic
   - Zero or low emission vehicles of appropriate size
   - Delivery/ removal time slots
3. Minimising the impact of parking, loading/ unloading
   - Clearly signed, dedicated loading bays, parking infrastructure
   - Law enforcement to prevent illegal parking, loading/ unloading behaviour

10.2 Key Strategies

The city of Limassol is a place of great concentration of economic and social activities with logistics being of highest importance for the sustainability and the economy of the city but also the entire region. The current logistics system is not based on an integrated concept; therefore, urban logistics is inefficient and causes various negative impacts.

The proposed concept aims to reduce negative impacts, namely congestion in urban environments, noise and pollutant emission

The key strategies in detail are:

- Optimising routes of commercial / freight traffic outside the environmental zone
  - To consolidate trips of commercial traffic, signposted routes serve to direct the vehicles on optimal routes to their destinations
  - Destinations are both, gates to the environmental zone as well as final destinations
- Minimising the impact of commercial traffic generally in environmental zone particularly
  - Access restrictions: no commercial traffic allowed in sensitive areas at all, access from alternative streets only
  - Vehicle restrictions: appropriate size and high environmental standards allowed only
  - Time restrictions: time slots for delivery and removal trips
  - Incentives for consolidation of delivery trips to reduce number of trips
- Minimising impact of parking, loading and unloading
  - Dedicated loading bays for commercial vehicles
  - Clearly signed and specified restrictions and provisions for loading / unloading
  - Designated parking places for commercial vehicles
- Strict law enforcement to prevent illegal parking, loading /unloading
- Optimising port traffic
  - Incentives and regulations to consolidate trips from and to the port of Limassol
  - Optimising routes to / from port by signposting dedicated routes (e.g. between port and motorway A1)
  - Implementation of heavy vehicle restrictions on routes that are currently used as shortcuts

10.3 Urban freight logistics for the city centre of Limassol

The central city logistic proposal will be mainly built upon general experiences acquired in similar projects in European cities. For Limassol and most other cities, there is a fundamental urban freight transport dilemma: the future success of the city centres depends on their effectiveness in different dimensions and those are often contradictory.

Urban areas must be attractive places to live, work, shop and spend leisure time. In this context, they face increasingly severe competition, notably from out-of-town retail and leisure parks. If retailers, other employers and income generators aim to preserve confidence in town and city centres, efficient logistics systems must be provided so that commercial as well as private entities can be serviced in a cost-effective manner.

In contrast, urban planners are very conscious of the need to maintain or improve the quality of city centre environments, to attract shoppers, tourists and workers and perhaps to persuade people to live there. There is a common perception that specifically large and noisy goods vehicles are detrimental to the urban environment. In fact, they are contributing significantly to the problems of congestion, pollution, safety and noise. Therefore, it is obvious, that conflict can arise between commercial interests and the environmental lobby as far as urban logistics is concerned.

10.3.1 Reduction of freight traffic volumes

The Limassol city centre (here considered to be the environmental and the buffer zone) occupying an area of slightly more than 6 square kilometres, will have in 2030 a population of about 24,000 (22% of total Limassol population) and almost 44,000 working places. The latter constitutes more than half of the working places in Limassol.

As an estimate based on empirical data in Germany[5], one resident induces approximately 0.1 commercial vehicle trips per day (commercial passenger car, LGV, and HGV). In addition, one employee induces 0.5 to 1 commercial vehicle trips per day. Based on these data, the area described above induces between 24.4 and 46.4 thousand vehicle trips per day! It has to be noted, a Courier, Express, Parcel service (CEP service) round trip serving “n” recipients consists of “n plus 1” trips.

A large traffic survey was conducted in Germany in 2010[6] aiming to analyse road traffic. Data were mainly obtained from the owners of almost 115,000 vehicles of all vehicle types. The questionnaires comprised of questions regarding the vehicles and also their usage and trips. Amongst the questions, the operators of CEP services were asked for information on the trip chains of delivery tours. This revealed an average of 32 CEP legs within a round trip.

To reduce the traffic volumes, it is important to ensure unavoidable trips to be as short and direct as possible and to avoid detours and search traffic. For this purpose, a clear signposting is crucial, to warn the drivers when roads are inappropriate for their vehicle (e.g. narrow alleys), inform about regulations on roads (e.g. vehicle weight, time restrictions) and parking/ loading regulations.

Not so important for the urban logistic, but even more so for origin/destination and transit traffic (e.g. port of Limassol, see below), is to sign advisory or statutory truck routes mainly for heavy freight traffic. The routes can be defined for several reasons:

- Strategic route to consolidate trucks on suitable (major) roads
- Connections between truck routes
- Access routes to provide suitable access to particular locations

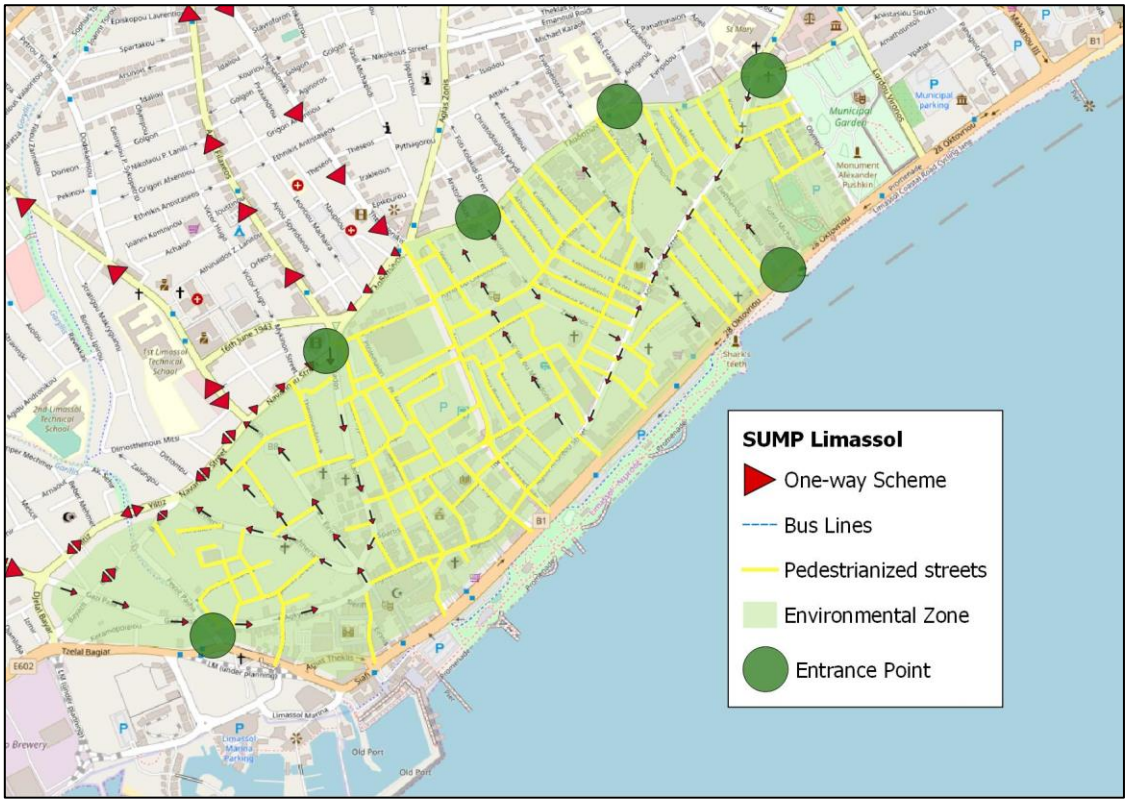


Figure 73: Entrance Points to the Environmental Zone

[5] Hinweise zur Schätzung des Verkehrsaufkommens von Gebietstypen“, Forschungsgesellschaft für Straßen- und Verkehrswesen (FGSV) Nr. 147, 2006

6 Kraftverkehr in Deutschland 2010, BMVBS, 2012

Electronic navigation systems or printed maps should provide the information on truck routes and should be complemented with information on other relevant freight traffic infrastructure such as major freight generators, truck parking facilities, motoring associations. In combination with real-time information and ITS, the freight traffic routes can be optimized, and their direct impact minimized.

For the Limassol Environmental Zone and for the Buffer Zones, a One-Way Road scheme is proposed to service the areas. For the urban freight traffic and particularly for the heavy freight vehicles, proper signposting is required to lead the traffic to the respective entrance points (see Figure 73).

Another important measure to reduce the number of trips and consequently vehicles, is to consolidate the deliveries. There are a number of concepts, also referred to as Central goods sorting point, Urban transhipment centre, Urban Consolidation or Distribution Centre. The idea is to reduce the number of vehicle trips, delivery time (personnel costs), potential reduction in the number of drops, improvement in the volume/weight utilisation of vehicles.

To a certain degree consolidation centres have in common that they may generate additional handling procedures (and consequently costs) to the delivery chain, that competitors would have to cooperate and share knowledge (e.g. about customers). Also, increasingly deliveries are promised and expected in time and partially even more than once a day, which contradicts the concept of consolidating various single deliveries into more efficient consignments. Moreover, consolidation centres require space and as a result induce costs, specifically so in the vicinity of city centres. As a consequence of those (partly perceived only) disadvantages and in combination with the unwillingness of communities to sustainably provide funding to reduce additional costs, (Urban) Consolidation Centres in most cases did not reach profitability in the long run and were abolished.

10.3.2 Reduction of freight traffic impacts

For safety and environmental reasons, regulations with respect to vehicle restrictions can be imposed to prevent vehicles of a certain weight and/or length to use particular streets. In case the restriction is of regulatory nature and physical conditions do not prevent the respective vehicle type from passing, regulations can exempt vehicles that need access for a delivery.

Figure 74: Time regulations for motorized traffic at a pedestrian zone

Time regulations should be used to control urban freight transport, but also private road vehicles. In some areas of Limassol city, this is already the case, providing access to Pedestrianised areas from 6:00 am to 10:00 am only (see Figure 74). Access to Pedestrianised areas will be allowed for vehicles with special permits only. This also applies for the freight traffic, and here the access should be combined with time regulations.

While the current regulations do not specify the types of vehicles or the purpose of the transport, those could be used to control freight traffic.

Figure 75: Access regulation for deliveries

Increasingly, Low Emission Zones (LEZ) are introduced in European cities (e.g. London, Brussels, Antwerp, Berlin) and also elsewhere (e.g. Hong Kong). Depending on vehicle size (Car, Van, LGV, HGV) and emission class, vehicles (private as well as commercial) are either charged for entering/ passing through the LEZ or even generally banned from entering. In some cases, the ban is combined with time regulations.

Due to the worldwide concerns over emissions, a wide range of projects aim to develop and promote Environmentally Friendly Vehicles (EFV), also in the context of urban logistics. Since costs are the decisive factor in transporting goods, while EFVs partially still have higher operating costs (or lower speeds, increasing costs in turn), charging (heavy) polluting vehicles helps to increase competitiveness of EFVs. Another option also suggested for the city of Limassol would be to support EFVs, for example by providing charging stations free of cost or at reduced cost. Additionally, providing dedicated space for parking EFVs near the city's area of operation would facilitate the promotion of environmentally friendly logistics.

Finally, incentives could be given to the most environmentally friendly logistics concept: the cargo bike (with or without electric support). Specifically in the pedestrian zones they can be used without restrictions for delivery of small loads or parcels. Combined with stationary boxes at appropriate places next to the permitted road network, they can serve to reduce the amount weight of the load and allow for multiple tours through the Pedestrianised streets. Taking into account the nature and increasing importance of delivery trips with smaller consignments, this approach can help to significantly reduce the overall impact of urban freight transport.

10.3.3 Reduction of parking, loading/unloading impacts

A study conducted by the Frankfurt University of Applied Science in 2014[7] included the analysis of urban commercial traffic. The findings from the study described above may not necessarily reflect exactly the same issues prevailing in Limassol, but it can be assumed that the situation is very similar, having comparable size of study area (CBD with partly very narrow streets), similar economic characteristics (mainly retail and touristic destinations) and still a significant number of residents.

Negative impacts of parking, loading/ unloading vehicles are:

- occupied (road) space in general
- blocking space for other dedicated uses (e.g. parking reserved for people with reduced mobility)
- hindering other traffic (also cyclists and pedestrians) if parked illegally
- noise and even pollutant emissions from running engines
- noise and even pollutant emissions from air-conditioning/ cooling equipment
- noise from loading / unloading equipment (e.g. cranes, hoisting platform or pallet trucks)

A parking scheme for all private and commercial traffic is proposed for the Limassol Environmental as well as for the Buffer Zone (see also Figure 76). In combination with the Pedestrianised areas, parking is permitted only on designated parking areas which are liable to pay costs. In order to guarantee necessary deliveries of goods and services, loading bays and waiting areas need to be provided. Particularly this holds true for one-way streets and most importantly for those served by bus lines. Here illegally parked vehicles would severely hinder the bus operation and in turn all other traffic.

[7] Optimierung des Wirtschaftsverkehrs in der Frankfurter Innenstadt

Figure 76: Signs to restrict loading / unloading and waiting (e.g. short delivery stop)

Special attention must be given to roads through which bus services operate. In particular in the Environmental Zone, some of the streets with bus services are rather narrow even for one-way traffic (see Figure 77). Here loading and unloading has to be organized in detail for shops, restaurants but also private premises avoiding any interference to the bus operation. For those streets and also for the Pedestrianised Anexartisias street, time regulations could be considered in very early hours or even during the night hours. Due to the small number of residents in those small commercial streets, the impact on residents might be considered reasonable.

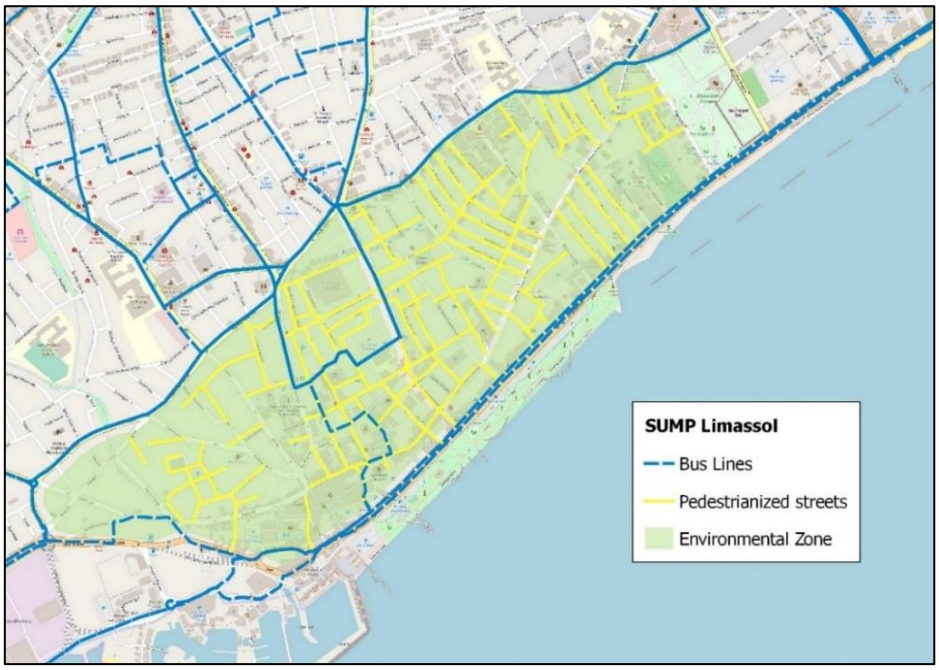


Figure 77: Streets with bus lines

Obviously, strict law enforcement is needed to exact the regulations. On the one hand urban freight traffic needs to be capable to serve residential and commercial premises with goods and services on a regulated bases, on the other hand residents, shoppers, tourists but also workers must not be affected too much by commercial traffic.

10.4 Limassol port traffic

Traffic counts on the Vertical and Omonoias road show almost similar volumes of HGV traffic of approximately 300 to 500 trucks per day and directions. Site visits indicate, that a significant share of the trucks on Omonoias are semi-trailers loaded with 6 and 12 metres (20/40ft) ISO sea containers.

On the one hand, those trucks are affecting residents and passers-by, pedestrians and cyclists as well as other motorized traffic, on the other hand the road is partly not suitable for such heavy trucks. In contrast, given that the Vertical road with 2 lanes per direction as a high capacity and has an alignment not so close to built-up environment, the number and intensity of effected people is far lower.

Therefore, as a measure to consolidate freight traffic (but potentially also coaches) to and from the port, a clear signage of the proposed lorry route in combination with restrictions on Omonoias road should be applied.

No detailed data on port turnover in terms of quantities handled, imported and exported were made available. Apparently approximately 300,000 containers (TEU) and 3,000,000 tons of cargo are currently handled per year. It is not known how much the internal turnover between vessels and what enters and leaves the port exactly is. But the maximum per day and direction would be 500 trucks loaded with containers and 250 trucks (20 tons payload) loaded with other cargo. This would correlate with the counted total of 1,800 HGV on Omonoias and Vertical road, taking into account also a share of local freight vehicles.

The population of the urban area of Limassol represents a share of about 20% of the total Cyprus population. Assuming this to be also the share of goods to remain in the wider Limassol area and the rest to be distributed by road transport to the other 4 districts, approximately 650 loaded trucks plus estimated 50 empty return vehicles per day and direction should be consolidated to and from the motorway A1. Although the route via the Vertical road is slightly longer compared to Omonoias (1,4km), the travel time even in the unloaded network is shorter by 2 minutes.

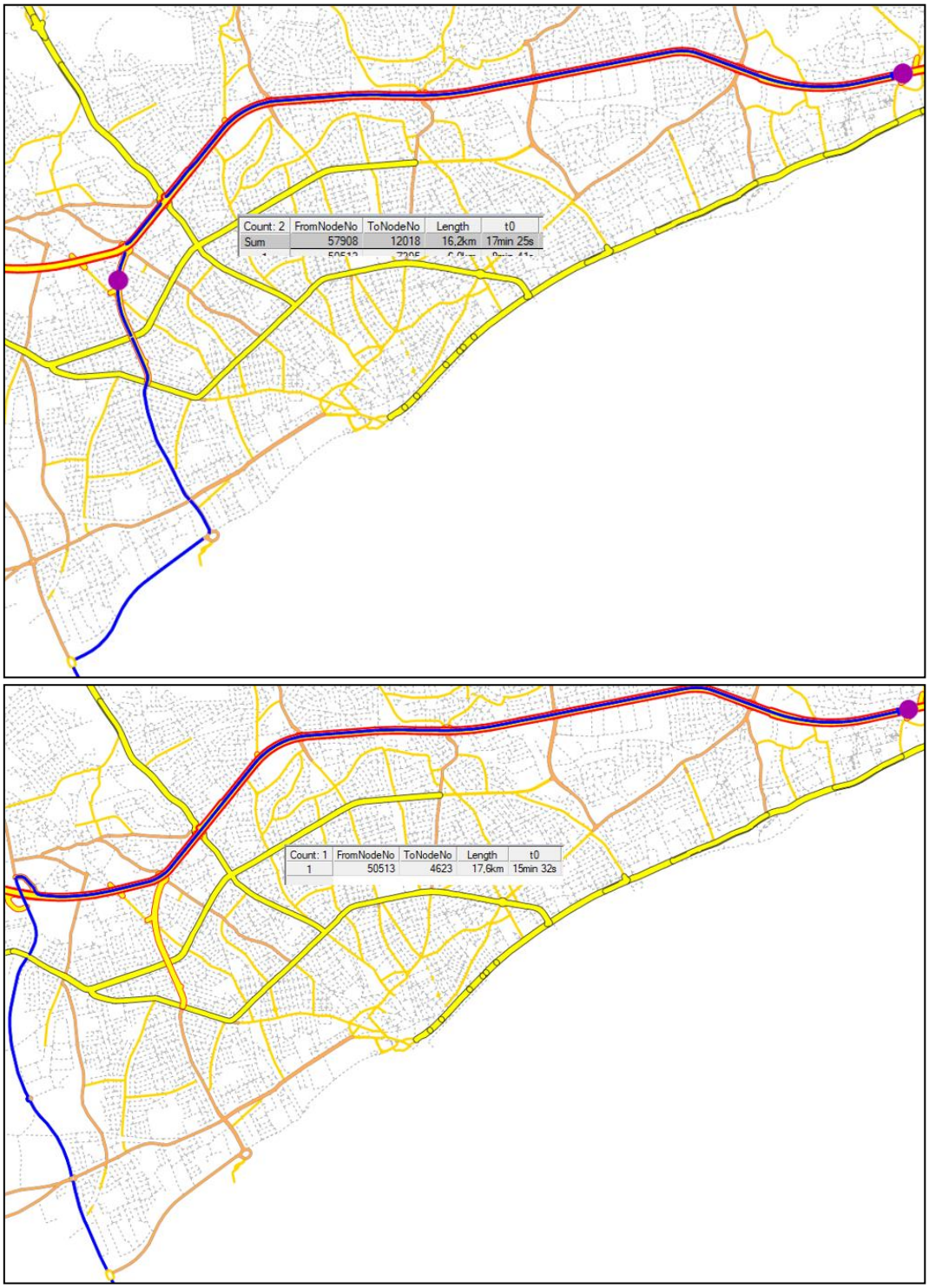


Figure 78: Comparison of routes to/from the port of Limassol

This would be achieved by signposting the proposed route via the Vertical road already at the port exit gates for traffic leaving the port, additionally the eastern port exit could be permitted for local freight traffic, buses and passenger cars. In the opposite direction, the port of Limassol should be clearly signposted at the motorway A1 exit signs. This would include (coming from the East) indicators already from the city entrance to not use an exit before the Nikaias/Vertical road. In addition, Omonoias road should be closed for trucks of a length exceeding 15 metres (with exception of local delivery).

11 Traffic Safety

11.1 Introduction

Road safety is an integrated system of infrastructure, infrastructure components, rules and regulations, behaviour and attitudes of road users, moving vehicles, cyclists and pedestrians, individual behaviour of drivers and other road users. Road safety obviously has a major impact on those who are directly affected by an accident, but it also impacts on the perception of the transport system, the possibilities to use the public road space for different activities ranging from moving with motorized vehicles, cycling, walking, lingering. Consequently, it affects the freedom of people and particularly of the younger generation to use the road space or to being allowed by their parents to use it.

11.1.1 Current Status

A road network safety analysis was conducted and revealed

- Serious problems with parking on and next to the roads, in bus bays, at intersections
- Significant shortcomings of markings and signage/combinations thereof
- Inadequate road lane widths
- Safety issues with multi-lane roundabouts
- Serious insufficiencies of pedestrian sidewalks
- Almost total lack of road cycling infrastructure
- Unsafe unsignalized pedestrian crossings

Also, a safety inspection of 3 kilometres of Limassol city roads was conducted, confirming in detail the general findings of the network safety analysis. Moreover, an accident accumulation zone analysis was conducted for road accidents from the years 2013 to 2016. In general, it can be concluded from the analyses that the road safety situation in Limassol needs massive improvements. The detailed results of the analyses can be found in the Problem Analysis Report (Deliverable D5.1).

11.1.2 Objectives of Traffic Safety

Road and traffic safety strategy as part of the SUMP aims to mitigate the risks for all road users. Therefore road safety measures are chosen to reduce the number of accidents as well as the number of injuries and fatalities on the roads of Limassol. The goal is to create safe infrastructure for all road users, especially improving the situation for pedestrians and cyclists. All road users should have a feeling and perception of safety on Limassol's road network. A safe road network which considers the needs of all road users and furthers non-motorized and public modes of transport is required to enable the mobility of all generations, especially younger ones.

11.2 Key Strategies

A road network safety analysis, a specific road safety inspection and an Accident Accumulation Zone analysis were conducted for the SUMP Limassol. The analyses revealed serious issues concerning road safety in a wide range of aspects from parking, to marking and signage, lighting, cycling and pedestrian infrastructure, lane widths and multi-lane roundabouts.

The aim of traffic safety proposal is to mitigate the risks for all road users. The key strategies are:

- Safe pedestrian crossings using (physical/raised) road median as crossing-aids to increase safety for crossing pedestrians and block vehicles from overtaking (e.g. stopping buses)
- Separated / protected right turning signal phase as standard to reduce risk of head-on collision, improve safety of crossing pedestrians
- Pedestrian signals with sufficient green-times at all signalised junctions
- Improvement of visual contact/reduce sight obstructions, enforcement of organised safe parking
- Road network classification under safety aspects considering flow and access functions
- Reduce number of lanes to reduce speeds and minimize overtaking manoeuvres, shorten turning lanes
- Improve equipment for handicapped people (e.g. acoustic signals during green time)
- Crossings aids at public bus stops to allow for safe crossing and reduce risk of vehicles overtaking stopping buses

11.3 Traffic Calming Programme

As described in sections 5 and 7, several schemes are proposed for traffic calming. Besides some one-way streets, the environmental zone is fully pedestrianised (see Figure 79). In the buffer zone and the home zone, one-way schemes and other measures are proposed to complement traffic calming outside the Environmental zone.

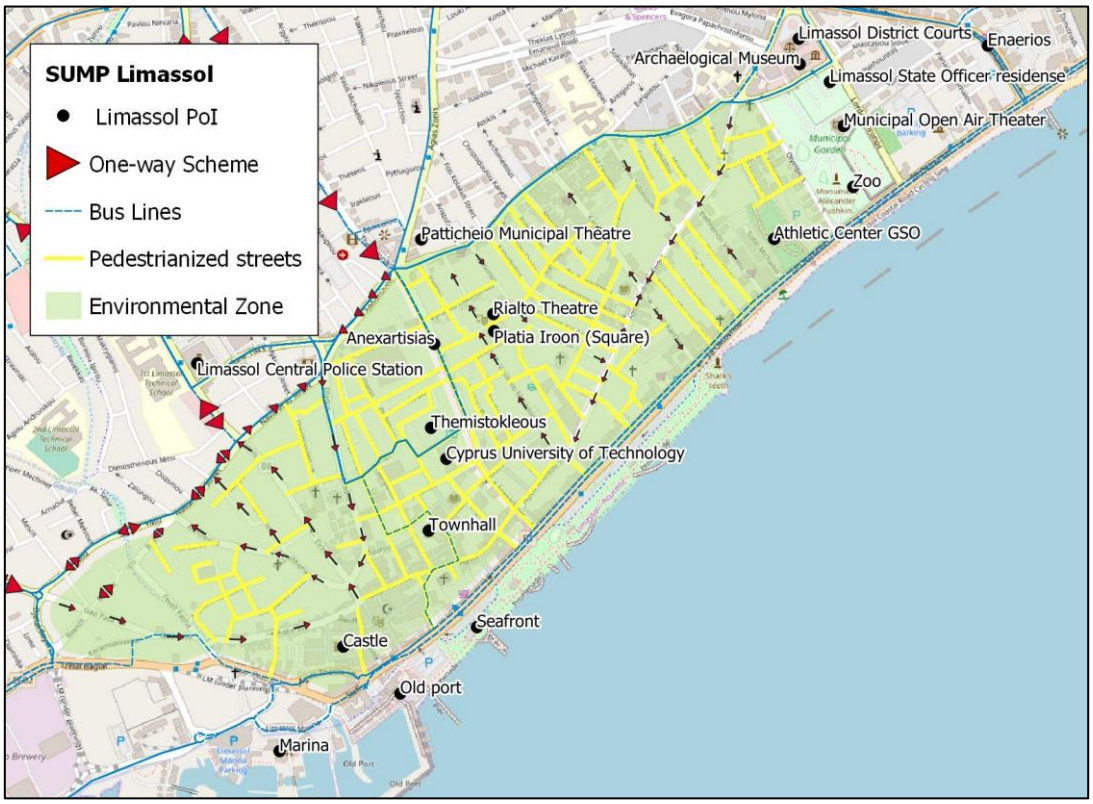


Figure 79: Environmental Zone: Pedestrianisation of city streets and one-way scheme

As described in section 5.3.6, due to the low number of buses operating in pedestrianised streets (compared to current volumes of private passenger cars, LGV, HGV and buses) the conflict between buses and pedestrians/cyclists can easily be managed as many examples around the world show.

11.4 Accident Accumulation Zone analysis/mitigation

Current Status - Results Accident Accumulation Zone Analysis Limassol 2013 - 2016

Accident accumulation zones are areas where accidents repeatedly occur. Often local features (conspicuities) of the traffic situation, mainly the infrastructure, contribute to such accidents taking place. Road accident accumulation zones are areas in the road network with a minor spatial extent, at which a defined limit of number of accidents is reached or exceeded. Accident accumulation zones can be traced at curves, junctions or intersections.

For accident accumulation zones in urban road networks, the following criteria are defined in the German guideline for local accident investigation Merkblatt zur Örtlichen Unfalluntersuchung in Unfallkommissionen [MUko12]8 (Guideline for local accident analysis in accident commissions):

Period	Number of accidents	Spatial extent
3 Years	5 accidents with injuries	50m

The aim of the Accident Accumulation Zone Analysis is to filter out accident-promoting factors of the traffic system and to provide hints in regard to the most common accident sites in the road network so that their corresponding problematic issues can be rectified in order to reduce the risk of accidents. The Accident Accumulation Zone analysis of the provided accidents from 2013 - 2016 revealed 12 road accident accumulation zones in the city of Limassol. The Accident Accumulation Zones are listed below

[8] Merkblatt zur Örtlichen Unfalluntersuchung in Unfallkommissionen - M Uko, Cologne: FGSV-Verlag

in Table 29 the form of a ranking order and a map (Figure 80). The ranking considers the following criteria:

- First ranking criteria: Number of accidents with fatalities and severe injuries
- Second ranking criteria: Number of accidents with only light injuries

Road accident accumulation zones:

	Location	Accidents	Accidents w/ fatalities	Accidents w/ serious injuries	Accidents w/ slight injuries
RAAZ 1	Arch. Makarios III Ave / Agias Fylaxeos	7	1	4	2
RAAZ 2	Spyrou Kyprianou Ave / Omonoias Ave	8	0	4	4
RAAZ 3	Arch. Makarios III Ave / Despoinas kai Nikou Patichi	5	0	4	1
RAAZ 4	Arch. Makarios III Ave / Agias Sofias	5	0	4	1
RAAZ 5	Anemonis / Lotou	7	0	3	4
RAAZ 6	Kolonakiou / Ayiou Athanasiou	7	0	3	4
RAAZ 7	Parou / Fragklinou Rousvelt	5	0	3	2
RAAZ 8	Arch. Makarios III Ave / Georgiou Averof	6	1	1	4
RAAZ 9	Nikou kai Despoinas Pattichi / Christofi Ergatoudi	6	0	2	4
RAAZ 10	Spyrou Kyprianou Ave / Agias Fylaxeos	6	0	2	4
RAAZ 11	Arch. Makarios III Ave / Vasili Michaelidi	5	0	2	3
RAAZ 12	Polemidia Junction	7	1	0	6

Table 29: Road accident accumulation zones

The following figure represents the locations of the Road accident accumulation zones within the network.

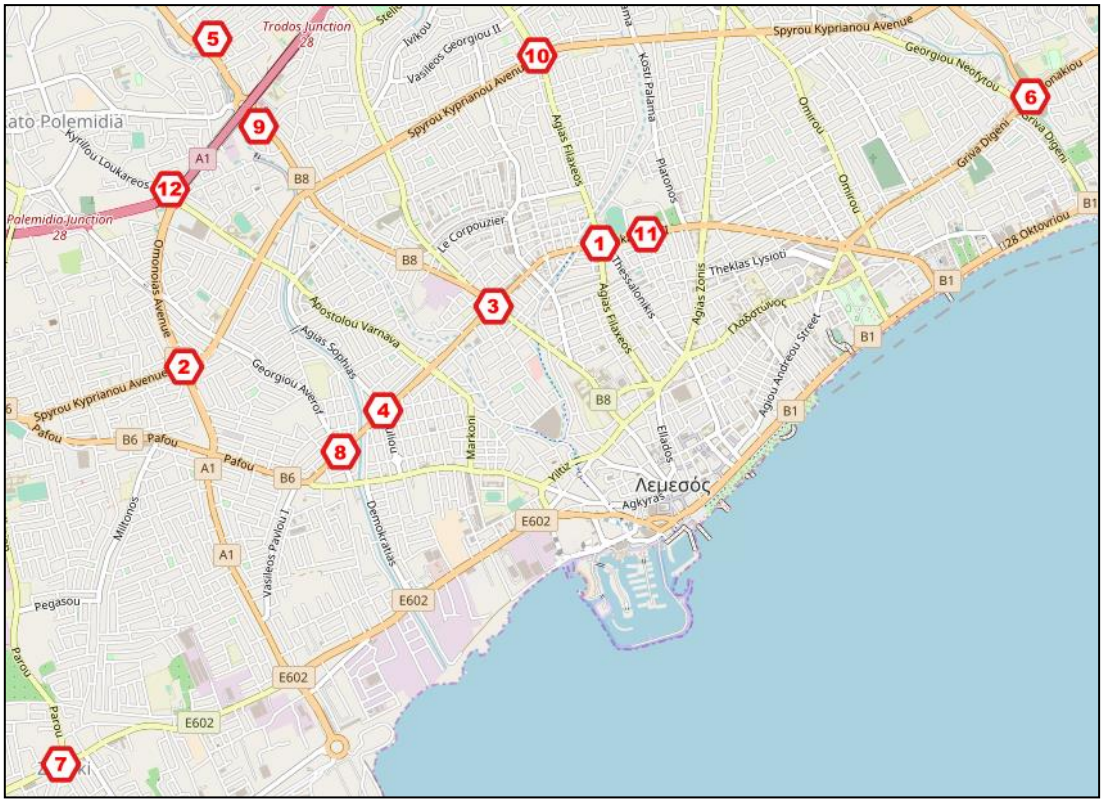


Figure 80: Location of Road Accident Accumulation Zones, Map: © OpenStreetMap contributors

Road Safety Concept

The status of the infrastructure in terms of road safety has been analysed in the Problem Analysis Report for the City of Limassol in general and for special areas, which had a high amount of accidents in the last year. To improve the road safety of all road users the following aspects should be improved:

- Safe pedestrian crossings using road median as crossing-aids:
  - Existing medians often are too narrow or only realized as markings. The construction of wider medians, which also form a physical barrier for motorized traffic, can support safe crossings along roads. Furthermore, they also facilitate to block overtaking vehicles at bus stops.
- Separated/protected right turning signal phase:
  - Separated right-turning phases should be the standard since this makes it not necessary to look for oncoming vehicles. In addition, the situation for crossing pedestrians at intersections Is improved because the focus of turning drivers is mainly on the oncoming vehicular traffic but not on the crossing pedestrians that make up the next conflict point.
- Pedestrian signals at all signalised junctions:
- There should be a pedestrian traffic signal on every enter/exit road at an intersection. If there is a traffic island/median, it should also be equipped with a traffic signal for pedestrians. Pedestrians should then also get sufficient green times.
- Improvement of visual contact/reduce sight obstructions:
  - Regular inspections of the conditions of the street spaces will help in maintaining a safe road environment with sufficient sight (see each other) and visual (communicate by eye-contact) contact between road users and on street furniture. Parking needs to be organised and enforced more strictly. Speed limits and actual speeds need to be balanced with sight distances. Shortened sight distances need lower speeds in order to provide for a safe traffic flow.
- Road network classification under safety aspects:
  - Organising for a safer road traffic condition always starts with a sufficient road network classification that considers safety aspects. This needs a clear separation between flow and access function. A mixture between flow and access function (e.g. intensive land use and high traffic volumes) should be avoided because this is deemed critical under safety considerations.
- Reduce number of lanes, shorten turning lanes:
  - Additional lanes per direction allow for more overtaking manoeuvres, which lead to higher speeds. To reduce speeds in urban areas and to improve the safety of crossing pedestrians it is necessary to reduce the number of lanes and the length of turning lanes to a minimum.
- Improve equipment for handicapped people:
  - Special signals/infrastructure for handicapped people and acoustic signals that provide a sound during green time in order to proceed on a safe crossing.
- Crossings aids at public bus stops:
  - Public bus stops are a main origin and destination for pedestrians and as such places with a lot of pedestrians crossing the road. Passengers tend to cross right after exiting in front or behind the bus. In this case the bus is like a visual obstruction and critical situations with passing or overtaking vehicles arise. For this case, crossing aids such as traffic islands (see diagram below) fulfil several tasks:
  - Crossing aids help pedestrians crossing the road. It is divided into two parts, with a safe resting area in the middle of the roadway.
  - Traffic islands – if long enough – can block vehicles behind the bus that need to overtake during passenger transfer, reducing conflicts between pedestrians and overtaking vehicles.
  - Traffic islands serve as a safe space in the middle of the roadway, waiting passengers on the traffic island can be seen from oncoming vehicles from all directions (good visual contact).

Especially at the analysed accident locations/zones, measures to improve the current situation should be implemented as soon as possible. A detailed list with road safety measures for the abovementioned RAAZ can be found in **Annex VII, Chapter 1**. Proposed improvements for the RAAZs 4, 8 and 11 are presented in preliminary design sketches in **Annex VII, Chapter 2**.

12 Needs of specific groups

12.1 Introduction

Although the focus is on the accessibility of all groups and users to public space, special attention is given to certain groups. Given their mobility limitations in physical, social and financial aspects and well as the higher vulnerability of certain groups, those specific groups are:

- blind persons,
- visually impaired persons,
- wheelchair users,
- persons with mobility disabilities,
- elderly,
- children,
- youth and students,
- people with low income.

When referring to accessibility and social inclusion in the following section, we mean a state and situation in which all citizens are offered transport options that enable access to key destinations and services. We also refer to accessibility to public spaces such as roads, pavement, public squares, parks and beaches in Limassol. It does not include accessibility within buildings such as libraries, schools, universities or government buildings.

12.1.1 Current Status

Typical situations in current everyday life are:

- Conflicts between different modes (parked cars vs. pedestrians and people in wheel-chairs)
- No guidance for the visually impaired in the public space – Solution: Square design with guidance system
- Bus stop with no orientation point for the visually impaired

In terms of walking and pedestrian infrastructure, persons with mobility limitations face the same problems all pedestrians face in Limassol, which are among others:

- Problematic pavement geometry (small width)
- Lack of and/or poor maintenance of existing pedestrian crossings
- Incomplete short or long-distance pedestrian streets network (discontinuities)
- Limited public "green" areas (leisure parks)
- Poor walking conditions on the pavements (damage to the walkway, parking on the sidewalk, poor cleanliness, obstacles, lack of shading or unsuitable trees, strays, non-existent benches, traffic congestion, noise pollution, etc.)
- Poor walking conditions on existing pedestrian streets (safety issues, unpleasant environment, motor vehicle violations, etc.)

In present-day Limassol, people with permanent and temporal mobility disabilities encounter deficiencies even in the elementary infrastructure thus impeding the free and unhindered movement. When using private cars, mobility impaired persons miss parking options as the dedicated parking areas for disable people within the CBD, but also in other areas are few in numbers. The parking lots dedicated for disabled people is considerably low as account for 0.8% of the total parking lots within the CBD; at Core City Centre level, the relevant figure is quite higher as it reaches 3.4% of the total available parking lots.

But also, when using public transport, mobility impaired persons are confronted with a lack of appropriate infrastructure and equipment to serve persons with reduced mobility. Given the different

needs of persons with mobility limitations, the current bus-based public transport imposes certain problems and obstacles which include:

- Inadequate, not barrier-free public transport infrastructure with old buses not adjusted to people with permanent and temporal mobility limitations (e.g. wheelchair, strollers)
- Insufficient connections, paths and frequencies - low reliability (inability of trip planning, loss of precious time, inconvenience)
- Malfunctions in use (purchase and cancellation of tickets, absence of multiple-route tickets)
- Lack of information at bus stops about the arrival time of buses, lack of easy-to-use printed information material/ need to refresh the website

Currently, there are only few public transport facilities available to people with physical disabilities. Many existing buses are unsuitable for all persons with mobility limitations (disabled, elderly, parents with baby carts, etc.). The bus fleet has to be replaced with low-floor buses, have a gradient to the side of the entrance and a ramp drawn to meet the sidewalk or the ground. Furthermore, it is necessary to adjust the public transport infrastructure by building accessible urban environments with coherent access chains including appropriate accessible bus stops.

Besides physical barriers impeding the barrier-free movement and mobility, there are also psychological barriers impeding the movement of people. Such psychological barriers are fear-inducing spaces, might it be during night-time or due to the characteristics of individual locations such as poorly lit parking lots or public spaces. The personal sense of security in public space is an important aspect particularly, in regard to the mobility behaviour of women but also of elderly persons as well as of children and teenagers, disabled or homeless persons. They all may also feel vulnerable to attacks at certain locations. The perception of public and private spaces as fear-inducing is dependent on the actual criminality and on the subjective feeling of safety. In Limassol, some parking places and underpasses are perceived as fear-inducing spaces.

12.1.2 Objectives

The overall objectives for improving the mobility of persons with permanent and temporary mobility limitations are social inclusion and accessibility. Both aim at ensuring that all citizens are offered transport options that enable access to key destinations and services – equal and free choice of transport modes as well as accessibility to public space for all groups and users.

As transport and mobility are prerequisites to participate actively in society, enforcing the mobility of all people in Limassol is one way of increasing social inclusion. The measures aim to increase the free movement of all persons in Limassol independent of their social status, age, gender, physical constitution and income as well as transport mode preferences. As part of the preferred scenario for the future development of Limassol, the most relevant measures are:

- improvement of public transport service (better PT network, upgrade of PT services, reduction of fares),
- improving parking availability for disabled persons,
- increasing the number of accessible points of interest for disabled persons,
- safe crossings for children, elderly as well as disabled persons.

Whereas measures to increase accessibility and barrier-free movement focus on removal of physical obstacles, measures to increase social inclusion to people with low income focus on affordability and the removal of financial impediments. The latter include measures to subsidize public transport tickets for certain groups and/or to exempt them from the obligation to purchase tickets for public transport. Among others, the Ministry of Education and Culture proposed the free of charge transport of the children with special needs. While in the preferred scenario, free public transport is one of the measures (see below and also section on public transport).

As stated in Cyprus' First National Disability Strategy and in previous National Disability Plans, the main challenge as well as the focus of future actions and measures is on making all public space accessible so that people with mobility limitations can use it without being dependent on an accompanying person. In order to guarantee to people with special needs both barrier-free movement and wider mobility, it is also necessary to address both the barrier-free access to public transport and the supply of parking spaces for people with disabilities. The barrier-free design of public space is an ongoing task.

Future measures are to make public space ever more barrier-free and to increase the affordability of mobility.

Improved accessibility is made possible by:

1. Easy and quick access to all the city's land uses (alternative transport modes, travel time reduction, reduction of congestion)
2. Respect for all citizens' particularities and equal provision of free and accessible space (infrastructure facilities for disabled people, ramps, sufficient pedestrian width for strolling, infrastructure for blind and deaf persons, etc.)
3. Enhancement of the Public Transport system services (creation of a central station, regional terminals and P&R stations, network coverage, scheduling, special services for people with disabilities, etc.)
4. Development of a Public Transport system on Demand and increase of densities to support the public transport demand
5. More equitable distribution of road capacity to all users. Obviation of the phenomenon "road boundary" - "urban ravine"
6. Unobstructed access to the coastal front
7. Intersections' and gateways' management, multimodal connections' development and creation of routes vertical to the coastal front

12.1.3 General Approach – the principles

Making all public space accessible so that it can be used by people with mobility limitations without being dependent on an accompanying person involves different measures in different fields of actions, the main ones being:

1. Construction and technical measures: Changing infrastructure
2. Changed distribution of use within the construction measures
3. Technical measures
4. Public awareness

The elaboration of measures to satisfy the needs of specific groups in the SUMP Limassol is grounded in the following findings:

- The dismantling of barriers requires a long breath.
- Accessibility is not a purely technical construction goal, but rather a political strategy with different levels of implementation and associated time horizons.
- There is a need for a lasting and secure provision of financial resources for the gradual realization of more accessibility.
- A staged/tiered concept of accessibility is necessary, with at least three quality level:
- Barrier-free to the greatest possible extent:

  Areas are barrier free to the greatest possible extent if all technical, design and organisational measures which correspond to the state of the art of the technology have been taken to enable all people with disabilities to use public spaces safely and without problems, just as people without disabilities do.
- Largely barrier free:

  Public spaces are largely barrier-free if existing regulation, guidelines and good practices are implemented and if it is ensured that deviations from the guidelines do not cause any impairment to persons with mobility limitations and higher vulnerability.
- Barrier-free to a limited extent:

  Public space and situations are barrier free to a limited extent if the regulations and guidelines applicable to them are not fully complied but are nevertheless complied with to the extent that compliance would lead to disproportionate additional expenditure.

Currently, the focus of several public organizations in Cyprus and Limassol is on the removal of physical barriers as they are perceived as a primary problem for disabled persons. Consequently, the efforts include a Pavement Accessibility Commission, Accessible beaches, parking without hindrance.

When focusing on infrastructure and construction measures for increasing accessibility to public space, those measures apply to:

- Sidewalks
- Pedestrian crossings with large and easy to reach buttons to call green
- Public places, squares, green areas and parks, including beaches, playgrounds and sports facilities
- Public transport stops
- Traffic lights
- Ramps and staircases
- Disabled parking spaces

For Cyprus, various organisations including the Office for People with Disabilities at the Ministry of Transport, Communications and Works promote the barrier-free and "Design for all" («Σχεδιασμός για όλους») by providing guidelines, technical specifications for different structural elements including sidewalks, pedestrian crossings and parking spaces.

As nearly all aspects of urban design are affected by making cities accessible and all public space and its tremendously diverse functional areas need to welcome all persons without limitations, such guidelines need to include:

- Structural elements of public space, such as
- Surface design and materials of walking areas
- Stairways and steps
- Inclined surfaces and ramps
- Tree pits
- Gutters
- Equipment in public space, such as
- Equipment for orientation in public space (by vision - drawings, signs, colours, contrasts; by touch – surface texture of pavements and squares)
- Resting areas and seating arrangements (taking into account different weather conditions so that people can choose between sunny and shady places as well as wind-sheltered areas)
- Public sanitary facilities (barrier-free, lightning, locking system, well maintained and clean)
- Lightning (including aspects as light intensity, light distribution and light density as proper lightning is an important aspect of road safety, public and individual/subjective safety, orientation in the public space)
- Plants (as they are part of parks being structural elements, but sometimes also are visual barriers and impede the visual connection and sometimes impede barrier-free movement by its roots and branches)

12.2 Key strategies

For persons with disabilities to be able to move freely and self-determined, all efforts and measures undertaken in public transport, pedestrianisation, parking, traffic and road safety are necessary but not sufficient conditions.

It is necessary to develop a public transport system both in time (service times and frequencies) as well as in space (bus stops and hubs in the central areas and at the destinations not just close to them). Furthermore, it is mandatory to have coherent access to, in and from the public transport and its means/vehicles. The same applies to pedestrian measures. For persons with disabilities as well as for the visually impaired, elderly and children, it is also necessary to improve the pedestrian infrastructure by providing adequate and wide pedestrian pavements as well as a coherent, coherent pedestrian network connecting homes, shops, work, leisure, medical and other facilities. Following and implementing a coherent “Design for all” concept in new and already existing built environment, removing obstacles and providing clear orientation, both visual as well as tactical, are mandatory steps to make public space accessible, convenient and barrier free.

With respect to measures directly and indirectly related to special needs groups, the key measures are (also included in the preferred Scenario of SUMP Limassol):

- Improvement of the layout / structure of the Public Transport network
- 3 Public Transport network levels - Primary bus lines, Secondary bus lines, Feeder/ On Demand Services (geographic coverage - density of bus lines)
- Upgrade of the Public Transport services
- Extending operation hours
- Increasing frequency on primary lines, secondary lines as well as feeders
- Vehicle characteristics / acceptable service levels (improved & very modern bus fleet: low floor, air conditioning, etc.) accessible to persons with disabilities
- Increase the number of accessible points of interest for disabled people
- Concerns particular points of interest, such as the CBD area, municipalities and communities as well as shopping centres, university, hospital, stadium, social insurances services
- Creation of accessible routes linking the points of interest of disabled - Provisions around the points of interest of disabled (within a radius of 100 meters) based on design criteria and standards
- Increase the number of "safe pedestrians' & cyclists' crossing" along pedestrian & cycling ways network
- For all cross-section points of the particular networks to the main road network
- Development of a safe pedestrian infrastructure
- Closure of selected areas to motorised traffic (pedestrianisation - only for pedestrian / bicycle use and / or Public Transport) - "environmental zones"
- Balanced allocation of road network to cars & pedestrians - "calming areas"
- Adoption of low speed limits (<30kmph) - "home zones"
- Increase the "safe buffers" around primary schools
- Secure a safe buffer with a radius of approximately 50 m around all primary schools

12.3 Detailed presentation of measures

12.3.1 Improvement of public transport infrastructure and services

Making Public Transport more attractive, convenient and comfortable is one way to serve the needs of special groups.

Extending the operation time as well as the coverage of public transport

Providing more public transport options by extending the operation hours, the public transport network helps increasing the mobility of persons with disabilities as well as elderly, children and

pregnant women who do not have the possibility to use a car and depend on good public transport infrastructure or other persons to move them around. The improvement and extension of the public transport operation hours is one necessary, but not sufficient condition. As long as public transport facilities are hardly or not accessible to specific groups, the extension of public transport services will not improve the mobility of persons with mobility limitations. The public transport vehicles as well as the infrastructure have to be adjusted to allow coherent access chains.

Vehicle characteristics/acceptable service levels (improved & very modern bus fleet: low floor, air conditioning, etc.) accessible to persons with disabilities

Currently, there are only a few buses in Limassol suitable for persons with mobility limitations, particularly disabled persons, elderly with wheeled walkers/rollators, parents with baby carts. The bus fleet needs to be replaced with low-floor buses, which have a gradient to the side of the entrance and a ramp drawn to meet the sidewalk or the ground as well as suitable space to transport two-wheel chairs, wheeled walkers/rollators and/or baby carts (see Figure 81).

Figure 81: Bus with wheelchair ramp9

In its interior, buses in Limassol need sufficient space to cart wheelchairs, baby strollers, buggies, baby carts and wheeled walkers (see Figure 82).

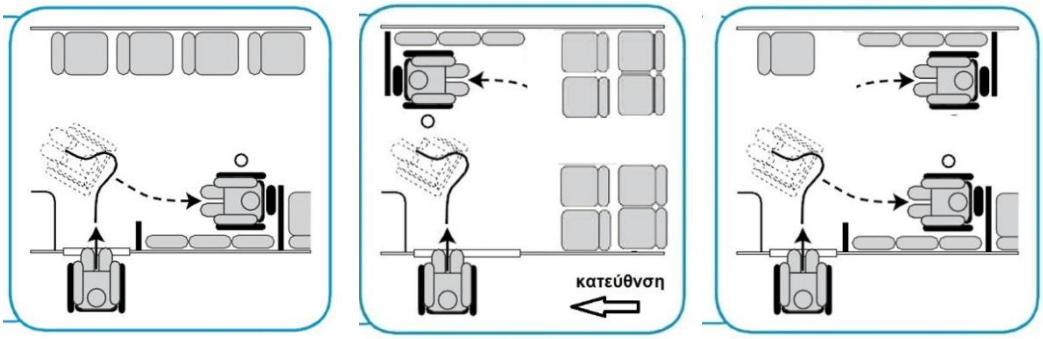


Figure 82: Suitable bus interiors10

- Improvement of public transport infrastructure: Allowing coherent access chains to and from public transport access points/bus stops

With this, it is necessary to adjust the public transport infrastructure by building accessible urban environments with coherent access chains including appropriate accessible bus stops.

Making the public transport infrastructure more accessible to persons with mobility limitations also has to go hand in hand with making a journey with public transport as convenient and comfortable as possible. This includes pleasant waiting areas with possibilities to sit and rest on seating arrangements. Bus stops should also be designed in such a way that people are able to choose between sunny and shady places as well as being wind-sheltered when wind is blowing. Charging points for electric wheelchairs at stops and also in buses should be implemented.

[9] (Source: Blog "Accessible buses - Instructions for Drivers and Disabled passengers" / "Προσβάσιμα λεωφορεία - Οδηγίες προς Οδηγούς και ΑμεΑ επιβατες", online: http://leoforiaaccess.blogspot.com/ (accessed 09 March 2019))

[10] Suitable for one or more wheelchair, baby carts, strollers, buggies and wheeled walkers/rollator (Source: Blog "Accessible buses - Instructions for Drivers and Disabled passengers" / "Προσβάσιμα λεωφορεία - Οδηγίες προς Οδηγούς και ΑμεΑ επιβατες", online: http://leoforiaaccess.blogspot.com/ (accessed 09 March 2019))

Figure 83: Bus stops with pleasant waiting and seating arrangements in Anexartisias street

Affordable mobility and public transport: Reduction of public transport fares

Once well-developed public transport services with high frequency, adequate capacities and suitable geographic coverage are available, lowering or suspending public transport fares is another measure to increase public transport's attractiveness. Thus, low and no public transport fares help to increase the individual mobility by overcoming financial impediments. However, the public transport services have to be capable to provide appropriate capacities to meet the demand once more people shift from car to public transport.

Low and no public transport fares are one means to increase the individual mobility by overcoming financial impediments. If low and no public transport fares are accompanied by well-developed public transport services with high frequency, adequate capacities and coverage, then public transport can become much more attractive.

The preferred scenario includes the "no PT fare" scheme. With the methodology and the transport model chosen, it was not possible to conduct a proper analysis as the developed transport model follows an aggregated approach and therefore, it is not sensitive to all parameters of users' behaviour including their response to a free public transport service. For this reason, the testing of such a "no PT fare" scheme for Limassol, would require a disaggregated approach. For testing this measure, it is suggested to do a stand-alone Stated Preferences Survey for the willingness to use free public transport or, alternatively, to conduct a pilot with a trial phase of 2 to 6 months duration in order to draw solid conclusions on the response in the passenger demand.

The implementation of a bus free of charge scheme in Limassol urban area has some pros and cons:

- Pros
  - Excess capacities (no costs for increase of the vehicle fleet)
  - No cost for automated e-ticketing system
  - Small surcharging needed due to low public transport passenger volumes in Limassol and very cheap ticket
- Cons
  - Low modal shift response to public transport ticket changes
  - Possibility to affect walking trips by reducing them

12.3.2 Improvement of accessibility for disabled persons

Moving around in the city as a visually impaired person, as a person in a wheelchair as well as an elderly person is more convenient if shops, medical centres, everyday commodities and services as well as work or school are in close vicinity to the homes. But it is also convenient if the ways are free of obstacles and barriers. Unfortunately, the built environment in Limassol includes barriers and/or misses orientation guidance. At some locations, there is a zebra crossing with lowered pavement. But there is no orientation for visually impaired and the signs, street lights as well as other street furniture

and infrastructure devices (e.g. distributor boxes, street lights) are obstacles for many persons with mobility limitations.

In Limassol, several efforts have been made to increase the accessibility of persons with mobility limitations, including among others installation/refurbishment of traffic lights with acoustic and tactile devices to support blind and deaf people at traffic light crossings, tactile pavers on footways and pavements supporting orientation of visually impaired as well as "Accessible Beaches for People with Special Access Needs" by the Deputy Ministry of Tourism. Although positive, what is needed next are integrated, coherent, barrier-free and coherent access chains connecting daily activities of persons with mobility limitations (e.g. visually impaired, disabled, elderly and parents with small children).

Increase the number of accessible points of interest for disabled people by establishing coherent access chains and accessible routes

In order to provide access to and connectivity between major destinations as well as to locations of daily activities around home, work and leisure activities, an accessibility network of access chains was created. With very few exceptions, the network follows pedestrianised streets and connects also public transport facilities and car parking.

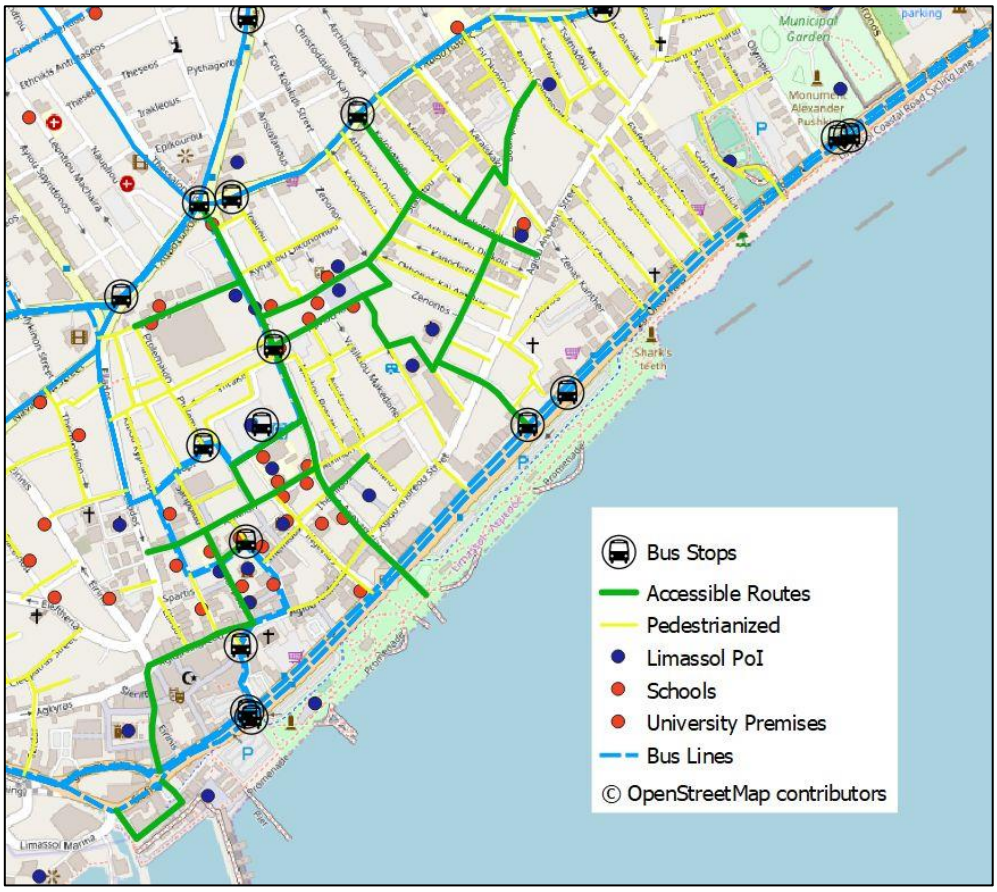


Figure 84: Accessibility Routes in Limassol city centre

The accessibility network will:

- be designed without any stairs or curbs to be suitable for wheelchairs, walking frames, etc.
- be signed with tactile pavers for visually impaired persons (see also Chapter on pedestrian measures)
- provide clear orientation with tactile pavers on the footway and visual design (combining contrast, brightness, colour and shape of materials used in the built environment) and
- at best offer digital information systems at crucial points (including tourist sightseeing spots) conveying information visually and audibly.

Visual and tactile orientation is also possible be using different surfaces (see **Annex VII, Figure A-VIII 1** for some examples of visual and tactile orientation for pathways and crossings).

Within the Environmental zone, there are some potentially conflicting points where the one-way streets have to be crossed. Despite very low traffic volumes, here crossing should be appropriately

designed (e.g. zebra stripes) and equipped with tactile pavers and acoustic signals. Those conflicting point are illustrated in the Figures 85 and 86 below.

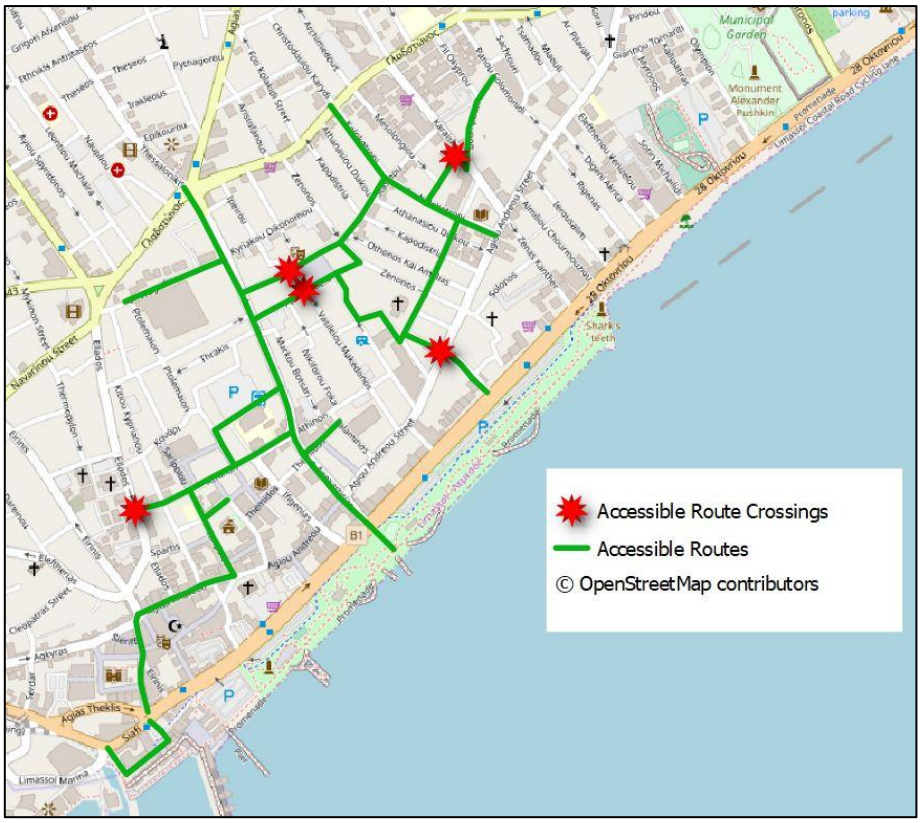


Figure 85: Accessibility Routes: potentially conflicting points in environmental zone

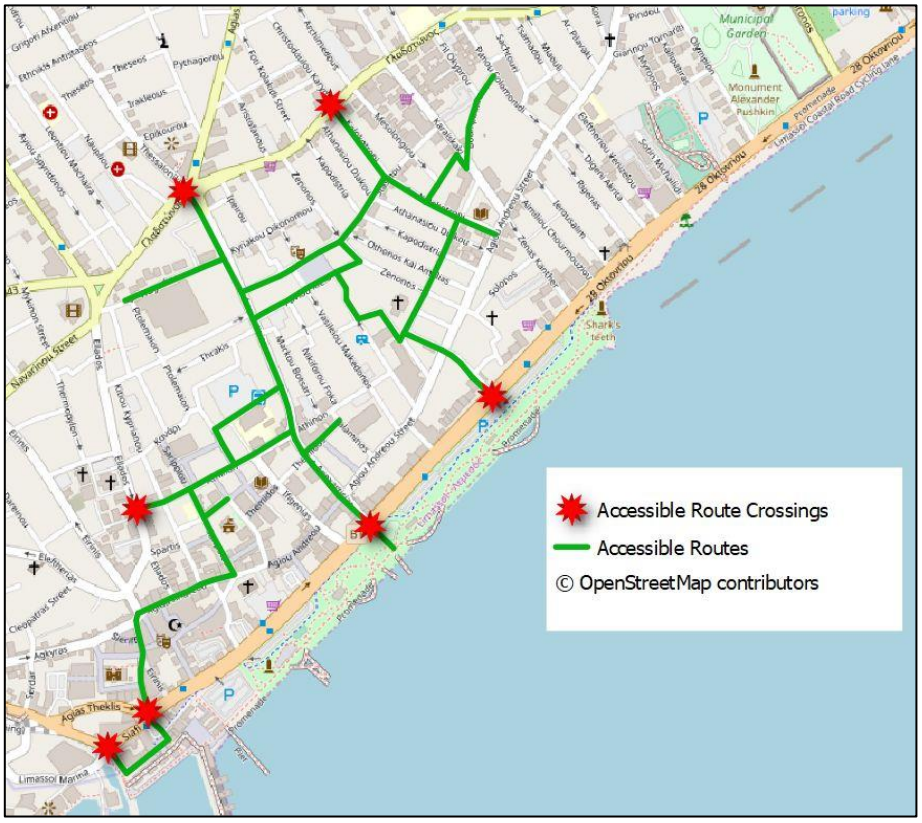


Figure 86: Accessibility Routes: potentially conflicting points at the edge of environmental zone

At the edge of the Environmental zone, major roads with significant traffic volumes require safe signalized crossings as described below.

Development of a safe, barrier-free and convenient pedestrian infrastructure

Developing safe, barrier-free and convenient pedestrian infrastructure is to follow the motto and motivation: "*Make walking a pleasant activity for all, not just for persons with limitations in its mobility*". Applying the "Design for all" («Σχεδιασμός για όλους») concept consistently and coherently includes among others the following (for a detailed description see for example "Berlin - Design for all" manual):

- Adequate surfaces

Choosing the right surfaces is one element of making built urban environment barrier-free and safe. Surfaces of walking areas are to follow the minimum requirements of "level, non-skid surfaces; small joint spacing; tight, even joints, especially for joints bigger than 8 mm; paving stones with a small chamfer or unchamfered; tactile and colour contrasts as well as functional drains" (Source: Berlin Design for all, 2011, p. 12). For visually impaired persons, tactile pavers support them in walking and orientating in the public space indicating them the direction of travel, warning them when approaching streets, stairs, ramps and the like.

- Stairways and steps

Minimum requirements for stairways include slightly ascending stairs with marked steps, handrails, integrated detectable warning surfaces with visual and tactile elements (see also **Annex VIII, Ch. 2**).

Safe crossings

Pedestrian crossings of streets constitute another important element of barrier-free and safe movement. Safe pedestrian crossings differ in type, appearance, used materials including colours. Some crossings are delineated by zebra stripes with/without reflectors; others are only two parallel white lines, while others have a different colour than the asphalt. In addition, some crossings are equipped with traffic lights including warning systems for visually and hearing-impaired persons supporting them audibly. Important aspects of safe crossings are a clear indication and orientation both for pedestrians and car drivers as well as motorcyclists and cyclists and integrated detectable surfaces with visual and tactile elements both for the visually impaired and children. In case of traffic lights, the waiting time for crossing the street must be satisfactory for persons with reduced mobility.

For increasing the convenience, attractiveness and amenity of public space, the following aspects are to be integrated in the design and refurbishment of public space:

- Resting areas and seating arrangements
  (taking into account different weather conditions so that people can choose between sunny and shady places as well as wind-sheltered areas)
- Public sanitary facilities
  (barrier-free, lightning, locking system, well maintained and clean)
- Lightning
  (including aspects as light intensity, light distribution and light density as proper lightning is an important aspect of road safety, public and individual/subjective safety, orientation in the public space)
- Adequate and wide pedestrian pavements along all urban roads
- Pedestrian crossings in general or special equipped ones for the visually impaired
- Road curbs designed and realised at appropriate locations to allow easy wheelchair and baby buggy crossing

Parking

As the car is the dominant transport mode in Limassol and persons with mobility limitations also depend on them, an element to facilitate the easier movement of persons with reduced mobility concerns the provision of adequate parking, in particular for persons with wheelchairs.

12.3.3 "Safe buffers" around primary schools

Regarding the needs of children, public transport and its improvement is a measure for facilitating children's and teenagers' ability to move in Limassol. A specific measure for the needs of primary-school pupils concerns the implementation of safe buffers around primary schools. Within a range of the school entrance, the ways to the school have to be made safe and adequate to the needs of children of ages 5 to 12 years old. Where feasible, the most efficient way to achieve this is through pedestrianisation around primary schools. First starting with a radius of 50 meters, the minimum

radius of a pedestrianised zone around primary schools should be at least 100 meters.

Both cases are only minimum requirements and do not fully reflect the needs for children to move safely by bike or by walking to school, but it is a start. The application of a 100-meter buffer zone to the primary schools in the city centre of Limassol shows in Figure 87:

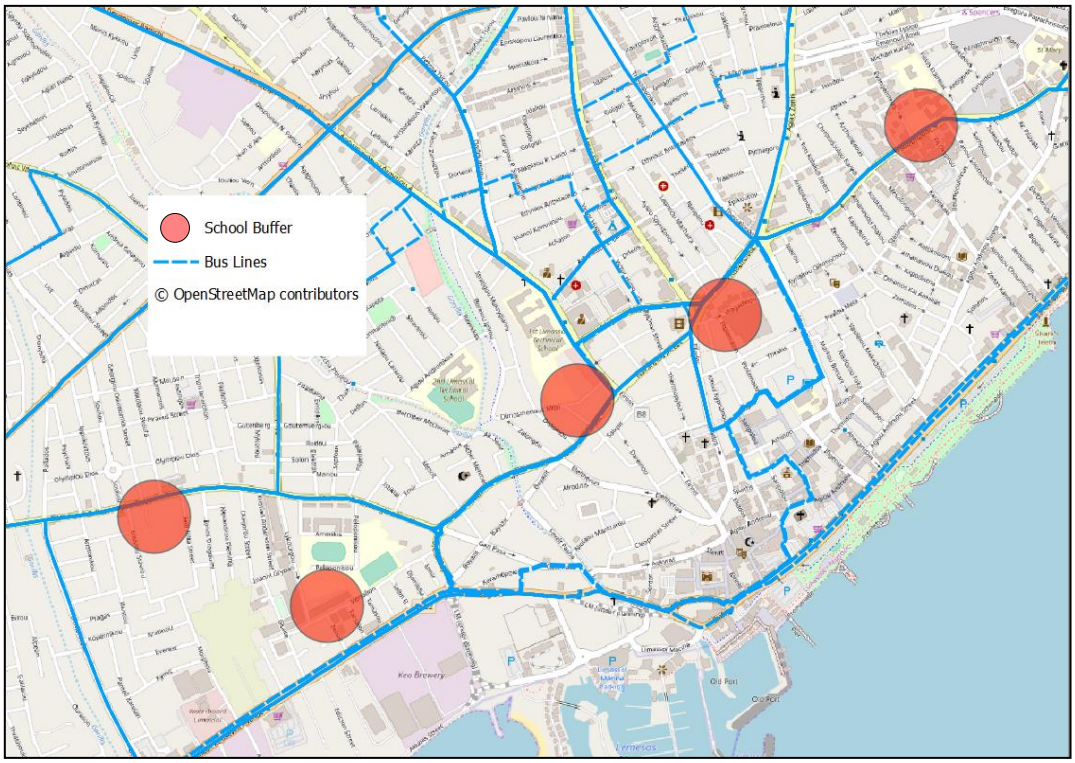


Figure 87: Primary schools in the city centre with a 100-meter safe buffer

In cases it might not be possible to pedestrianize street segments, alternatives are “No Parking areas”, called and signed as “Drop-off and Pick-up Zone”, “Kiss and Ride Zone”, or “Kiss and Drop Zones”. One option is to have a zone on the school side of the road which is designated by “No Parking” signs in close vicinity to the school entrance. Another option is to have those zones in a 50 to 200 meters distance to the school entrance. In those zones, drivers are supposed to drop off and pick up children within a certain timeframe (i.e. 2 or 3 minutes). Children then walk on their own to the school.

Those zones are meant to prevent congestion including parking in second row in close vicinity to the school and its entrance. They rather provide a safe location for parents to drop off and pick up their children by car. The drivers always remain in the vehicles while the children get in or get out of the vehicle on the far side of the lane. In some countries (i.e. Australia), supervising adults authorized by the schools assist the children to get off or get in the car. Thus, those zones are a means to avoid dangerous traffic situations in front of schools as it is mostly the parents and carers who abruptly stop, do U-turns or other dangerous turning manoeuvres, impede other road users and in addition, drive too fast in front of schools. “Drop-off and Pick-up Zone”, “Kiss and Ride Zone”, or “Kiss and Drop Zones” help to equalize the traffic flows of parents bringing their children to school and picking them up again (see Figure 88).

As parents are the ones hard to convince and as it is not feasible to control all zones adequately by authorized persons respectively policemen, one could also focus on the children instead. Once zones have been implemented, incentives for children can help to trigger a behavioural change of their parents. When walking from the zones to the school on their own, those pupils and their classes could receive and accumulate points which they could utilize for certain rewards (i.e. school excursions, short trips, visit to museum).

Figure 88: Signs for School Drop-off Pick-Up Zone[11]

[11] (Source: Transport for New South Wales, Australia, Centre for Road Safety. Online available: https://road-safety.transport.nsw.gov.au/downloads/dropoffpickup/drop-off-organise.pdf (accessed on 08 March 2019))

12.3.4 Administrative measures to improve the conditions of special needs groups

As already stated, accessibility is not a purely technical construction goal but rather a political strategy with different levels of implementation and associated time horizons. The dismantling of barriers requires perseverance which also needs a lasting and secure provision of financial resources for the gradual realization of greater accessibility.

Administrative measures to improve accessibility of all persons, but particularly those with reduced mobility includes:

- Developing a political strategy with different levels of implementation and associated time horizons
- Strategic plan and action plan to implement accessible urban environments with coherent access chains including public transport
- Establishing forms of participation in infrastructure planning and refurbishment (similar to Pavement Accessibility Commission)
- Audit of the existing infrastructure by accessibility experts and representatives
- Inventory of the public space regarding accessible urban environments with coherent access chains with problem identification and tailor-made solutions
- Survey of public transport regarding accessible urban environments with coherent access chains with problem identification and tailor-made solutions
- Inventory of fear-inducing spaces; problem identification and tailor-made solutions, such as better lighting, designation of well visible, well-lit parking lots for women and disabled persons
- Lightning policy, strategy and actions plans

Making all public space accessible involves different measures in different fields of actions, the main ones being:

1. Construction and technical measures: Changing infrastructure
2. Changed distribution of use within the construction measures
3. Technical measures
4. Public awareness

Achieving accessibility and social inclusion for all persons, but in particular for persons with disabilities to be able to move freely and self-determined, efforts and measures to undertake are in public transport, pedestrianisation, parking, traffic and road safety.

Regarding the costs in designing, planning and implementing accessibility, the Department of Economic and Social Affairs of the United Nations Secretariat states in its publication "Good Practices of Accessible Urban Development – Making Urban Environments Inclusive and Fully Accessible to ALL" (2016, p. 9):

"Available evidence illustrates that urban infrastructures, facilities and services, if designed and built following accessibility or inclusive "universal design" principles from the initial stages of planning and design, bear almost no or only 1 per cent additional cost. Therefore, progressive realization of accessibility following universal design principles in urban development is not beyond reach for low-income countries. Cities that depend on a tourism economy are also likely to pay high opportunity costs for inaccessible infrastructure and services if they exclude tourists with disabilities, older persons and parents with young children, who may experience accessibility limitations, who may otherwise have visited these destinations."

13 Intelligent Transport Systems – ITS

13.1 Introduction

Smart city can be considered as a long-term vision of an enhanced urban area aiming at reducing its environmental footprint and at creating conditions for better quality of life. It can be perceived as a cost-effective strategy to cope with severe urban problems such as traffic, pollution, energy consumption and waste treatment. It is part of Limassol's vision to promote innovation through the smart city concept, in order to become a place where traditional networks and services are made more efficient with the use of digital and telecommunication technologies for the benefit of its inhabitants and commercial activity.

A smart city goes beyond the use of information and communication technologies (ICT) for improved resource use and fewer emissions. It means smarter urban transport networks, upgraded water supply and waste disposal facilities and more efficient ways to light and heat buildings. It also involves a more interactive and responsive city administration, safer public spaces and meeting the needs of an ageing population.

Smart mobility is largely dependent on the technological sector, i.e. infrastructure and communication technology, intelligent transportation systems. The most frequently met smart mobility objectives are:

- reducing air and noise pollution
- reducing traffic congestion
- increasing peoples' safety

Smart mobility should be considered as a complex combination of projects and actions with different goals, contents and technological intensity. This chapter should be considered as a comprehensive road map for selecting and combining such ITS projects, based on legacy systems and maturity of telecommunication networks already in place always taking into consideration time plan and budget constraints may be applied in funding such activities in a still unstable financial environment in South East Europe and Cyprus.

13.1.1 Current Status

The Ministry of Transport, Communication and Works of Cyprus (Public Works Department – PWD) published the first National ITS Action Plan in line with the requirement of 2010/40/EU Directive: "Deployment of Intelligent Transport Systems in the field of road transport and for interfaces with other modes of transport, July 2010". The relevant EU Directive has been adopted by the Cypriot Parliament on 16 November 2012. Following the Directive adoption, the National ITS Action Plan has been published by PWD on December 2012 where the main presented planned projects were based on the findings of the ITS National Study completed in 2009, entitled "Study and Implementation of Intelligent Transportation System (ITS) & Development of Geographical Information System in Cyprus". The latest National ITS Action Plan progress report has addressed the time period from August 2014 to August 2017. Based on results of previous ITS projects DIAVLOS and PRODROMOS, the main planned ITS applications in Cyprus are based on the EU co-funded CEF projects and INTERREG Programmes: Crocodile II, Crocodile III, TN-ITS GO and Step2Smart. However, the majority of the ITS applications refer to city of TEN-T road and the city of Nicosia; ITS applications relating to Limassol Area are relatively low. However, programmed ITS interventions in the city of Limassol are not included in the afore-mentioned projects. However, systems planned to be implemented (e.g. National Access Point – Open Data Portal) can be integrated in the future with systems that can be implemented in the city of Limassol.

Existing Intelligent Transportation Systems that cover the Limassol Area are briefly described below:

- Traffic Detection. Permanent traffic counters and Bluetooth devices have been gradually installed upon the road network of the Study Area (DIAVLOS, MIELLE and PRODROMOS projects). Therefore, traffic levels, average speed, traffic composition and travel times are monitored and stored in real-time state. Such data are available and managed by the PWD Traffic Management Control Centre (TMCC) in Nicosia. The existing geographical coverage within the Study Area is quite limited, since the A1 motorway and specific vertical axes leading to Limassol port, are quite adequately monitored (Figure 89 below).

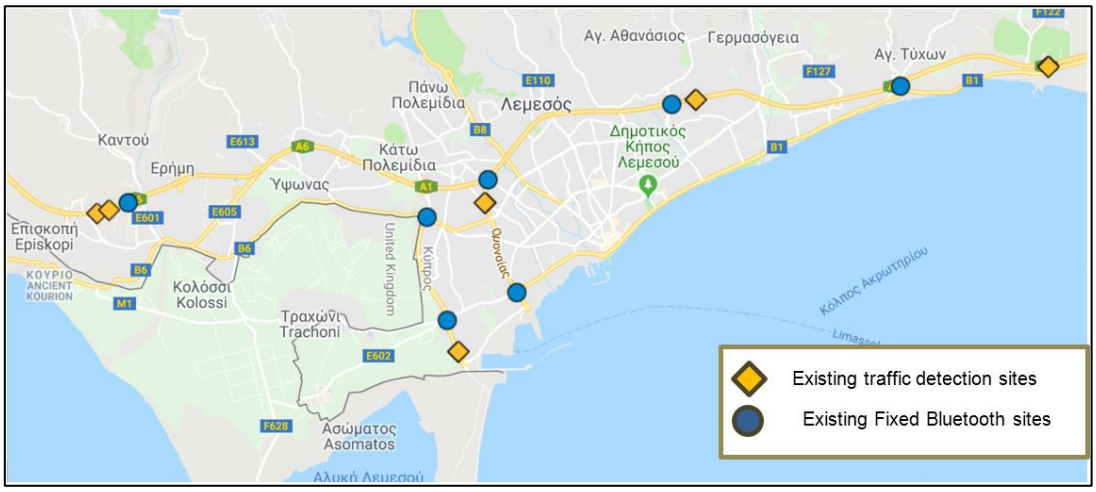


Figure 89: Traffic Detection Units and Travel Time Recording Units in Study Area

- Vehicle Actuated Traffic Signalization System (SCOOT). In PWD, a dedicated Control Room for traffic signal management and operation is on operation. The SCOOT system has been installed in 90 intersections in Cyprus and provides advanced functionalities for traffic-actuated traffic signals operation, traffic signal optimization in an arterial or a specific selected network. The system for all traffic signalized intersections in three (3) cities of Cyprus: Nicosia, Limassol and Larnaka is centrally managed by the PWD Control Room. However, the SCOOT system is not currently in operation in the city of Limassol since the existing traffic controllers are old, while there is also need for some further maintenance and upgrading of telecommunication connections as well as inductive loops installed in the road (i.e. real-time traffic detection units). The Ministry of Transport, Communication and Works is currently preparing a procurement project for new traffic controllers in the city of Limassol, which can be considered as a major prerequisite for the actual and smooth operation of the vehicle actuated traffic signalization system. The SCOOT system has been installed in nineteen (19) traffic signalized intersections within the Study Area and are mainly allocated within Limassol Central Business District (CBD).

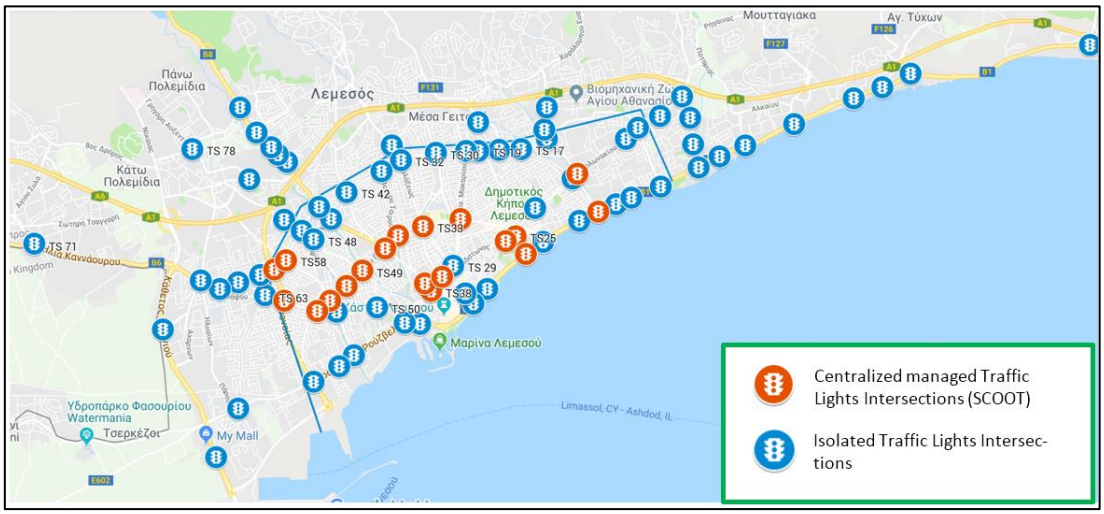


Figure 90: Traffic Signalized Intersections in Limassol – SCOOT Intersections

- Bike Reservation System/Bike Sharing System. A bike reservation/bike sharing system has been introduced in Cyprus and specifically in Limassol. The service operator is NextBike Cyprus which enables cycling around the city. A public bike sharing system is available in Limassol with bikes available 24/7. A web-portal is available for users to reserve their bikes according to the real-time bike availability in various stations within the Study Area. This service is managed and operated by a private operator. It is not currently integrated and managed by the PWD with the used of Traffic Management Control Centre (TMCC) in Cyprus.
- Bus Fleet Management System. An Automated Vehicle Location (AVL) System is installed on the entire urban and rural bus fleet of Limassol. This system is expected to optimize bus operation and time-schedules of the Limassol bus operator, while the Ministry of Transport, Communication

and Works will be able to centrally monitor the service level of bus operation. The system is under initial operation phase.

- Bus Travellers' Information System. Based on the installation of the AVL system in the entire urban and rural bus fleet of Limassol, a dynamic travellers' information system is installed for the provision of dynamic bus time-schedules and bus arrivals. The dynamic information will be available via on-board dynamic displays, LED signs at bus stops and a web-portal application. There are currently six (6) LED signs installed in Limassol: in Makariou street, Mall, Franklinou Rousvelt street, New Hospital and Old Hospital. Additionally, a web-travellers' information system has been developed. A web-travellers' portal (**http://www.motionbuscard.org.cy**) has been also developed, which provides real-time information about arrival times at the bus stops per city, timetables and routes as well as electronic payment services; such information is also available as a mobile application for bus travellers' information.
- Bus Ticketing System. An advanced bus ticketing system with smart cards and web-service reservation/purchase system will be installed for the Limassol Bus Operator. The Ministry of Transport, Communication and Works will be able to receive reports on the actual transaction of bus service. The smart cards can be purchased and be renewed via bus terminals/stations. In parallel, paper ticket can be also purchased and validated within the bus vehicle by suitable ticketing machine. The system is at its final implementation stage.

Additionally, the following projects are under planning or tendering stage:

- Procurement of Traffic Controllers Equipment. There is a short-term plan by the Ministry of Transport, Communication and Works to proceed with the procurement of new traffic controllers for the city of Limassol. The planned EU funded project is expected to be procured for the city of Limassol in 2019. The installation of new traffic controllers' equipment will ensure the proper and smooth operation of the vehicle-actuated traffic signalized intersections (SCOOT system) in the city of Limassol. The relevant works are expected to be completed in 2020.
- Speed Enforcement System. A tender is under preparation stage for implementation of 90 speed enforcement cameras and numerous mobile cameras to cover Cyprus needs, including also Limassol.

13.1.2 Objectives of this Area of Intervention

Intelligent Transportation Systems (ITS) are considered as effective means to support the achievement of urban mobility goals. ITS are viewed as a set of tools assisting into the introduction of various transportation planning/management measures and actions.

Clearly, the deployment of ITS is much more complex within an urban environment since there are many inter-related urban transportation functions carried out by different actors. The cooperation of different actors is a prerequisite for successful implementation and operation of ITS within the city in order to support effectively the urban mobility system. In parallel, integration and interoperability among different systems and transportation modes is considered as a significant ITS aim in order to support integrated transportation services within the city, promote inter-modality and assist to travellers' information needs.

The main objectives of this area of intervention is to define the suitable ITS measures/interventions in order to serve as an effective tool the specific policies and measures defined within the Sustainable Urban Mobility of Limassol in different areas such as:

- Traffic Management within the city centre.
- Public transport operation.
- Parking management.
- Road safety.
- Freight logistics.
- Cycling.
- Pedestrian.
- Specific group needs.

Based on a comprehensively methodology, the ITS high-effectiveness measures/interventions are identified in order to serve high level objectives, operation objectives and the specific measures of the pre-mentioned areas of Limassol SUMP.

So, ITS measures/interventions have been addressed by examining horizontally all relevant measured defined within the Limassol SUMP.

13.1.3 General Approach/Principles

The overall approach aims to determine suitable ITS measures fully aligned with the defined Limassol SUMP measures (more details can be found in **Annex IX, Table A-IX 1**). To identify the suitable and high effectiveness ITS measures for the city of Limassol, the overall approach is briefly described below:

- For each thematic area of SUMP, as pre-mentioned in section 13.1.2, the specific measures defined in this study have been reviewed. Those measures are strongly coherent with the high-level and operation objectives of each area, i.e. traffic management, safety, public transport etc. The ITS measures defined serve the following SUMP measures:
- By taking into account the current ITS status in the Study Area, potential suitable ITS measures are identified to address the various areas of Limassol SUMP. The potential suitable ITS measures identified are addressing the following SUMP measures:
  - Improving the layout/structure of the PT network to better respond to mobility needs and promoting the complementarity of transport systems.
  - Upgrading the PT services.
  - Affecting costs of using PT.
  - "Development of emissions free zones in the city centre and other sensitive locations. Discouraging the use of car in selected (environmentally sensitive or congested) areas and/or through residential areas. In parallel, facilitating traffic around these areas and increasing the availability and level of service of PT".
  - Affecting operating costs of the car and/or costs of using it.
  - Increasing road safety.
  - Affecting environmental conditions.
  - Increasing the public space for citizens.
- Potential ITS measures are prioritized by taking into account the expected benefits, best ITS practices, the local characteristics as well as possible budget and time limitations. The systems ranked as high priority are considered as the most suitable for short-term implementation in parallel with the adoption of the corresponding SUMP measures (preferred scenario 6).
- Early ITS winner projects for the city of Limassol are identified, i.e. projects that can be implemented in very short-time period since there is no need to fulfil many prerequisites or their operation is dependent on other proposed implementation activities presented in this study.

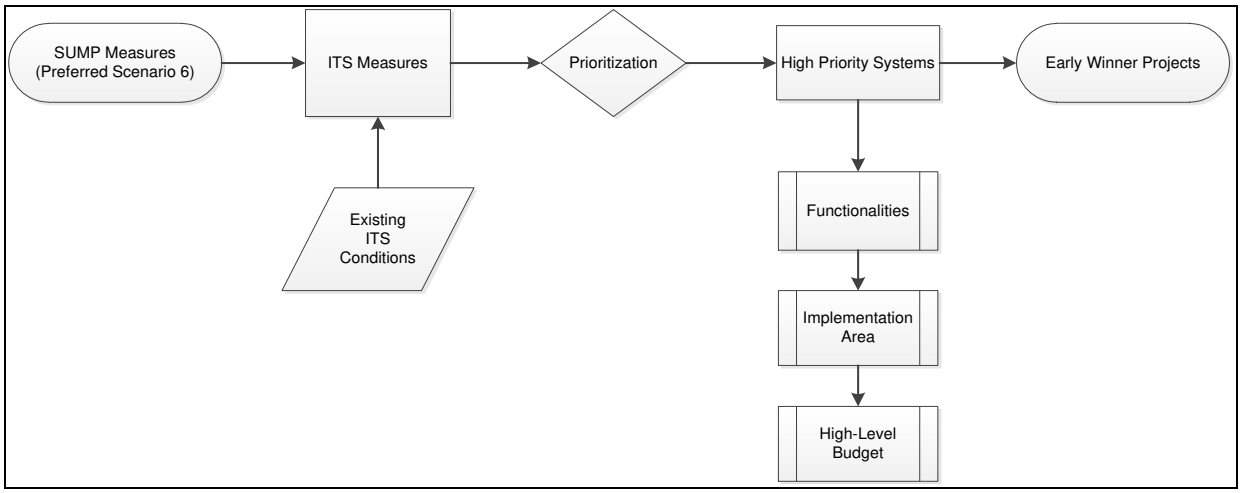


Figure 91: Overall Approach for the Identification of ITS SUMP Measures

The system prioritization has been carried out by taking into account the following criteria:

- Reduced pollution. Expected benefits in environmental emissions and reduced noise levels.
- Reduced congestion. Expected benefits in traffic congestion (e.g. less private traffic, road arterial optimization) and reduced vehicle queues (e.g. queues at traffic signals).
- Increase safety. Expected benefits in terms of enhancement of road safety (e.g. reduced road accidents, improved response of emergency services).
- Improved speeds. Expected savings in travel times of all modes resulting in improved speeds upon the transportation network.
- Reduced transfer costs/Improved Operators efficiency. Reduced transfer costs refer primarily to passengers and freight transportation costs; improved operators efficiency refers to improved stakeholders' efficiency (e.g. faster response for receipt of traffic management measures, faster response time of emergency services, better scheduling of public transport services operation).

13.2 Key Strategies

As mentioned previously, the defined ITS measures address horizontally the various SUMP policies and measures. The key ITS strategies for Limassol Area are summarized in the box on the next page.

The suitable ITS measures in relation to Limassol SUMP measures (approved by scenario 6) are depicted on the relevant Table of **Annex IX, Table A-IX 1**; the ITS measures prioritization is also shown.

13.3 Detailed Description of Measures

Through this detailed methodology, a significant number of High Priority ITS measures has been identified to support the effective implementation of reduction of private car traffic flows passing through the city centre (coastal street). The high priority measures have been presented in section 13.2.

Following the analysis carried out, the high prioritized ITS measures are briefly described mainly in terms of their main functionality and the area of implementation in the Limassol road network. This section should also be considered as a presentation of the finally selected relevant and high priority ITS systems for Limassol in close relation to the selected SUMP measures.

13.3.1 Dynamic Bus Display

The system objective is to provide dynamic/real-time information about the bus arrivals, bus departures and bus time-schedules so that passengers receive promptly reliable information about bus time-schedules and to enhance bus terminal/station operation.

Different LED signs and monitors should be installed at Central Bus Terminal (CBT), to all Transfer Bus Stops, to all Multimodal Transport Hubs and to all Park & Ride Stations (please refer to Figure 34 and 36 of this document for exact locations). Depending on each station's characteristics, the dimension of the monitors may vary. A central software system should be hosted in a local control room at each bus terminal/transportation centre/park & ride station in order to receive and process data from the fleet management systems of each bus operator and to manage bus services time-schedules at the relevant terminal.

13.3.2 Bus Priority System

The system objective is to provide bus priority in traffic lights intersections in order to reduce bus intersection delay and to optimize bus travel time upon a road arterial. The system will be installed in road segments where dedicated bus lane will be implemented in order to enhance bus operation and to improve bus schedule reliability.

The bus priority system will be implemented in significant number of critical intersections where a dedicated bus lane will be introduced in Limassol.

Intelligent Transportation Systems (ITS) should be implemented in Limassol by taking into account the existing systems in operation as well as strategies, policies and measures to be implemented in order to develop a more sustainable transportation and urban development.

The introduction of ITS is as part of the **Limassol Sustainable Urban Mobility Plan (SUMP)** since ITS are considered as cost-effective measures and tools in order to support various Limassol SUMP measures in the areas of public transport management and operation, traffic management, road safety, parking management, freight logistics, cycling, pedestrian and specific group needs.

The key ITS strategies to support the SUMP Limassol implementation measures are described below:

- **Integrated Traffic Management Control Centre Operation**. All ITS city related applications (existing and future) should be centrally managed and in coordinated manner with the participation of all key city transportation actors.

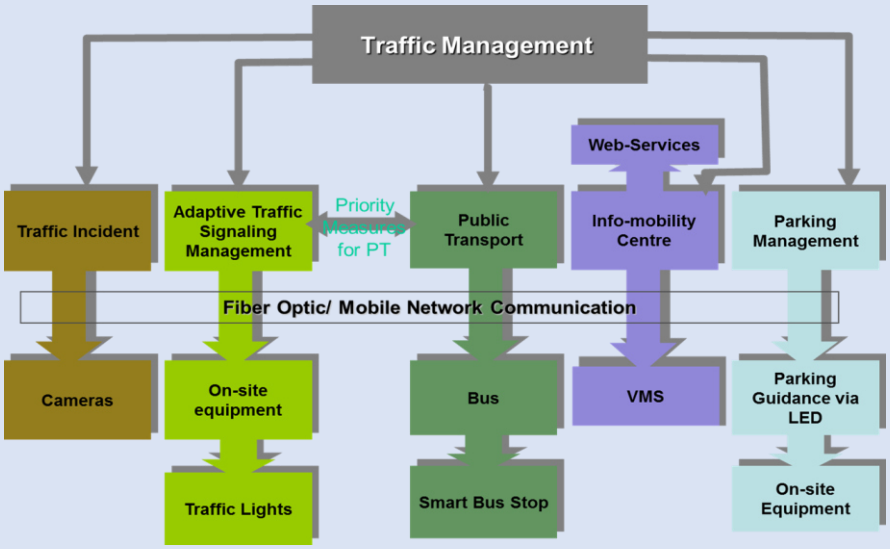


Figure 92: Overall Concept of an Urban Integrated Traffic Management Centre

- **Traffic Management & Control**. The introduction of ITS applications for the improvement of traffic conditions and congestion as well as the enhancement of the efficiency of transportation actors in relation to the receipt of traffic management actions/ measures in real-time or semi-real-time fashion for both private and public transport operation.
- **Local Travel & Traffic Information Systems**. The introduction of multi-modal ITS applications for the enhancement of travellers' information both pre-trip and on-trip in order to gain travel time savings for the users and to improve the balance between transportation/ parking demand and supply.
- **Safety & Emergency Systems**. The introduction of ITS applications for the enhancement of passengers' and drivers' safety either for pro-active purposes or improved incident reaction management and corresponding times.
- **Integrated Ticketing & Mobility Services**. The introduction of modern payment mechanisms to improve transport operators' efficiency as well as to improve the demand balance between the various transportation modes.
- **Enforcement**. The introduction of ITS applications for improving the enforcement of transportation measures such as the use of bus lane, speed limits and to reduce illegal driving such as crossing red light intersections.

- Coastal street: Vertical Port Axis to Mediterranean Hotel (Amathountos/Kykladon): Eighteen (18) intersections are included. It should be noted that the vast majority of intersections is not currently centrally managed by SCOOT.
- Arch. Leontiou street: From Navarinou to Arch. Makariou III including 3 intersections. All SCOOT currently managed intersections.
- Thessalonikis street: From Gladstonos (Five Roads IC) to Arch. Makariou III including 2 intersections. 1 SCOOT currently managed intersection.
- Ag. Zonis with Arch. Makariou intersection which is SCOOT currently managed intersection.

The implementation area within the city centre, i.e. Arch. Leontiou and Thessalonikis street are illustrated below:

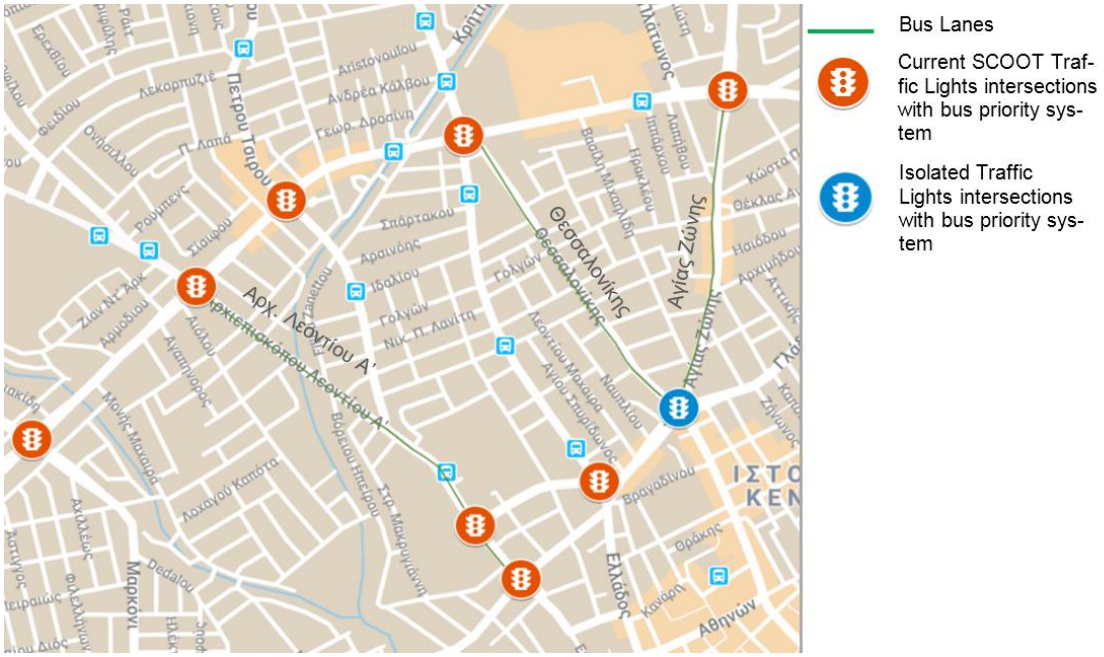


Figure 93: Bus Priority System Implementation Area

It should be noted that red intersections denote the currently SCOOT managed intersections, whereas green lines denote the approved scenario 6 bus dedicated bus lanes.

13.3.3 Bus Lane Enforcement System

The purpose of the system is to enforce unauthorised use of dedicated bus lanes expected to be implemented within measure 2.5 – Exclusive lanes for PT. The core of the system lies in the use of Automatic Number Plate Recognition Cameras (ANPR), the development of an appropriate back-office system for data management, penalty validation, penalty issuing and to manage penalizing procedures in order to reach to violator's address.

Two common solutions are to be deployed for this ITS configuration:

- Fixed infrastructure of ANPR cameras close to the road network, where a specific area of coverage can be achieved.
- Bus vehicle mounted cameras to detect the bus lane situation at an approximate distance of 20 m. The system digitally photographs vehicles in the bus lane 20m ahead of it and transmits the registration number of those vehicles to a variable message sign near the end of the bus lane. The digital images are stored and can be used for subsequent enforcement procedures.

The bus lane enforcement system is initially planned for 2 road segments within the city centre where the bus dedicated lanes will be introduced according to preferred SUMP scenario. The system will be initially implemented in the Arch. Leontiou street and Thessaloniki street (5 sites in total). Since, two (2) bus lanes are expected to be introduced in each road segment, 10 ANPR cameras are expected to be installed within the implementation area (see Figure 94).

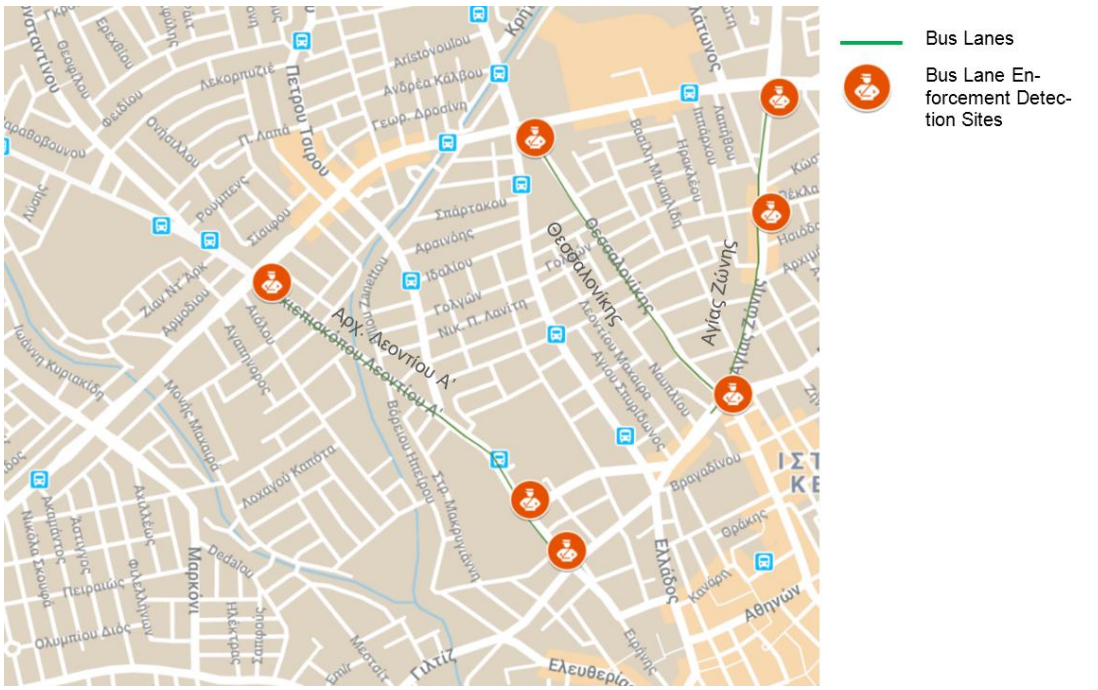


Figure 94: Bus Lane Enforcement Sites

13.3.4 Advanced Urban Traffic Control System (Existing System Upgrade)

The system optimizes the traffic flows in the urban environment by using advanced traffic regulation algorithms in order to serve in real-time the optimized traffic demand requirements. The systems are especially effective in areas with significant traffic variation within the day in critical traffic signalized intersections and corridors.

The system works by analysing the traffic data from an extensive network of traffic detectors located strategically in the network. Detectors layout is one of the key aspects of the project, since selection of detection location are closely related to the traffic regulation (usually detectors are located at least 150m to 200m prior to each traffic light intersection). According to this, data received real-time by the on-site equipment, a central software decides dynamically the parameters of the traffic lights signals such as cycle, green split and off-set.

The implementation area includes existing SCOOT managed intersections (19 intersections) and a significant number of other traffic light intersection located mainly in the CBD (45 intersections). In total 61 intersections will be centrally managed in Limassol covering adequately the traffic control management needs in the city centre. The main streets leading to the city centre as well as main arterials within the city centre will be centrally managed by SCOOT such as part of the: coastal street, north-south vertical axis (Ag. Filaxeos, N. Pattichi, Potamianou/Varnava), Kavazoglou street, Omonoia street, Spirou Kyprianou, Arch. Makariou), Griva as well as Giannou Kranidioti (northern to A1: motorway) which is a highly traffic congested axis (maps illustrating deployment layout can be found in **Annex IX, Figure A-IX 1**).

The geographical expansion of SCOOT includes:

- Coastal street: Vertical Port Axis via Franklinou Rousvelt until Amathountos with Ag. Saranton (Grand Resort), 18 intersections in total (2 intersections are currently managed by SCOOT)
- Kavazoglou/Paphou street, from Miltonos street (south to Spirou Kyprianou) to Yiltiz, 6 intersections in total (2 intersections are currently managed by SCOOT).
- Spirou Kyprianou, from Paphou street to Ag. Athanasiou, 16 intersections in total (2 intersections are currently managed by SCOOT).
- Griva Digeni, from Arch. Makariou to Edessis, 5 intersections in total (1 intersection is currently managed by SCOOT.
- Yannou Kranidioti street (northern to A1): 5 intersections

- Five Roads intersection.
- Ag Fixaleos with Ierou Lochou intersection
- Nikou Patichi intersection.
- Theodorou Potaminanou intersection (JUMBO STORE).
- Apostolou Varnava & Ag. Sofias intersection.

Please refer also to **Annex IX, Figure A-IX 1**.

13.3.5 Traffic Detection

Permanent traffic detection units should be procured and installed on the road network in order to record basic traffic data all year round. The minimum traffic data that needs to be collected are the traffic flows, the traffic composition (the classification scheme should include at least 5 vehicle types, but there are systems that can yield very accurate data such as the make of the car, Euro emissions rating and the year of manufacture), the average vehicle speeds and percentage of occupancy in the detection zone (real or virtual). Moreover, it is important for both directions of traffic to be recorded. The system should feed the data to the existing central traffic management software (MISTIC) at time intervals of no longer than 5 minutes.

The traffic detectors should be installed at strategically selected locations on the road network. The location of traffic detectors will be determined in such a way to best serve the operation of the existing traffic management software which is supported by a Dynamic Traffic Simulation Model. The locations should enable the operator to receive representative information regarding the pertaining road conditions at primary arterial and critical secondary urban roads. The second criterion that will be used to base the selection of equipment locations is road geometry. High road inclinations and high curves should ideally be avoided. The proximity to private or public private access points and to dedicated areas for the loading and unloading of trucks need to be taken into consideration. Moreover, since this traffic detection system does not intend to serve traffic signalling management purposes, detectors should be located at a reasonable distance from traffic lights (more than 200m if possible) and should ideally be installed in the middle of any road segment to be fitted with traffic detection capabilities.

An extensive traffic detection system is recommended to be introduced within the study area.

For traffic detection units, the entire study area is satisfactorily covered with 30 additional new traffic detection sites. Similarly, for sample detection of travel times in pre-determined routes, a quite satisfactory coverage can be achieved by introducing 14 new detection sites. The Figure 95 below illustrates the recommended new traffic detection and travel time detection sites Variable/Dynamic Message Signs (VMS/DMS)

Variable Message Signs (VMS) are electronic signs used on the roadway to provide information to travellers in priority order. Several types of messages can be displayed via VMS.

- Travel time information.
- Real-time traffic congestion and/or the presence of queues.
- Unscheduled lane/road closures due to collisions or other incidents.
- Planned lane/road closures due to construction, maintenance or special events.
- Safety messages in support of Police initiated education/enforcement programs.
- Missing child alert (AMBER alert).
- Severe weather condition alerts (e.g. flooding, winds).
- Environmental related messages.

The PWD TMCC should manage the information that is being displayed on the Signs by verifying current road conditions through field equipment such as traffic detection units, traffic (CCTV) cameras and automatic incident detection cameras.

Seven (7) Variable Message Signs (VMSs) are foreseen initially in the Study Area as follows:

- Two (2) large size VMSs in the A1/A6: Motorway: western to Anthoupoli IC (Kato Polemidia) with eastbound direction and eastern to Moutagiaka IC with westbound direction.
- Five (5) smaller size VMSs with direction to CBD: (a) Giannou Kranidioti street (Pano Polemidia), (b) Ag. Filaxeos street (southern to Agh. Fyla), (c) Ag. Athanasiou street (northern to A1), (d) Ag. Paraskevis (southern to Germasogeia) and (e) coastal street between Arch. Makariou and Chriktaki Kranou.

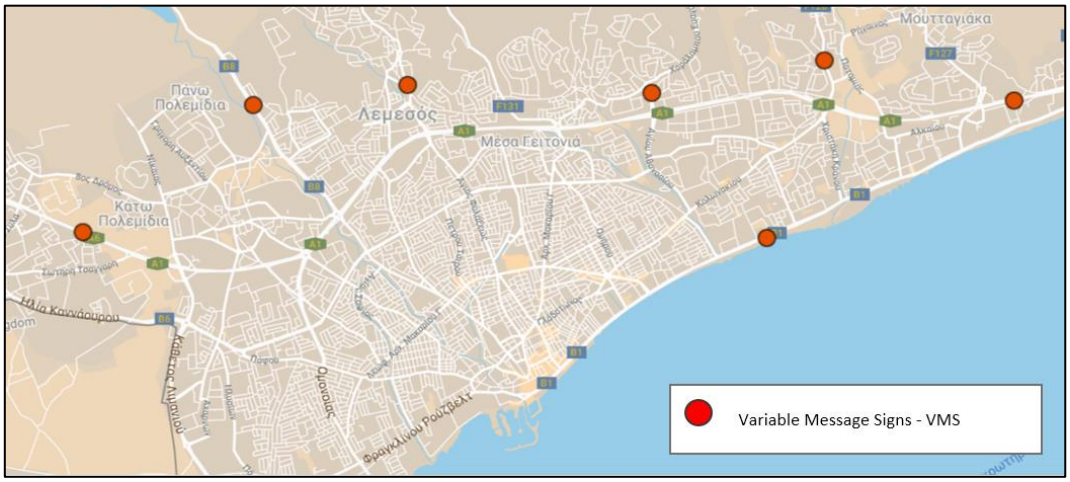


Figure 95: Variable Message Signs Locations

13.3.6 CCTV

The scope of CCTV cameras is either to view, in real-time, any traffic events or incidents, or to verify a specific traffic event or incident after receiving some relevant notification (such as traffic variables indications by traffic detectors, receiving a notification by police or local council or citizen).

The recommendation is that CCTV cameras that are not required for traffic counting or other continuous processing should be PTZ so that the operator will be able to monitor larger road stretches, using a single camera. Through PTZ cameras, the covered surveillance area is expected to be widened considerably as opposed to a situation where static cameras are used. The positioning of CCTV cameras depends heavily on their intended use. The main scope for Limassol should be to achieve visual surveillance of critical traffic signalized intersections such as highly congested intersections, as well as intersections where dedicated bus lanes are in operation. In the future, the CCTV system can be further expanded in order to achieve a significant adequate coverage of primary road arterials in Limassol.

A quite wide coverage of Traffic Monitoring CCTV/PTZ system is recommended in order to monitor traffic conditions and incidents. For the selection of the sites, the main criteria are to cover satisfactorily intersection presenting (i) significant traffic levels, (ii) quite high accidents rate (presented in previous study's deliverable) and (iii) dedicated bus lanes. In total 25 CCTV sites are allocated within the study area (please see **Annex IX, Figure A-IX 4** for details of the CCTVs System area).

13.3.7 Incident Detection

Automatic Incident Detection (AID) cameras should be installed in order to detect automatically traffic incidents and abnormalities upon the road network. The cameras should be fixed, so CCTV/PTZ cameras can be in parallel installed to verify and monitor in parallel the traffic conditions in the incident detection area.

The most suitable candidate positions for installing AID cameras are the following:

- Monitoring complicated intersections and road segments that are associated with multiple turning movements, frequent traffic flows/queue variations, and frequent traffic incidents.
- Transmission of images during special traffic events and incidents.
- Monitoring road segments with increased probability of incidents.

The system will be installed initially in few intersections by taking into account traffic levels as well as accidents rate (as presented in previous study's deliverable). The system will be installed at 4 intersections (see Figure 96 below), where one (1) AID should be allocated per intersection approach, i.e. in total 16 AID units.

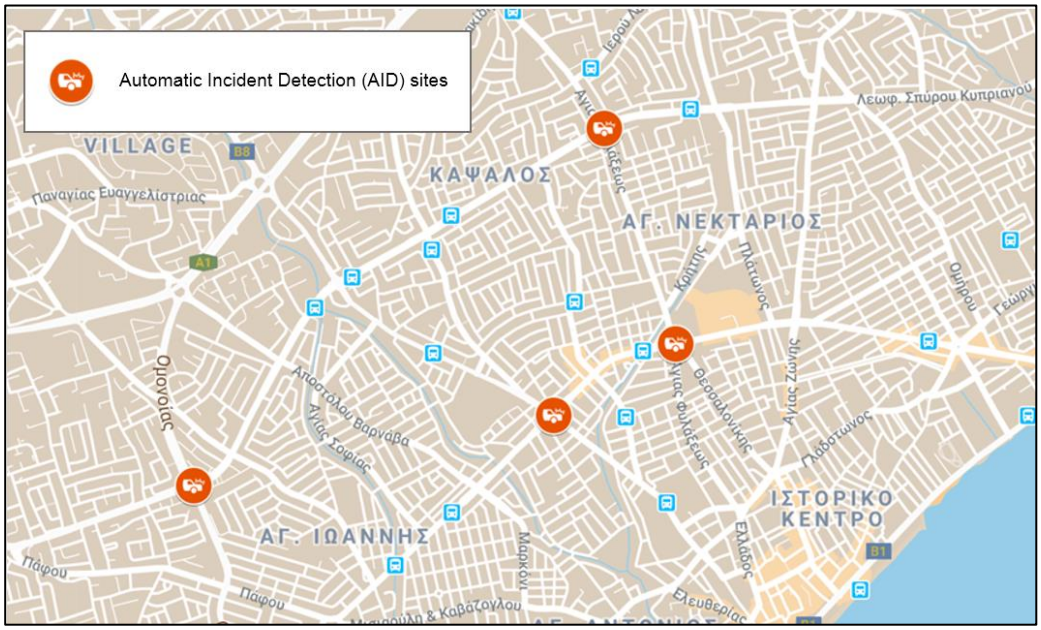


Figure 96: Automatic Incident Detection System Sites

Incident detection system can be used within the existing PWD traffic management platform in order to provide real-time warning and information to users for re-routing. It is rather a synthesis of various parameters to achieve reduction of delays (please refer to section 13.3.10).

Regarding insurance claims on vehicle priority or illegal driving behaviour, the video storage could be used for such issues, but the legal framework has to be thoroughly examined (e.g. protection of personal data).

13.3.8 Integrated Parking Guidance System

The system refers to a fully operational parking guidance system for the provision of information regarding parking space availability at main off-street parking areas based on real-time information. This information will allow drivers to choose their final parking destination en route.

The underlying rationale of a parking guidance system is to combine strategically selected parking areas with the provision of alternative transportation modes (such as bus and bicycle) in order to incentivise modal shift for at least part of the journey for a cluster of commuters. Accordingly, Park and Ride areas are also good candidates for the installation of such system.

By taking also into account pedestrianization of the core city centre (according to preferred scenario 6), the implementation area including the off-street parking areas and dynamic parking guidance system is illustrated in the following Figure 97.

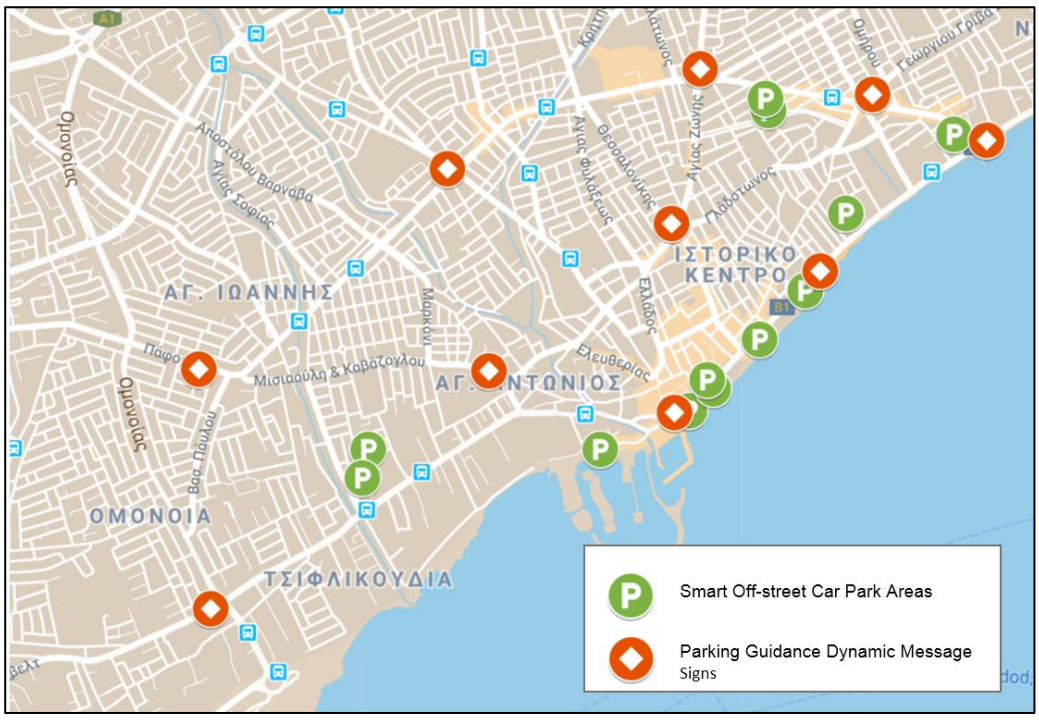


Figure 97: Parking Guidance Implementation Area – Parking Areas & Dynamic Signs Locations

Twelve (12) off-street parking areas will be monitored by the system where LED signs will be also installed at the entrance of parking areas. Additionally, ten (10) parking guidance signs are located within the CBD of Limassol so that drivers can promptly decide about their preferred parking area based upon real-time parking availability.

13.3.9 Advanced Parking Payment System

The system objective is to develop a smart parking payment system in Limassol in order to modernize the current parking payment methods available to parking users for on-street parking, as well as, to ensure on-street parking pricing efficiency. The system will also provide tools to enforcement officers to enhance parking enforcement activities and minimise unnecessary patrol through the city.

The following streets are expected to be included in the system:

- Arch. Makariou III.
- Papachristoforou.
- Emanouil Roidi.
- Griva Digeni.
- Sioukri.
- Ag. Zonis.
- Epikourou.
- Thessalonikis.
- Gladstonos.
- Ag. Filaxeos.
- Zinonos.
- Georgiou Karaiskaki.
- Eleftherias.
- Eirinis.
- Ag. Theklis.
- Spirou Araouzou/Christophorou Chatzipavlou (coastal street)
- Ipatias.

It is also expected to install 26 smart parking meters at convenient locations for on-street parking users, i.e. close to parking segments with charging policy (Subject to changes in case the parking policy suggests otherwise, e.g. Full restrictions of on-street parking in CBD area). 20 PDAs are assumed to be purchased for parking law enforcement officers in order to detect illegal parking in real time.

Finally, it is also considered that 80 parking sensors will be installed in various locations within CBD in order to detect illegal parking, as an additional tool to parking law enforcement officers. This measure would work as a supplement to the traffic signs in the proximity of a junction, by allowing traffic police to get warnings on their PDAs for the presence of vehicles.

13.3.10 Control Centre

It should be noted that the Strategic ITS Master Plan in Cyprus (2009) examined the solution of development of a Local Traffic Management Control Centre per city, which would be integrated with the Central PWD TMCC located in Nicosia. However, such a solution has not been decided by PWD and consequently all related ITS investments in the period 2010 - 2020 regarding ITS mainly focused on achieving centralized management by the PWD Traffic Management Control Centre in Nicosia.

By taking into account the relatively low demographic and geographical coverage of Cyprus, the PWD TMCC is expected to serve at least for the medium-term horizon the traffic management needs of the Limassol Study Area. The same architecture is also currently adopted for the PWD UTC Centre which is also located in Nicosia. Consequently, by taking into account the existing ITS conditions in Cyprus and Limassol, the high priority proposed systems can be managed and/or monitored by different Control Centres.

Medium Term Solution

The following systems are expected to be integrated and centrally managed by the existing PWD TMCC:

- Traffic Detection Systems.
- Variable/Dynamic Message Signs.
- CCTV system.
- Incident Detection System.
- Integrated Parking Guidance System.

The following systems are expected to be centrally managed by the existing PWD Urban Traffic Control Centre:

- Advanced Urban Traffic Control – existing system upgrade for Limassol.
- Bus Priority System.

A Control Room should be developed in order to host the parking applications for central management by Limassol Municipality:

- Integrated Parking Guidance System – also integrated with PWD TMCC.
- Advanced Parking Payment System.

The following systems are expected to be also managed or monitored by the existing Traffic Police Control Centre located in Nicosia:

- Bus Lane Enforcement System.
- CCTV – via integration to the PWD TMCC.
- Incident Detection – via integration to the PWD TMCC
- Advanced Parking Payment System – via integration with Limassol Municipality Control Centre for strictly enforcement purposes.

The Dynamic Bus Display Signs that will provide real-time information for city, rural and intercity travel can be managed by the relevant public transport operators' Control Rooms (Limassol bus operator, Inter-city Bus operator). Control rooms have been recently developed by bus operators to centrally manage the bus fleet management system, the bus travellers' information system and the advanced payment system.

Data communication and some form of integration is needed between the different Control Centres in order to ensure coordinated services for the transportation network of Limassol. The

communication between the Control Centres is depicted in following Figure 98; the dashed lines denote the required integration while the single line denotes current integration.

As it can be seen the PWD TMCC plays an important role to the city's traffic management, since it is expected to collect the majority of dynamic information by the various systems. More specifically, the PWD TMCC should receive the following information in order to provide some coordinated and integrated traffic management actions:

- Receive vehicle actuated traffic signalized data such as intersection delays and traffic flows from the PWD UTC.
- Receive parking data such as off-street parking occupancy from the Limassol Municipality Control Room.
- Receive public transport data from the public transport operators' control room; this communication has been recently established.
- Share CCTV and Incident detection images and stream with Traffic Police Control Centre; this communication has been established for the existing CCTV systems which are in operation in Nicosia.

The data exchange between Control Centres should be conducted through a virtual private network (VPN).

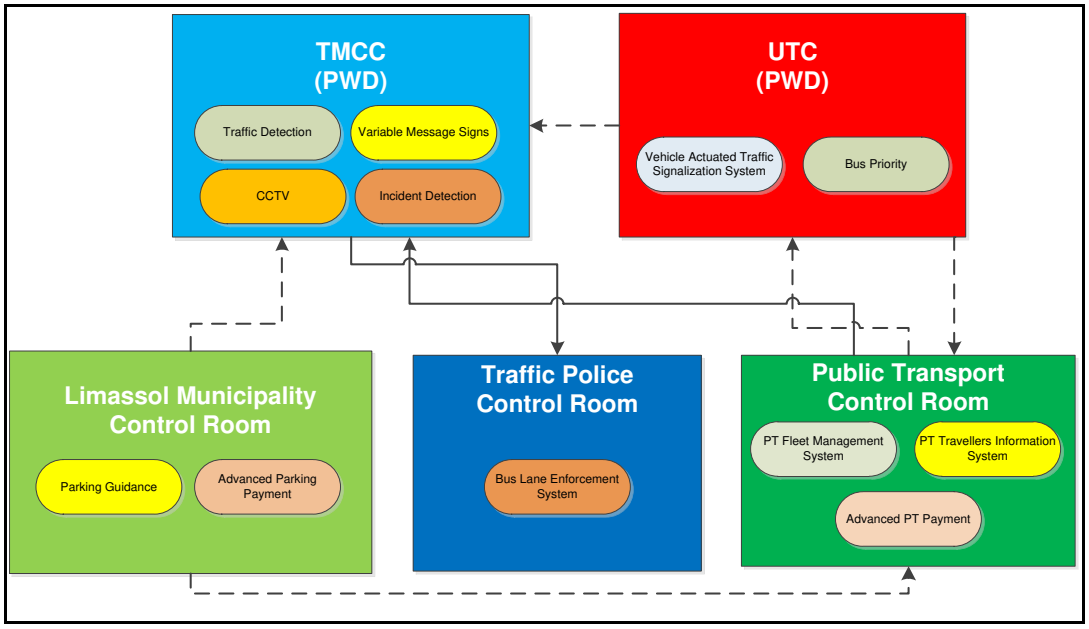


Figure 98: Functional Architecture of Control Centres

Long-term Vision

The cities are becoming ever more crowded with people and vehicles and the traffic infrastructure has its limits. The congestion does not disappear. The only way to challenge this growing problem is by employing advanced Intelligent Transportation Systems and thus actively managing the traffic flows.

Traffic Management Control Centres (TMCC) are established at city level to serve integrated ITS operation for various functions such as traffic management, traffic lights control, incident management, public transport management, and parking management. The TMCC objective is the integrated multi-modal management of a significant set of transportation functions within a city. The TMCC within the city can be integrated with other Control Centres such as emergency control centres (traffic police, ambulances, fire brigade) or various operations to be carried out within TMCC by emergency stakeholders' representatives.

For the long-term smart transportation vision in Limassol, an integrated Urban Traffic Management Control Centre should be considered for central hosting, management and operation of all ITS related city applications in Limassol which can be operated by personnel with various skills and possibly allocated by different stakeholders (e.g. public transport operator, traffic police, Municipality, PWD).

14 Strategic Plans and Policies

14.1 Introduction

The success of a sustainable mobility plan depends strongly on the coordination and integration of the transport and land-use policies in a study area. In the case of the Limassol SUMP the preferred policy Scenario chosen in order to achieve the vision and objectives of the SUMP is Scenario 6, which has been described in Deliverable D8.1. Scenario 6 consists of a set of transport mobility strategies and an urban policy strategy based on the polycentric and mixed land use development pattern. This chapter evaluates the existing development plans of the study area and analyses the proposed policies of the polycentric land-use development of Scenario 6.

The proposed land-use strategy tackles the existing challenges of the Local Development Framework and mitigates against the negative mobility trends taking place in Limassol. The recommended land-use policy package, complements and adds value to the transport interventions proposed by the SUMP and plays a key role in achieving the desired objectives.

14.2 Current Status

Assessment of existing Development Plans

The existing development plans and related policies affecting the study area have been assessed in WP2. The Development Plans that affect the SUMP Study Area are the Policy Statement for the Countryside (PSC), the Limassol Local Plan (LLP) the Limassol Central Area Scheme (LCAS). All these Development Plans contain most of the modern sustainable planning principles, but the implementation of these principles has failed, resulting in dispersed development and strong car dependency. The main conclusions of the assessment of these Development Plans are described below.

1. **Policy Statement for the Countryside (PSC)**

- The PSC planning policies are too general to be effective. The transport policy is not effective because it is not area specific and it only attempts to list sustainable mobility principles without any spatial consideration.
- The peri-urban communities that are included in the Limassol SUMP study area but fall within the PSC have more urban than rural characteristics and are part of the greater Limassol Metropolitan Area. Their inclusion in the PSC is an anachronistic planning measure that needs to change.
- The relaxation policies for single housing in the PSC and the continuous demand for expansion of development zones without a real demographic need has created a huge problem of dispersed and scattered development, which is opposite to all sustainability principles. A real effort must be made by the relevant Authorities to halt the unnecessary expansion of the city and to promote compact development.

2. **The Limassol Local Plan (LLP)**

- The general principles of the LLP are in theory compatible to the objectives of a Sustainable Urban Mobility Plan. The LLP includes the principle of a mixed and polycentric land-use development pattern with a strong emphasis to the development of the central area. However, this pattern has not been implemented. Development is scattered, and commercial development is mainly linear along main roads creating traffic safety, operation issues and car dependency.
- The environmental area theory which promotes mixed land-use development and on which the proposed LLP structure is based has failed. This has resulted in road safety problems and in increased car dependency. Land-use policies have to be re-examined during the LLP review so as to promote more compatible mixed land-uses, which will minimise the need to travel.
- The objectives of the LLP Transport Policy mainly correspond to the objectives of a SUMP. Consequently, applying the principles of the LLP will also support the SUMP of Limassol and vice-versa.
- The general parking policy of the LLP does not promote sustainable mobility but maintains and strengthens the use of the private car. The policy must be thoroughly reviewed to include an in-

tegrated approach taking into consideration improvements of the public transport service, efficient parking pricing policy and enforcement. If the parking spaces are simply reduced without an integrated approach, then this may lead to the decline of the town centre.

- The existing parking standards for developments and the Parking Incentive Scheme both for the LLP and the LCAS promote in many cases the use of the private car and thus, must be evaluated and reviewed.
- Although the public transport objectives and principles of the LLP are compatible to the SUMP approach, the proposed implementation of policies and measures is ambivalent. Some of the proposed measures will in fact promote a sustainable development, reducing the need to travel by car and providing alternatives. However, some other measures seem to be counterproductive, such as upgrading the road network in the central urban areas. Providing more road capacity, if no other measures are implemented limiting the access of private motorised vehicles, will induce more car traffic and not less. It is important to improve access and provide space for the sustainable modes of transport and simply restrict access by the car.
- The cycle and pedestrian network policies and measures of the LLP are adequate and in line with SUMP principles. However, they are not complete. The policies mainly focus on providing infrastructure for non-motorised modes. This is important and necessary but not sufficient. In order to really achieve a change towards greater sustainability, the built environment has to be adjusted in order to promote walking and cycling and encourage people to take action and change their travel behaviour. In addition to providing dedicated infrastructure, it is necessary to change attitudes, through public marketing and awareness campaigns, information and many more strategies and policies.

3. The Limassol Centre Area Scheme (LCAS)

- There is a strong interaction of the planning approach of the LCAS with the SUMP process. The SUMP takes both into consideration, the distribution of land-uses and the maintenance of architectural and historical heritage. The preservation of the traditional urban fabric excludes the car, as the car only intruded into the urban fabric a few decades ago. Centuries before that, urban settlements existed on the basis of closeness and non-motorised mobility. It is therefore imperative, to have a spatial management that aims at mixing land-uses rather than segregating them, which will ultimately result in more sustainable mobility patterns of the population and visitors.
- A compact town structure is more favourable for promoting sustainable mobility, short trips, non-motorised trips or using collective modes of transport. However, even with a town structure that has evolved historically, there are always possibilities to use the advantages and minimise the disadvantages. It will be part of the plans and future sections of the SUMP process to tackle these specific issues related to the current town structure. There are some conflicts between the LLP and the LCAS concerning the location of the central bus station. The LLP suggests the bus station at Leontiou Street while the LCAS proposes a bus depot station at Leontiou street and a bus transfer station at Themistokleous street. These proposals have been evaluated and the final SUMP proposal is the creation of the main bus station at Themistokleous street.
- The western extension of Aktea street, which will be included in the revised LCAS, should preferably be a traffic calmed road instead of a four-lane avenue. Scenario 6 of the SUMP proposal contains a specific proposal for this coastal road, which includes dedicated bus lanes, pedestrian and cycle infrastructure.
- The Technical University of Cyprus (TEPAK) is situated in the area of the LCAS. The location policy of the University in the central area is a correct one but generally, the evaluation of the car-parking policy of the TEPAK location is alarming and disappointing. Worldwide, in developed countries, it is the students, the young generation that have adopted alternative mobility patterns–that are clearly distinctive from the older generations, i.e. they cycle, walk and use public transport far more than their parents. It is to be expected that this young generation is more dynamic and capable and willing to change. In Europe and Northern America, young people tend not to own a car anymore, many not even hold a driving licence. It is the mobility behaviour that young people learn during their university times that will be reflected during the rest of their lives. It is therefore even more important to encourage students not to use the car and to promote sustainable means of transport. In this respect, it is utterly counterproductive to build car parks for the university and particularly for students. This is certainly not compatible with any kind of sustainable development and must be addressed.

14.3 Objectives

The polycentric land-use scenario follows the principles of sustainability endorsed by the Limassol SUMP. These principles aim at promoting multi-modal transportation and improving the quality of life of citizens.

The general scope of the proposed land-use strategy is the creation of a liveable, safe and inclusive built environment for the citizens of Limassol. The specific objective of the strategy is the enhancement of the peri-urban centres while maintaining and strengthening the pivotal role of the City Centre. The strategy also aims at attracting investment so that the city remains competitive nationally and internationally.

The diagram below (Figure 99), illustrates the general the objectives of the proposed planning strategy.

Figure 99: Planning Strategy Objectives

14.4 General Approach – The principles of the Polycentric Scenario Strategy

In order to successfully deliver the vision of SUMP the existing planning policies should be updated to reflect the present urban challenges. As mentioned above, the existing Development Plans support the use of sustainable means of transport but have failed to deliver such results.

Therefore, it is considered crucial to empower traditional means of formulating planning policies. The Polycentric Scenario Strategy proposes the inclusion of fiscal measures and a set of new supplementary planning policies and tools in order to coordinate and guide future land-use and transport development and achieve sustainability.

The main principles of the Strategy are the following:

- Enhancement of peri-urban centres
- Maintain and strengthen the primary role of the Central Area
- Compact urban development and increased population density
- Affordable housing and workspace.
- Activation of empty residential land.
- Reduction of travel distance.
- Challenge existing travel behaviours to favour public transport, cycling and walking

It is also important to achieve better coordination between transport and land-use plans and relevant decision makers and stakeholders. Participation and transparency in the decision- making process is crucial.

The proposals of the Polycentric Development Strategy must be incorporated in the new LLP and the LCAS which are currently in the process of being revised.

14.5 Key Strategy Policies

The proposed Strategy is divided into four policies, with each policy acting as complementary to each other. The proposed main policies aim at ensuring that the mobility policies proposed by SUMP are reflected in the urban form and land use of the Greater Limassol Urban Area.

The policy package is summarised and illustrated below in Figure below.

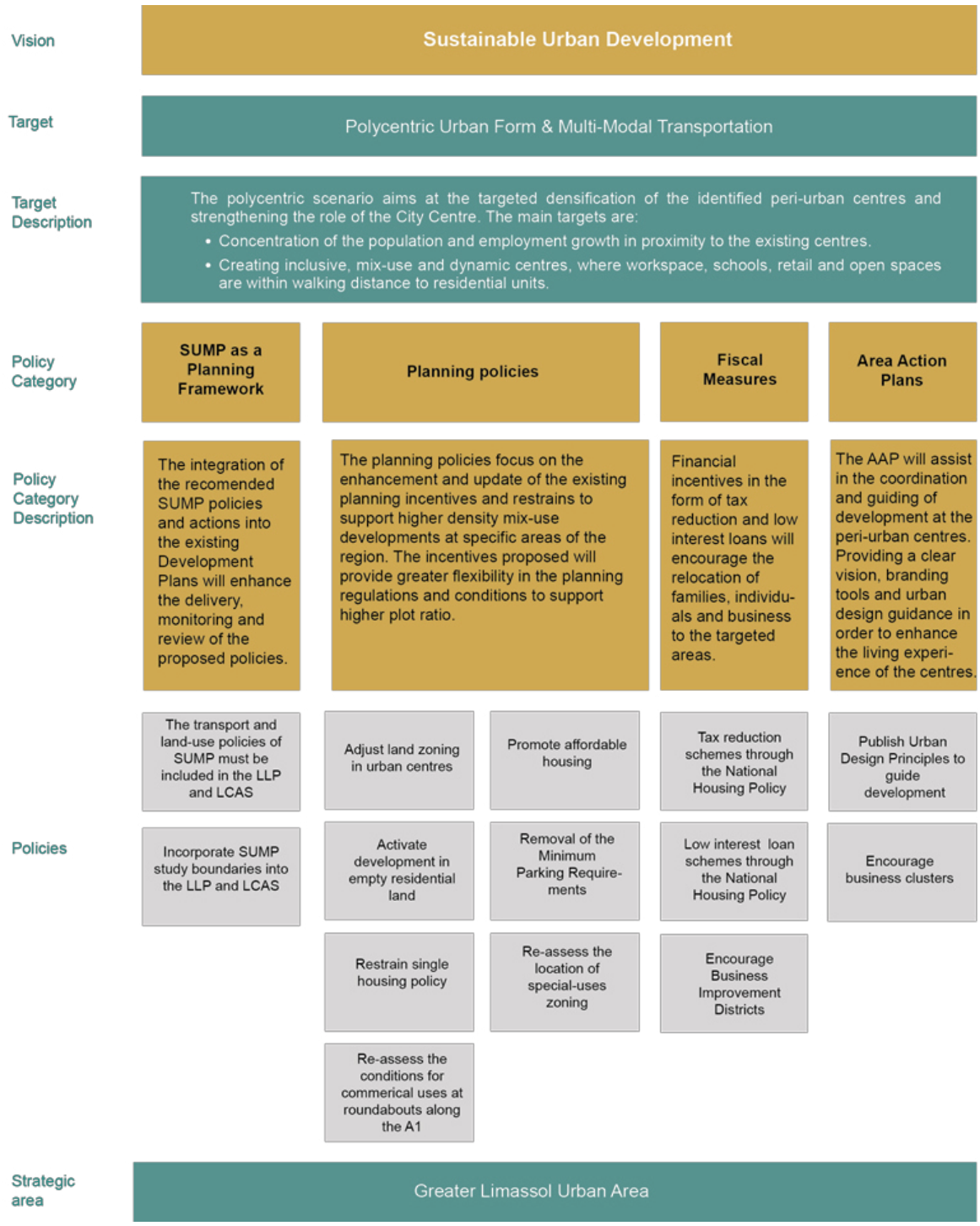


Figure 100: Polycentric Urban Policy

14.6 Detail Description of the Strategies and Policies of the Poly-centric Urban Development Scenario

Polycentric development

The proposed polycentric development aims at strengthening the urban centres in the periphery through the support of mix-use development, ensuring that the centres provide the necessary services to be self-sufficient, while maintaining the primary role of the city centre. The strategy also promotes compact development in existing development areas for sustainability reasons and in order to support public transport. This strategy is in line with the vision and the philosophy of the LLP and specifically with the following three basic LLP goals:

1. Goal 3.2(α): Future development in Limassol should be encouraged and guided in existing development areas and urban centres through various planning incentives.
2. Goal 3.2(γ): Compatible and balanced mixed land-use development should be encouraged
3. Goal 3.2(ζ): The primary and crucial role of the city centre should be maintained and strengthened.

The above LLP goals and especially goal 3.2 (α) Limassol have not been achieved in Limassol. The proposed strategies aim at achieving the polycentric and compact development through the introduction of more target specific policies and measures. The aim is to enable the central area of Limassol to continue to form the most important area of the city, while also allowing the peripheral urban centres to flourish.

The proposed strategies will have to be closely monitored and reviewed since substantial changes in existing development patterns are not always easily implemented. For this reason it should be noted that a number of the transport related measures of the SUMP may also work independently and do not completely rely on the full implementation of the proposed polycentric scenario.

The proposed polycentric scenario has identified specific urban areas in the periphery of the central area of Limassol which already constitute parts of peri-urban communities of the Greater Limassol urban area. These identified urban areas are intended to be transformed and developed into vibrant and dynamic urban spaces(sub-centres) and transport hubs. Independent, with ser-vices within walking distance from housing units and efficiently connected between them. As mentioned in section 6.7 ‘Bus Stops’, the SUMP preferred scenario proposes the creation of multimodal transport hubs (combined urban and intercity lines). Three of these transport centres are proposed at strategic peripheral locations. These stations could promote the polycentric development as vibrant transport hubs with suitable land-uses around them.

Similarly, the aim of the polycentric development is to attract population and employment in the urban cores of the identified peripheral areas. This could be achieved with various planning and fiscal tools like increased building and population densities in specific centres and around transport centres and financial and planning incentives for attracting people and business. The aim is to transform these peripheral areas into strong magnets for development, offering the opportunity for regeneration projects to attract new housing and employment.

Brief description of the polycentric urban development of SUMP Scenario 6

It is estimated that the population of the Limassol SUMP area will increase by 32.357 persons between the years 2016 and 2030 and the employment by 19.427 jobs for the same time period.

The predictions of the expected population and employment growth are based on the surveys of the Statistical Service of Cyprus. The process included the analysis of the existing trends of growth and the formulation of three different scenarios. Specifically, the projection included scenarios based on low, moderate and extreme rate of change, with the moderate rate of growth adopted. This rigorous statistical process was clearly presented and approved in Deliverable D3.2.

According to the polycentric scenario, the expected population and employment growth will mainly concentrate beyond the highway in the centres of the chosen peripheral communities. The Limassol City Centre will also maintain its significant economic and administrative role. The mixing of uses will be supported through appropriate policies.

According to the proposed scenario, 85% of the expected population growth will be guided towards five peri-urban centres as explained below. 15% of the expected population growth is expected to occur in the central area promoting the idea of mixed -use development. The existing residents in the central area should be encouraged to remain and new residents should be attracted to the central area by ensuring and increasing the quality of life in this area. This forms part of the polycentric strategy which promotes mixing of land-uses and decreasing travel distances.

Consequently, these various centres including the central area will be concentrations of the different activities working, shopping, leisure and will be in close proximity of where people reside, resulting in short distances and reducing the need to travel.

The figure below (Figure 101), illustrates the location of the targeted densification areas and the distribution of the population growth. These areas are indicative of their strategic location with development focusing within proximity of their existing centres and shouldn't be misinterpreted in supporting a sprawling-built environment. According to the chosen scenario, population will be distributed around the following centres:

- 25% in the Municipality of Ypsonas which can also act as a regional development pole for Erimi and Kolossi
- 20% in Agios Athanasios and Germasogia
- 15% in the Centre of Limassol
- 15% in Kato Polemidia
- 15% in Agios Tychonas.
- 10% in Agia Phyla

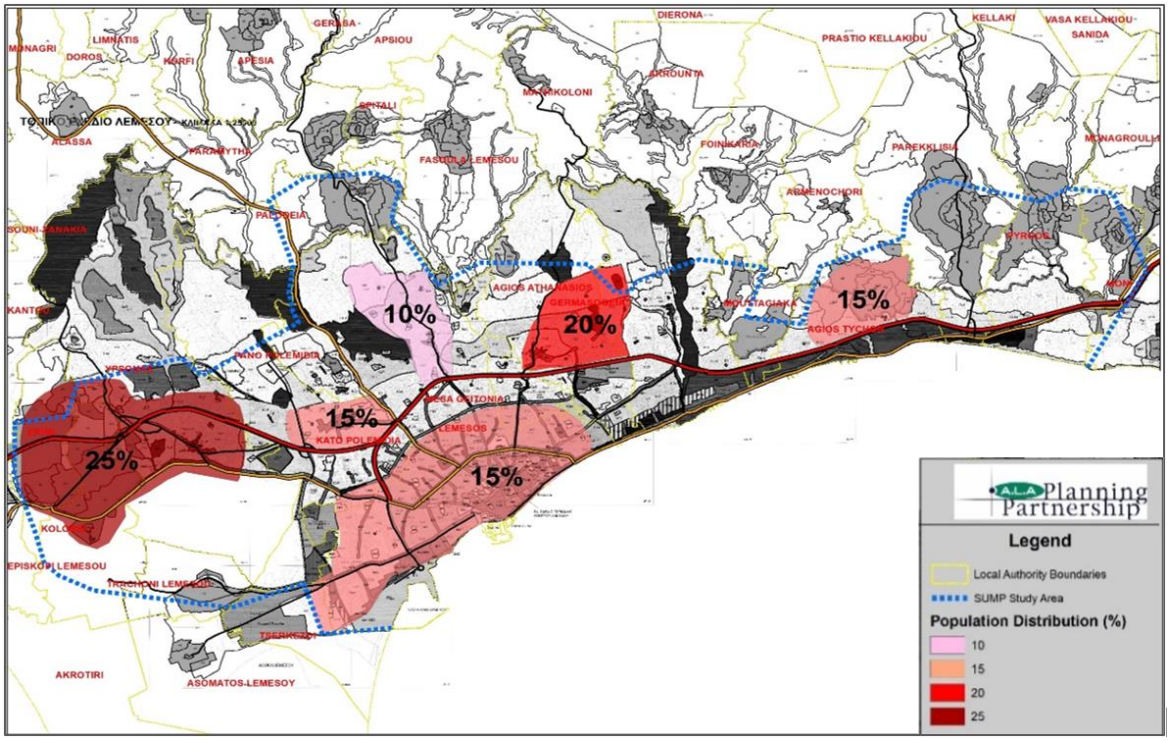


Figure 101: Polycentric Development: Population

Based on more detailed analysis of the development trends of the Limassol SUMP area, it is suggested that the population distribution for the preferred polycentric scenario is slightly modified as shown in the following table.

Municipality/Community	Population percentage
Limassol municipality	15-20%
Ypsonas/ Erimi/ Kolossi	25%-35%
Agia Phyla (part of Limassol Municipality)	10%
Kato Polemidia	15%
Agios Athanasios/ Germasogia	20%
Agios Tychonas	5% - 10%

Table 30: Modification of population distribution

Approximately 50% of new workplaces predicted/expected to be created in the Limassol Central Area while the remaining 50% will be distributed in the peripheral centres proportionally to their population. The assumed employment distribution of the chosen polycentric scenario is shown in the following figure.

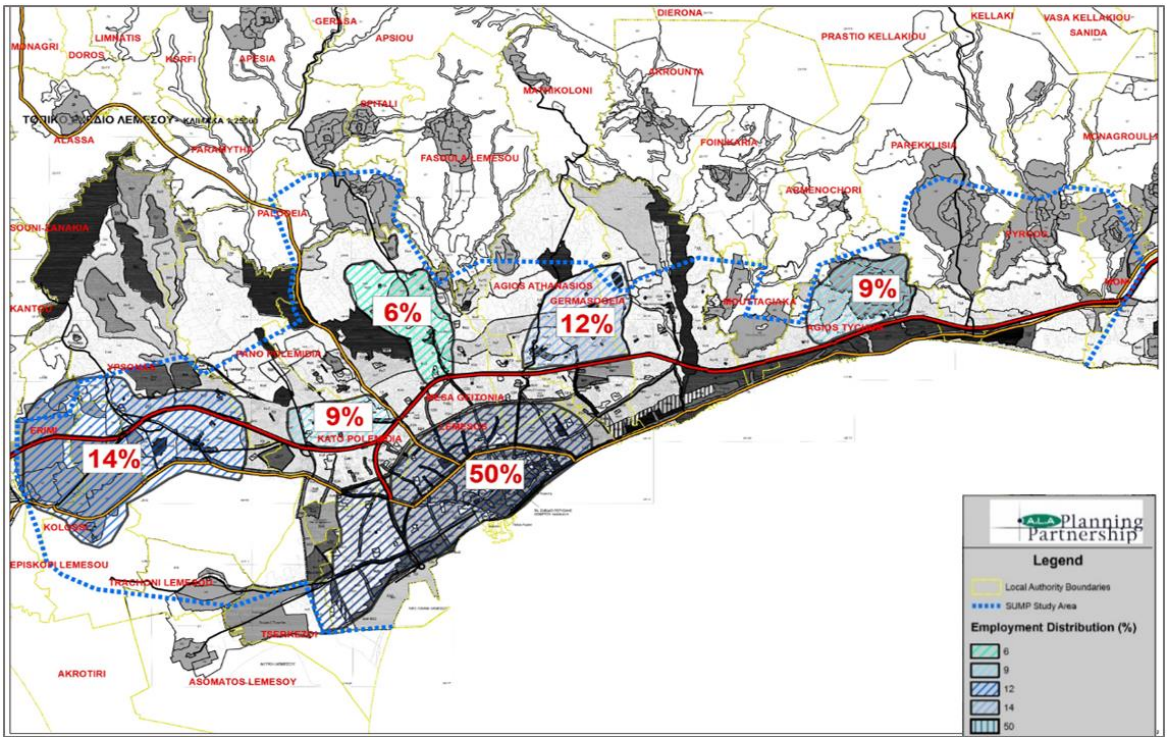


Figure 102: Polycentric Development: Work Places

Proposed strategy and policies

In order to achieve the proposed polycentric and mixed-use urban development, a clear change in the land use and urban policies from today's planning approach and urban policies is imperative. The recommended strategy and policies aim at revising and strengthening the existing planning framework and the utilising of new planning and fiscal tools.

As stated above, the policies proposed are interconnected and complementary to each other and are divided in the following four action categories.

A. Ensuring that the Limassol SUMP is a legal binding planning document.

B. Revising existing and introducing new planning policies.

C. Introduction of new fiscal measures.

D. Designing and implementing Area Action Plans

A. Establish SUMP as a binding planning legal framework

The primary recommendation of the strategy is to ensure the validity of SUMP as a legal development framework and to ensure that the proposed actions are delivered. This can be achieved through making the SUMP proposals and policies an integral part of the LLP and the LCAS. The participatory process of the SUMP study included the representation of the Department of Planning and Housing , the Planning Board and the Limassol District Officer in the Steering and the Key Stakeholders Committees. These Authorities are also directly involved in the process of the review of the LLP and the LCAS, thus facilitating the integration of the recommended SUMP policies with the new land-use policies.

The above recommendation will coordinate the sustainable land-use and transport policies and will allow a review of the SUMP every five years through the existing planning legal framework, improving the implementation and monitoring of the policies. This proposal will also ensure public participation through the procedures is included in the planning process.

It is also proposed that the LLP and LCAS boundaries are revised to reflect the SUMP study area, to allow for the merging of the documents and avoid conflicts and contradictions. The upcoming revision of the LLP and LCAS provide the opportunity for a fast integration and legal validity for SUMP.

Another more long-term proposal is the preparation of local transport plans for the areas covered by Local Plans and Area Schemes. These local transport plans could be also published and become compulsory legal documents with the publication of Local Plans and Area Schemes. This proposal requires changes in the existing planning and other relevant legislation.

In the long term, a National Transport Plan for Cyprus could enhance the legal validity of the SUMP study. The recommended plan will assist in the coordination of transport infrastructure across the island, enhance connectivity and endorse a sustainable mobility vision for Cyprus. Ensuring that the proposed policies are delivered and are supported by political and public will. This is related to a more general issue which concerns the preparation of a new Island Plan to replace the existing Policy Statement for the Countryside. Such a decision has political implications and is a long-term pending political issue.

B. Planning Policies

Adjust Land Zoning

The increase of building density and promoting mix use development in the urban centres of municipalities and in proximity to the proposed transport hubs is identified as pivotal to the delivery of the SUMP objectives. This will tackle the issues of urban sprawl, concentrate future development and enhance the liveability and attractiveness of the identified urban centres.

It is proposed to increase the plot ratios of the residential zones in proximity of the chosen urban cores to allow for a more vertical development and avoid the creation/extension of new residential zones unless this is substantiated by planning parameters such as the population capacity of existing zones. This will allow the construction of small blocks of flats in zones near the centres of the chosen peripheral areas. An example of increase in plot ratio is the increase from a plot ratio of 0.9:1 to 1.2 :1. Site specific examples are also included at the end of this chapter.

It is also recommended to change the existing residential policies and allow more land-uses in residential zones such as offices, education and some leisure facilities to promote mixed land-use patterns.

It is critical to adjust the above recommendations accordingly to the specific site characteristics of the peripheral urban centres.

The central area of Limassol should maintain its function as the primary activities' area in the Limassol urban area. It is therefore recommended to increase plot radios in this area based on substantiated studies.

A new comprehensive policy for the location of high-rise buildings is also recommended. The existing practice of the delivery of the high-rise buildings in Limassol along the seafront, is incompatible with sustainable transport principles. This is because, the construction of high-rise buildings towers is limited to residential uses and have low occupancy rates. This trend is likely to continue in the near future, with more high-rise buildings planned or under construction. As a result, the buildings will not contribute to necessary densities for efficient public transport operation and instead cater for more motorised trips for the occasional and wealthy residents. Additionally, the current planning practices supports the creation of new public car parks, under the new buildings that directly incentives more trips by car to their centre, which is incompatible with the SUMP philosophy. Therefore, it is proposed that existing policies are adjusted, to reflect the opportunities and challenges of high-rise buildings, dealing with issues such as their low occupancy rates, land-use and location.

Activate construction in existing empty residential areas

Compact development is also an essential land-use policy recommended in the SUMP plan. It is therefore recommended to activate the development of existing empty residential land which remains empty mainly due to the lack of suitable road access. The first step for this recommendation concerns the identification of suitable residential areas to be activated. Following this action, a main road layout plan should be prepared for each area and this plan should be implemented by Local Authorities either by acquiring the necessary land by compulsory acquisition (expropriation) or through agreements with the affected land owners. It is suggested that an action plan is prepared for this recommendation, which will define priorities and timelines.

Incentives for development in residential land with infrastructure

The policy recommends that the Plot Ratio increases by 0.10:1 in empty residential plots where the road and utilities infrastructure exist, within a radius of around 1.5 km around the centres of the peripheral areas, provided the plots are developed within a period of five years from the date of the publication of the new LLP. This will act as a strong incentive to activate empty residential plots and increase population density.

Affordable housing

At the identified urban centres, planning incentives can further add to the percentage of Plot Area Ratio, through the provision of affordable housing. This will ensure that construction of buildings is financially feasible, increase density and attract investment to the periphery.

The soon to be published National Housing Policy will play a key role in the implementation of the affordable housing scheme. This is because it will address existing issues that hinder the delivery of affordable housing. These include the role of the government in the provision of housing, the clarification of the criteria for eligibility to affordable housing schemes and the establishment of a public body responsible for the management and control of the affordable housing scheme.

The strategy recommends that the policy for affordable housing schemes in the urban centres and in proximity to the transport hubs becomes more flexible and lenient. The recommended in-creases in plot ratio for affordable housing at the identified peripheral urban areas is shown in the Table below.

Percentage of Affordable Housing in new developments	Percentage increase in Plot Area Ratio given to the new development
20%	10%
30%	15%
50%	25%
100%	50%

Table 31: Raise affordable housing

According to Table above, if a new development creates a percentage of the total buildable area as affordable housing then it is entitled to increase its plot ratio (i.e. buildable area) by a certain percentage as shown in the Table above. An example relating to the first row of the table above is the following:

If a plot with an area of 2.000 m^2 is located in a residential zone with a plot ratio of 1:1 the developer may construct 2.000 m^2 regular housing units. The plot ratio may be raised to1,1:1 (10%) and the developer may build 2.200 m^2 if he constructs 440 m^2 (20% of the development) affordable housing units. The size and the construction materials of the affordable housing units may be different than the regular housing units so that they may be affordable.

It should be noted that the above suggestions for promoting affordable housing through planning incentives is in line with the scope of the recent housing policy of the Government. This new Housing Policy contains suggestions for planning incentives (increases in plot ratios) and other measures including fiscal measures for rent subsidies. However the new Government Housing Policy for affordable housing does not apply for plot ratios below 1.0:1 and this creates a problem for the proposed polycentric development since all the urban centres suggested to be developed above the Limassol-Nicosia Highway have plot ratios less than 1:0:1. **It therefore suggested that this new Housing Policy and the suggestions of the Limassol SUMP are elaborated by the Planning Board and adjusted to promote the proposed polycentric development of Limassol.**

Minimum Parking Requirements and Parking Incentives Scheme

Parking standards for developments included in the LLP and LCAS, is one of the most crucial factors influencing the proposed transport policy and mobility patterns. It is recommended that parking standards are revised so that the parking requirements of developments are reduced especially in the city centre. This will reduce the costs of major developments, free up space that would have been used for parking to be delivered as open space and promote the use of public transport, walking and cycling.

Specific uses can benefit from the removal of minimum parking requirement. For example, student accommodation within mix-use complex that are well connected to the university and the public transport network are considered as ideal case studies to implement such policies.

The existing Parking Incentives Scheme which supports the creation of extra public parking spaces through the increase of the allowable plot ratio expired in January 2019. It is suggested that this scheme is not renewed. If the intention of the Government is to renew this scheme, then it is suggested that the revision considers the principles of the Limassol SUMP which require to minimise the supply of parking especially in the central area in order to promote public transport. Additionally, it is recommended that if the scheme is renewed, the funds collected are invested in the delivery of public transport, cycle and pedestrian infrastructure. Improving the quality, inclusivity and accessibility of the public realm.

Policy for commercial and office uses along grade separated junctions (roundabouts)

The existing policy for commercial and office uses surrounding roundabouts on A1 motorway at strategic location must be strengthened and updated. This is because the sites serve the primary public transport network and can enhance employment in the periphery of the city.

Issues that have been identified and are in need to be reviewed include the existing percentages of Plot Ratio, minimum parking requirements, provisions for specific land-uses as well the neglect of including key roundabouts, particularly in Kato Polemidia.

Re-assess policy for single housing outside the development zones

The single housing policy outside of the development zones has contributed to the sprawling-built environment across Cyprus. It is a priority to revise this planning policy to limit building single housing units outside development zones through stricter conditions.

Re-access location of Special Uses

The existing LLP allows for the creation Special Uses outside development zones. This contributes to the sprawling environment as developments take advantage of cheaper land value. The location of such developments must be re-accessed, allowing such developments closer to the urban centres, therefore, reducing the need for commuting.

C. Fiscal Measures

It is recommended that a set of fiscal measures, which may reduce various community and other taxes for business developments in the selected in the peripheral zones, is examined by the Planning Board in coordination with the Ministry of Finance and included in the revised LLP.

The soon to be published National Housing Policy will play a pivotal role in providing access to new household owners to loans with low interest rates and provide clarity on tax reduction schemes that will assist in the growth of the peripheral urban centres. These fiscal incentives will complement the planning incentives and result in an attractive and dynamic polycentric region.

A new planning and fiscal tool which should be investigated is the creation of Business Improvement Districts (BID). This policy aims at creating BIDs in order to strengthen employment opportunities in specific areas such as the selected peripheral areas. Businesses that agree to form a BID will be required to pay an additional tax in order to fund projects within the district's boundaries and to fund shared training and mentorship schemes. Combined with funds from Local Authority, the BID will act as an opportunity to decentralise public spending and allow locals to influence decision-making.

Moreover, it will enhance collaboration between businesses, work towards a common vision and enable SMEs to grow, contributing to the diversity of the local economy. Providing transparency and exposure of the sector's successes and challenges; to encourage meaningful collaboration within the city, the region and beyond.

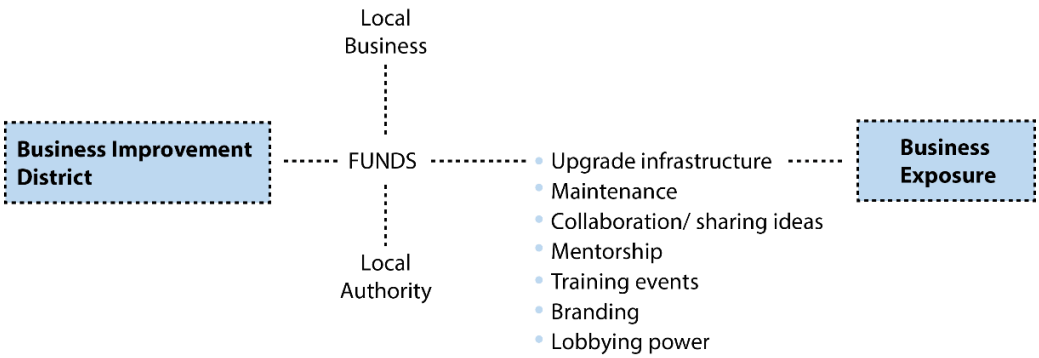


Figure 103: Fiscal Measures

Formulation and Publication of Area Action Plans

The polycentric plan of the area will benefit from the formulation and publication of Area Action Plans, that can facilitate and coordinate development in the periphery of the city. Similarly, to the LCAS, such documents will assist in adjusting the land zones, strengthening the character of the area and attracting housing and employment investments. It is proposed that the planning legislation is revised in order to include the development of such Area Action Plans with quicker and simpler procedures that are required for the development of Local Plans and Area Schemes.

The key deliverables of the Area Action Plans will be achieved through the establishment of a common Vision, implementing a public realm policy, pinpointing of sites that are suitable for re-generation, as well as improving transparency between the planning system and the public.

Planning at a smaller scale can guide future developments towards a specialised service and assist in creating strong agglomerations of businesses. These clusters will provide the employment opportunities required to avoid the commuting from the periphery to the centre.

The peripheral districts will benefit from an in-depth analysis of the existing development trends and proposed developments. Such as the new Limassol Football Stadium in Ypsonas and Kolossi, the Verregaria Brownfield Masterplan, which includes new educational facilities and student housing and the corporate hub in Agios Athanasios. Accordingly, the Area Action Plan will provide site-specific land-use interventions that can further support services to flourish. Acting as a tool for branding the peripheral areas.

Urban Design Principles

Complementary to the land-use policies, the Area Action Plan can provide people-oriented design principles and ensure that the urban form is not negatively impacted from new developments and that it remains homogenous. Recommending interventions to the public realm that are tailored to the specific challenges and opportunities of each urban centre and enhancing the living experience of the city, through improving the spaces between buildings.

The design principles will include guidance towards ensuring active ground floor uses, through the use of permeable materials, well shaded pavements with a diversity of street furniture and construction materials. The design principles can ensure that the diversity of building age is protect-ed, in order to safeguard the character of areas and cater for a diverse range of business and residents, balancing real estates' values. Where building height inconsistencies might develop through the increase in the Plot Area Ratio, the design principles can provide guidance on building height set-back, creating a homogenous urban environment.

The aim of the design guidance is to enhance the multi-sensory experience of the built form of the urban centres, creating attractive urban cores, places where locals want to live and work. Therefore, creating resilient communities and not commuter suburbs.

It should be noted that the LLP includes adequate policies concerning the conservation of old historic urban areas and includes incentives for safeguarding listed buildings. The above Area Action Plans should be complimentary to these policies of the LLP taking them a step forward. In the **Annex X**, you find some site-specific examples of implementing the above recommendations in Ypsonas/Kolossi/Erimi; Kato Polemidia; Agios Athanasioa/Germasogia; Agia Phyla; Agios Tychonas.

The polycentric planning strategy reflects the vision for sustainable transportation in Greater Limassol Area, proposed by the SUMP and ensures that the transport policies proposed are compatible with the urban form and land uses of the Greater Limassol Area.

The strategy is divided in four policy sections which are developed in depth, in order to deliver the targeted densification of the peri-urban centres and to strengthen the role of the City Centre. Guiding future population and employment growth in proximity of existing centres and creating inclusive, mix-use and dynamic centres, where amenities and jobs are within close distance.

The integrated and holistic approach of the SUMP must be endorsed by the decision-makers and key stakeholders, through the integration of the recommend transport and land use policies in the Development Plans. Although the key principle of compact and mix-use urban form is imperative to the delivery of the SUMP objectives, it is recognised that the transport related measures of the SUMP can also work independently and do not completely rely on the full implementation of the proposed polycentric scenario.

15 Implementation Plan

15.1 Introduction

The Implementation Plan is quite important for getting into the 4th Phase of the SUMP Cycle. To start implementing the SUMP proposed policies, projects, interventions, and actions, a well-structured plan containing all necessary information as well as time schedule is required. A good and comprehensive Plan can of course be a prerequisite for success only if at the same time the measures and policies proposed by the SUMP:

- have been positively evaluated from the key stakeholders and the majority of the citizens, therefore not only planning for people but also planning with people
- have been positively evaluated in terms of benefits being greater than their corresponding costs
- are technically feasible and legally permissible
- funding is available in an adequate pace

The current implementation plan builds on the work done so far regarding the Limassol SUMP and relies on decisions made up to now as well as on client's approvals of the previous project deliverables. More specifically, the Implementation Plan takes into account the staged implementation of the various interventions as placed in time during the SUMP implementation period of 10 years, i.e. from 2020 to 2030.

Cost elements of projects and interventions, proposed by the preferred SUMP scenario, are included in market values, increased by the respective VAT, currently at 19% (different from budget figures used in the CBA Analysis, net of VAT and other transfer payments such as taxes and subsidies.

Obviously, the Implementation Plan is closely related to the Monitoring and Evaluation Plan, which in effect establishes clear procedures and describes who, when and how, the activities carried out during the implementation phase. These two documents are bound to each other, thus any change occurred in the Implementation plan will inevitably influence the M&E in terms of output indicator values and SUMP project/intervention progress levels. This process loop though should be considered valuable as it allows us to understand success and failure as well as to identify new challenges for the future (please see D11.1 for the whole Implementation Plan).

15.2 Contents of the Implementation Plan

The Implementation Plan is intended to serve as a practical and useful tool to those involved during the period of preparing the project or intervention as well as during the initial steps of implementation. Since a number of interrelations between the various activities exist not only at spatial level (e.g. same or adjacent location) but also in terms of preparatory studies/works in construction, telecommunications as well as relative regulatory/legal frame.

Most interventions are interrelated to other interventions which will take place at the same location and therefore they must be coordinated. Similarly, other projects or interventions may precede or follow in time, which again means that coordination will be required. The specific coordination needs depend on several factors such as the type of the project or intervention, the need for functional or design studies, the prior approval of one or more involved authorities etc. Most of these required procedures are governed by the respective legislation; therefore, if the legislation alters, these interrelationships may be altered as well. Table 32 provides a first cut view of the SUMP program with the unique ID numbers, titles and timing of deployment, which are further detailed and analysed in Deliverable D11.1 and its Appendices A, B and C.

ID number	Measure/Intervention Description	Implementation timeframe										
		2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030+
		0-5 years					5-10 years					10Y+
ID 01	Enhanced level of operation for Public Transport											
ID 02	Interchange Bus Stops											
ID 03	Park & Ride Stations (excluding Land cost)											
	Land Acquisition cost for Park & Ride Stations											
ID 04	Main Bus Terminal (Themistocleous)											
	Land Acquisition Cost and/or Opportunity Cost for Main bus terminals											
ID 05	Telematics Bus Stops											
ID 06	Exclusive lanes for Public Transport on existing roads											
ID 07	Exclusive lanes for Public Transport on new roads											
ID 08	Construction of Aktaia Odos											
ID 09	Pedestrianisation of selected areas to motorised traffic											
	Pedestrianisation of selected areas to motorised traffic at the local centres of the other municipalities											
ID 10	Low speed limit area (<30km/h)											
ID 11	Increase the length of travel / one-way streets: Leontiou, Agias Filaxeos, Thessalonikis, Yitiz/ Navarinou/ Gladstonos											
	Increase the length of travel / one-way streets: CBD area											
ID 12	Bicycle lanes along all major corridors											
ID 13	Bicycle only roads for fast bicycle connections											
ID 14	Bicycle lanes along Sea Side Boulevard and Aktaia street											
ID 15	Safe and weather protected bicycle stands at all major destinations											
ID 16	Safe crossings											
ID 17	Adequate and wide pedestrian pavements along all urban roads											
ID 18	ITS equipment											
ID 19	Traffic calming measures in Traffic Calming Zone area (Buffer 1)											
ID 20	Integrated Parking Policy											
ID 21	Safety Buffer Zones around primary schools and creation of accessible routes											
ID 22	Improving traffic safety in selected road network locations											
ID 23	Road Development projects											

Table 32: The Implementation plan for the Limassol SUMP

The final list of interventions that have been included, evaluated through the transport model and finally selected in the preferred scenario and during the final steps of project have been detailed and thoroughly discussed with the Project's Steering Committee. In this list, the project that comes first and is of utmost importance for the successful implementation of the SUMP as a whole, is the enhanced PT operation (ID 01). Taking into consideration the current provisions of the new concession tenders the available already allocated subsidy for PT operating cost, including depreciation and maintenance of all investments on bus fleet, depots and other equipment, amounts at 10 million per annum from 2020 until 2030. For the forthcoming two 10-year periods (2030 to 2039 and 2040 to 2049) additional PT operating cost is estimated at 13 million and 15 million Euro respectively which corresponds to the 50% margin from the then initial contract value. Worth underlining that out of 22 interventions included in this table, ID 01 for PT operations is likely the first to be implemented and one of the very few already having confirmed budget line. Project IDs 2,3,4,5,6,7 and to some extent ID18 for the ITS, are related to the PT system enhancement, therefore their deployment in the first couple of years seems adequate. Project ID 20, dealing with the proposed integrated parking policy is also deemed of great importance and should be given special attention as it is widely acknowledged

that a decision whether to use our private car or not, strongly depends on parking availability, enforcement restrictions, cost of parking/hour etc. This is the idea behind the "early winner" proposal presented in Chapter 4 of this report, having both PT operational enhancements through ITS and traffic control as well as the new parking design at the same time. Project ID 16, 21 and 22 are related to road safety enhancements with emphasis on creating safety crossings. Last, but not least comes the rest of the projects deal with pedestrianisations and bicycle ways, that involve substantial funding and their implementation roll out is heavily depended on budget constraints, so it is spread out to the extent possible. Special attention also should be given to project ID 11 (one-way street network) whose budget line is manageable and can start as early as possible, to substantiate the change to a new driving behaviour and prepare the citizens for a new era of mobility for the city.

In Table 33, more details are given in tabular form on:

- Time frame of the implementation plan split by year for three (3) time horizons (0-5 years, 5-10 years, over 10 years) to allow measure implementation
- Cost estimates as a way of knowing the value of the implementation plan and also as input to the assessment and the prioritization of measures on a yearly basis.
- Allocation of responsibilities: A description of which stakeholder is responsible for the implementation of each specific measure. In most cases, the municipal authority is responsible for the implementation of the selected measures and interventions.
- Activities within a measure: Definition of the activities required within a measure. For a measure to be implemented it is usually necessary to break it down into two or more activities.
- Stakeholders involved: In some cases, stakeholders other than the city department are needed to implement a measure, e.g. state authorities such as the Ministry of Transport, Communications and Works. External stakeholders can also add extra value to the measure or will help its implementation. Such examples are for instance, bicycle associations when examining a measure related to cycling.
- Potential funding sources: Having established the source of funding could help gaining approval for the measure. Funding sources can also be an initial point for project development.

The total SUMP program budget sums up to **413 million Euro** for the period between 2020 and 2032 with an anticipated average yearly spending of 40 million. All SUMP related interventions will cost **170 million Euro**, the cost of the Public Transport service enhancements at **119 million Euro,** the funding of which has already been decided at the level of the Ministry. It was found reasonable to include in this total budget **124 million Euro** for funding specific road development projects included in the reference scenario 2030 that will receive funding during the same period of the SUMP implementation, though they are neither proposed by the SUMP, nor their implementation is deemed necessary in order to deploy the programme (see Table 32 hereinafter and for more details please refer to Deliverable D11.1 "Implementation Plan").

15.3 "Early Winner" projects

The Limassol SUMP being a strategic project, has to implement a number of individual projects, many of which are interrelated either as predecessors and successors or in some other cases bound together in terms of enhancing their mutual performance. To this end, some of the most mature and highly regarded interventions can serve as "early winners" showcasing a new era of mobility for the city. Public Transport services will be substantially enhanced in short term, with an ambitious target of more than gradually tripling PT ridership by 2030. The proposed set of projects is the following:

a. Enhanced Level of operations for Public Transport – The momentum is crucial and very positive as Cyprus is ready to air the new concession tenders while at the same time the PT telematics project is at its final stage of full deployment. Expanding hours of operation during the day and improving headways during peak hours constitute substantial enhancements that are expected to make a clear statement for what PT can deliver in the years to come (ID01), ID06, parts of ID18 for bus lane enforcement)
b. Exclusive bus lanes along a vertical arterial of the city – the concept is well known and mature and clearly underlines the importance of Public Transport as the main road transport means. Even before launch of the new contracts, EMEL (the current PT operator) will be willing to take part immediately (ID06)

c. Bus lane enforcement system – the system could be implemented in cooperation with the current PT telematics vendor who has all necessary know-how and can identify system requirements for procurement (part of ID18)
d. Bus priority system in selected signalised intersections along the selected corridor, constitutes an important Centre to Centre communication between the Urban Traffic Control and the PT telematics (part of ID18).
e. Advanced UTC (Urban Traffic Control System) is already in the pipeline for deployment and is directly bound to the bus priority system above (part of ID18)
f. Main Bus Terminal (at A. Themistocleous – ID04) and bus-only access through Kanari, Themistocleous and Anexartisias streets (ID08 through Phase 1)
g. Dynamic Bus display signs for the CBT (part of ID18)
h. Integrated Parking Policy (part of ID20)

The idea behind this proposal, is to provide the Ministry with a viable and ready to be implemented package of interventions fully related to PT operation but not limited only to these operations as it includes parking policy implementation as well as construction of the new CBT at Andreas Themistocleous str. These set of projects have a lot of common characteristics to play this role:

- PT is considered the backbone of the new mobility scheme for Limassol and it currently receives full support by the Ministry
- The Integrating Parking policy is already ranking very high to the municipality's agenda
- ITS related projects are relatively easy to implement, their budget it manageable and their cost to benefit ratio is very high.
- Cyprus in recent years has entered a new development era having shown a remarkable resilience after the financial crisis of 2013. Through right choices in funding and financing resources the SUMP can be implemented according to the plan.

ID number	Measure/Intervention Description	Cost plus VAT19% (€)	Implementation timeframe											Responsibility	Activities within a measure	Stakeholders inolved	Potential funding sources
			2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030+				
			0-5 years					5-10 years					10+				
ID 01	Enhanced level of operation for Public Transport	119.000.000,00	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%		Bus Operator	Implementation of new time tables, extension of operating hours, new buses, better scheduling	PWD/National Public Transport Authority	Concession contract/subsidy
ID 02	Interchange Bus Stops	833.000,00			40%	30%	30%							PWD	Traffic study, Implementation study, Regulatory decision, Construction	Construction companies, Bus operators	Public funding combined with funding from the PT Concessionaire
ID 03	Park & Ride Stations (excluding Land cost)	7.437.500,00				25%	25%		25%	25%				City administration	Traffic study, Implementation study, Regulatory decision, Construction	Construction companies, Bus operators	Public finding combined with private financing
	Land Acquisition cost for Park & Ride Stations	35.700.000,00			25%	25%		25%	25%					City administration/PWD	Market research, Regulatory decision		
ID 04	Main Bus Terminal (Themistocleous)	4.760.000,00		50%	50%									PWD	Traffic study, Implementation study, Regulatory decision, Construction	Construction companies, Bus operators	Public Funding combined with Investo capital / Employers parking levy
	Land Acquisition Cost and/or Opportunity Cost for Main bus terminals	4.760.000,00		100%										City administration	Market research, Regulatory decision	N/A	N/A
ID 05	Telematics Bus Stops	1.338.750,00		25%	25%				25%	25%				City administration / PWD	Implementation study, Supply and installation of ITS	Construction companies, Bus operators	Public funding including EU funding
ID 06	Exclusive lanes for Public Transport on existing roads	6.069.000,00			25%	25%			25%	25%				City administration/PWD	Traffic study, Implementation study, Regulatory decision, horizontal/vertical traffic signs	Construction companies, Bus operators	Public funding / Green funding
ID 07	Exclusive lanes for Public Transport on new roads	6.664.000,00			25%	25%			25%	25%				City administration/PWD	Traffic study, Implementation study, Regulatory decision, Construction	Construction companies, Bus operators	Public funding / Green funding
ID 08	Construction of Aktaia Odos	3.570.000,00						10%	40%	50%				City administration/PWD	Traffic study, Implementation study, Regulatory decision, Construction	Costruction companies	Public Funding combined with EIB financing
ID 09	Pedestrianisation of selected areas to motorised traffic	28.560.000,00				20%	20%			20%	20%		20%	City administration	Traffic study, Implementation study, Regulatory decision, Supply and installation of traffic signs	Neighborhoud associations	Public Funding / Green funding
	Pedestrianisation of selected areas to motorised traffic at the local centres of the other municipalities	11.138.400,00				20%	20%	20%	20%	20%				City administration	Traffic study, Implementation study, Regulatory decision, Supply and installation of traffic signs	Neighborhoud associations and municipalities	Public Funding / Green funding
ID 10	Low speed limit area (<30km/h)	571.200,00			100%									City administration	Implementation study, Supply and placing of traffic signs	Neighborhoud associations	Public Funding
ID 11	Increase the length of travel / one-way streets: Leontiou, Agias Filaxeos, Thessalonikis, Yitiz/ Navarinou/ Gladstonos	23.919,00			100%									City administration	Traffic study, Implementation study, Regulatory decision, Supply and installation of traffic signs, changes to signalised intersections, update on signal phasing schemes	Construction companies	Public Funding
	Increase the length of travel / one-way streets: CBD area	21.420,00			50%	50%								City administration	Traffic study, Implementation study, Regulatory decision, Supply and installation of traffic signs	Construction companies	Public Funding
ID 12	Bicycle lanes along all major corridors	11.942.840,00				25%	25%				25%	25%		City administration	Analysis of bicycle lanes, Develop a bicycle network plan, Plan and construct bicycle lanes	Construction companies, bicycle associations	Public Funding
ID 13	Bicycle only roads for fast bicycle connections	21.848.400,00					35%				17%	18%	30%	City administration	Analysis of bicycle lanes, Develop a bicycle network plan, Plan and construct bicycle lanes	Construction companies, bicycle associations	Public Funding / EU Green funding
ID 14	Bicycle lanes along Sea Side Boulevard and Aktaia street	1.199.520,00		50%	50%									City administration	Analysis of bicycle lanes, Develop a bicycle network plan, Plan and construct bicycle lanes	Construction companies, bicycle associations	Public Funding combined with Aktaia Odos implementation funding/EIB financing
ID 15	Safe and weather protected bicycle stands at all major destinations	73.684,80		100%										City administration	Select the location and construct bicycle stands	Bicycle associations	Public funding and/or inclusion into a EU funded project
ID 16	Safe crossings	285.600,00		100%										City administration/PWD	Implementation study	Neighborhoud associations	Public Funding
ID 17	Adequate and wide pedestrian pavements along all urban roads	2.474.010,00			50%		50%							City administration	Implementation study	Construction companies, neighborhoud associations	Public Funding
ID 18	ITS equipment	4.760.000,00		30%	30%	40%								PWD	Market research, Implemetation Study, Telecommunication networks, deployment of equipment, system initialisation, GO-LIVE process	ITS companies, Bus operators	
ID 19	Traffic calming measures in Traffic Calming Zone area (Buffer 1)	11.900.000,00							50%	50%				City administration	Traffic study, Implementation study, Regulatory decision, Supply and installation of traffic signs, Construction	Construction companies, neighborhoud associations	Public Funding including EU funding
ID 20	Integrated Parking Policy	1.190.000,00		100%										City administration	Designation of available parking spots/Regulatory Decisions/tender preparation/deployment of equipment/GO LIVE	Municipal police / private vendors of parking applications	
ID 21	Safety Buffer Zones around primary schools and creation of accessible routes	2.380.000,00			12%	24%	36%	28%						City administration	Traffic study, Implementation study, Regulatory decision, Supply and installation of traffic signs, Construction	Construction companies, neighborhoud associations	Public Funding
ID 22	Improving traffic safety in selected road network locations	714.000,00			50%	50%								City administration	Traffic study, Implementation study, Regulatory decision, Supply and installation of traffic signs, Construction	Construction companies, neighborhoud associations	Public Funding
ID 23	Road development projects	124.000.000,00	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%		PWD	Design studies / Implementation studies / tender preparation / Construction	Construction companies	Public Funding
		413.215.244 €	24.300.000 €	35.351.732 €	43.969.331 €	52.285.825 €	47.075.410 €	36.476.080 €	48.207.992 €	45.351.992 €	36.711.938 €	31.109.180 €	12.266.520 €				

Table 33: SUMP Implementation Plan

15.4 Funding and Financing Sources

As already stated above, the development and implementation of SUMPs is strongly depended on securing the necessary financial resources. In most cities, investment financing needs for sustainable mobility outweigh the available resources. The potential difficulty in finding resources is mainly related to "heavy" projects such as building new or expanding existing transport infrastructure, which is not the case in Limassol SUMP with the exception of the Public Transport Operations. Subsiding Public Transport operations in Limassol district - and in Cyprus - is undoubtedly a substantial financial burden for the Ministry of Transport, but fortunately enough this decision has been already taken at Ministerial level, therefore can be deemed as fully secured from the outset.

Currently, no funding schemes regarding the implementation of the SUMP projects have been disclosed. Limassol SUMP funding will have in a way to compete with other investment needs considered by the Ministry, therefore the involved actors have to put reasonable efforts in finding ways to secure funding.

Funding and Financing are two terms often used for the same purpose, obviously though implying different processes. Funding refers to a capital provided by an Organisation or a Governmental body free of charge that is with no requirements to be paid back. On the other hand Financing refers to a capital that is provided to an authority with the expectation to be returned in full plus a reasonable percentage of interest (The following table briefly quotes funding and financing resources as described in Deliverable D11.1).

	Funding sources	**Financing sources**
Conventional	The EU Funds (Structural, Investment, Cohesion, Social, Green funds)	Equity (shares),
	Government and taxpayers	Bank loans ,
	Investors, banks and capital markets	Institutional tools (capital markets),
	Real estate owners and developers through Land Value Capture	Performance based public-private partnerships (investors on PPPs and innovative risk management),
	Employers through levies, e.g. parking levy	Bonds issued by private corporations or governmental agencies etc.
	Travellers through tolling, parking charging, etc	
Innovative	User revenues (e.g. farebox)	
	Ancillary revenues (e.g. advertisement, rentals),	
	Grants covering financing gaps and subsidies (both representing forms of equity),	
	Land value surplus capture around fixed guideway stations (LVC),	
	Community infrastructure levies and stamp duty land taxes (England),	
	In-lieu fees for private parking spaces paid by developers (e.g. Green Fund revenues in Greece),	
	Business taxes,	
	Workplace parking levies paid by businesses,	
	Carbon funding (revenues from selling of CO2 emission certificates),	
	Earmarked road and parking congestion charges.	

Table 34: Funding and Financing Sources

16 Monitoring and Evaluation Plan

The current report is the **Monitoring and Evaluation Plan (M&E Plan)** of the **Sustainable Urban Mobility Plan for the Greater Urban Area of the City of Limassol**. The **M&E Plan** is an integral part of the SUMP planning cycle (8th stage) which is conducted during the plan elaboration.

The scope of this report is to address the main Monitoring and Evaluation activities that should be adopted and monitored during the SUMP implementation by the key and wider stakeholders in specific timescales as defined in the implementation plan of this study. The **M&E plan** ensures the successful planning progress of the SUMP and the satisfaction of the predefined objectives and targets during the implementation of the SUMP measures.

The **M&E Plan** establishes clear procedures and describes (i) how, which and when the monitoring and evaluation activities will be carried out, (ii) who is responsible for them and, (iii) what resources are necessary to implement them. It is a living document that should be adapted to modifications during SUMP implementation stages due to non-foreseen/incidental changes or knowledge gained during the process.

The **M&E Plan** has been developed according to CiViTAS Guidelines "Applied framework for evaluation in CiViTAS PLUS II" (2013) which is designed to maximize the benefits from M&E activities and minimize the risks and impacts of potential barriers. The current **M&E Plan** has been customized and adapted to the local conditions of the Limassol area; the private motor vehicle is the dominant transport mode while (i) the public transport services are carried out only by bus with low LoS and very low passenger demand and (ii) cycling network is quite limited with almost negligible demand. Hence, an overall SUMP aim is to discourage the use of the motor vehicle and promote other environmentally friendly modes of transport such as public transport, cycling and walking by adopting and implementing relevant strategies and measures.

The delivery and monitoring of the M&E Plan activities require the establishment of M&E Team that should include a **Limassol SUMP Monitoring and Evaluation Manager** (**MEM**) and the **Coordinators** that should represent the various Municipalities or Communities within the Study Area. The organizational structure of Limassol M&E Team is summarized on the following diagram (Figure 104); the M&E Plan contains a detailed description of the activities of the M&E team as well as the responsibilities of the individual partners during its implementation.

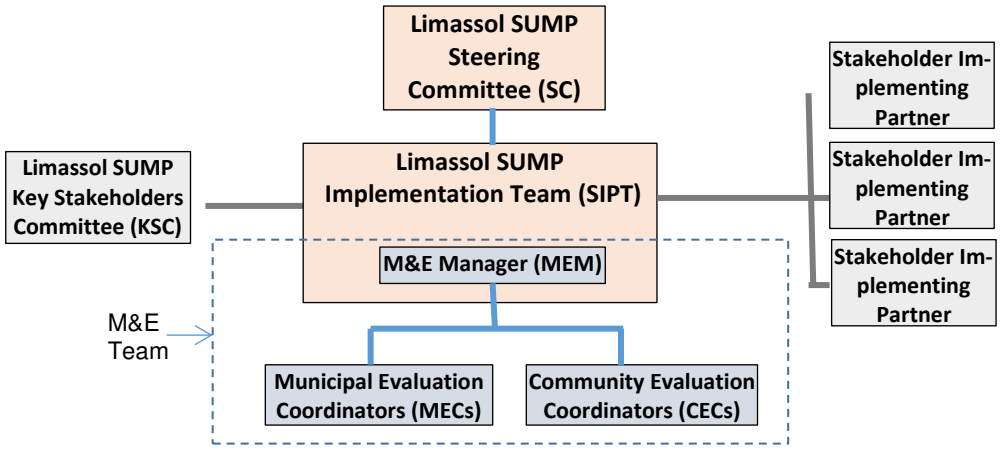


Figure 104: Proposed Organisational Structure of Limassol SUMP M&E Team

In close coherence with the CiViTAS guidelines, the **M&E Plan** includes both the impact evaluation and the process evaluation for the selected **scenario 6** that combines the polycentric land use approach (where development is focused in the municipalities of the Urban agglomeration) with the more advanced level of transport policy measures (please see D11.2 for the whole M&E Plan).

Three (3) pillars of evaluation and assessment are integral part of the **M&E Plan,** as depicted on the following diagram (Figure 105) and described in more detail below.

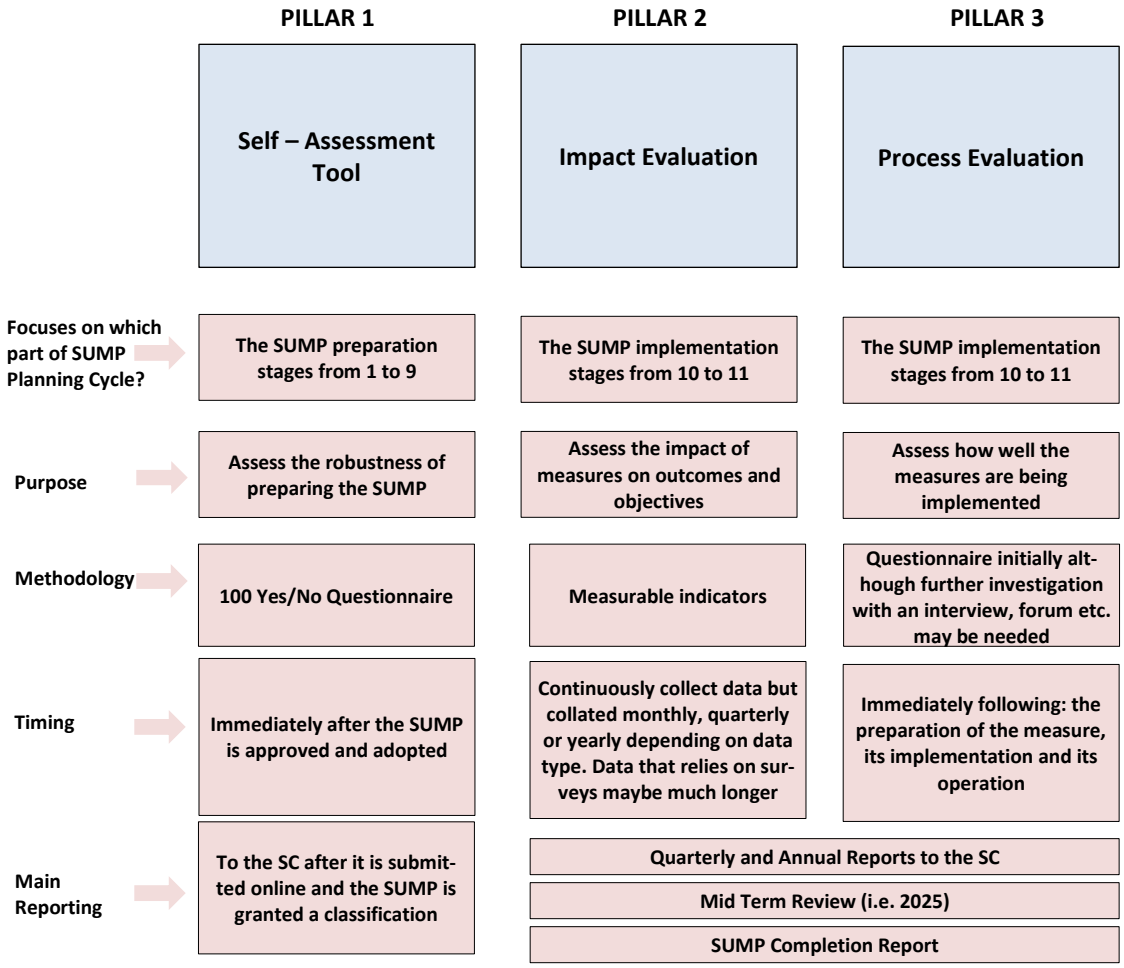


Figure 105: The M&E Framework

1. **Self-Assessment Tool (Pillar 1)**. This is a simple and comprehensive tool for evaluating and assessing the robustness of the process in preparing the SUMP up to the point where it has been approved for implementation. It is basically a questionnaire of 100 "yes-no" questions that follow the steps in the well-known SUMP preparation cycle and generally focus on whether an action or activity relevant to SUMP preparation has or has not been carried out. It is designed to be undertaken immediately after the SUMP has just been approved and adopted.

2. **Impact Evaluation (Pillar 2).** An assessment of the impacts of a measure (e.g. impact on safety) on a particular target group (e.g. society). The impact evaluation uses indicators to assess the impacts caused by the implementation of the SUMP's qualified measures. The process of indicators' selection included public consultation by taking into account a number of factors such as relevance, accuracy, importance, credibility, ease of measurement and understanding. The indicators used are divided into five main categories (further analysed below): (i) **outcome indicator**, (ii) **transport activity indicator**, (iii) **output indicator**, (iv) **input indicator** and (v) **contextual indicator**. The relationship among the five (5) type of indicators as well as the correspondence with the entire Limassol SUMP plan regarding the objectives, strategies, instruments and resources is presented on the following diagram.

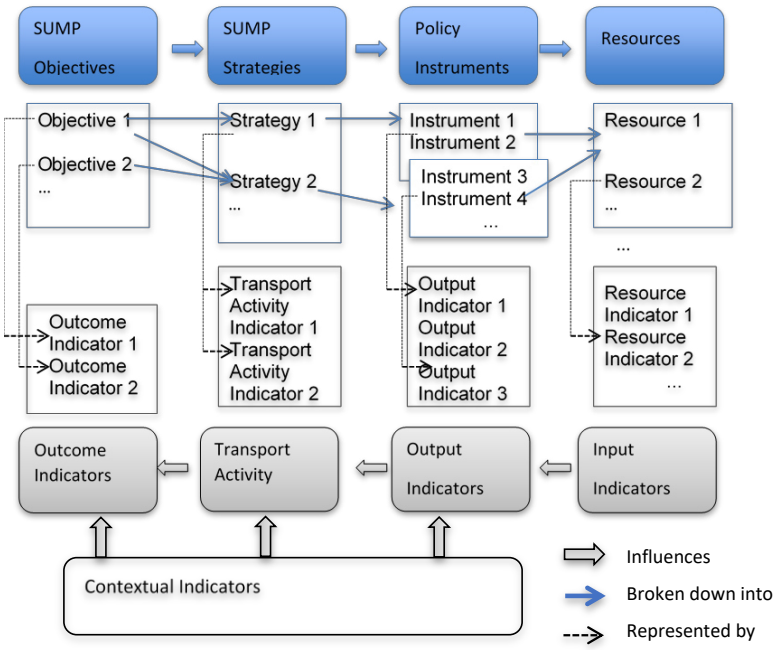


Figure 106: Relationship between indicator types and objectives, strategies, instruments and resources

- **Forty-three (43) outcome Indicators** are adopted (please see **Annex XI, Table A-XI 1** for the indicators), serving the relevant performance targets for the high-level objectives including: a) economic efficiency, b) environmental sustainability c) accessibility and social inclusion, d) safety and e) quality of life.

- **Eighteen (18) Transport Indicators** are adopted in order to monitor and evaluate the effectiveness of implemented transport strategies and to identify potential causal factors leading to the observed outcomes. The indicators are distinguished into five (5) categories as listed below:

  (i) **Traffic**: i) Motorisation, ii) traffic volume iii) corridor capacity utilisation iv) vehicle use, v) higher vehicle usage costs to motorists
  (ii) **Public Transport**: i) Bus journey travel times, ii) control over headways iii) average PT occupancy, iv) PT user satisfaction, v) frequent PT service access, vi) adapted bus services, vii) smart ticketing, take up rate
  (iii) **Parking**: i) Unrestricted Parking Spaces Restricted Parking Spaces. Ii) illegal parked cars
  (iv) **Sustainable transport**: i) Perception of infrastructure quality for walking and cycling ii) modal share (trips)
  (v) **Other**: i) Travel behaviour characteristics

- **In total, thirty (30) Output Indicators** are adopted for measure implementation distinguished into seven (7) thematic categories. Indicative output indicators for each category are listed below:

  (i) **New infrastructure**: Length of new infrastructure construction by mode and type.
  (ii) **Public Transport**: i) Higher frequency services implemented?, ii) has smart ticketing been implemented?, iii) number of bus Stops with Telematics infrastructure.
  (iii) **Sustainable travel**: i) Number (or percentage) of shared cars, ii) number (or percentage) of shared bikes.
  (iv) **Access**: i) Number of buses with disable friendly access (low platforms), ii) number of accessible points of interest for disabled people.
  (v) **Safety**: i) Number of primary schools with safety barriers, ii) Number of safe crossings for pedestrians and/or cyclists.
  (vi) **Parking**: Parking fines collected.
  (vii) **Shared road space**: i) Length (km) of streets converted to “environmental zones", ii) length (km) of streets transformed in to “calming areas”.

- **Input indicators** are adopted to monitor the use of resources for the implementation of the SUMP for Limassol, as listed below:

  (i) Transport investment costs for new/improved infrastructure.
  (ii) Start-up costs for new transport schemes.
  (iii) Expenditure for maintenance of streets, roadside facilities and PT infrastructure.
  (iv) Subsidies for operation of Public Transport.
  (v) Subsidies for discounted Public Transport fares.

- **Contextual indicators** should be also taken into account for Limassol, such as**:**
  - Socio-demographic developments (population size and composition)
  - Economic performance (GDP/resident, employment, number of businesses, retail turnover, tourism if relevant)
  - Tourism economic performance.
  - National or international transport policy campaigns and legislation
  - Other sector policies (e.g. regeneration, health, education)

3. **Process Evaluation**. The main goal of the process evaluation procedure is to develop new findings about factors of success and strategies to overcome possible barriers during the implementation phase. The process evaluation should also be conducted at the "bundled measure" level rather than at the "individual" level. The process evaluation is linked with the typical phases of bundle of measures, known as the investment life cycle, which can be classified into three time periods: a) **Preparation Phase**, b) **Implementation Phase** and c) **Operation Phase**.

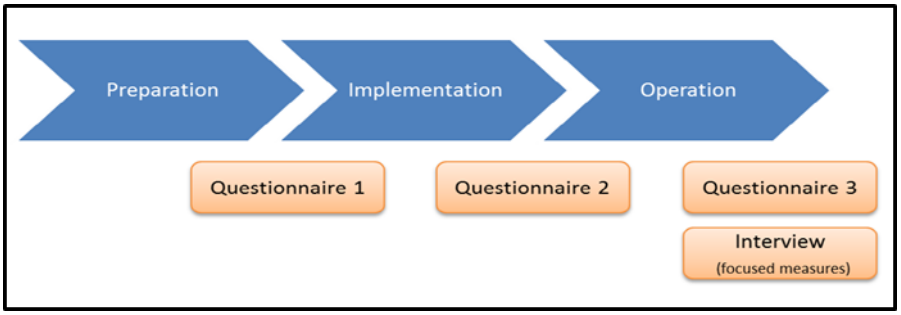


Figure 107: CIVITAS PLUS II Process Evaluation Design

The process envisages **questionnaires** and **interviews** that should be conducted at predefined phases. In specific, all "bundled measures" should be assessed in the same way after the end of each of the three phases, with information gathering based on a semi-closed questionnaire, which is called the Measure Process Evaluation Form. This form is to be completed by the person responsible for implementing the measure. The process evaluation of the 'focused' measures will consist of additional interviews at the end of each project phase. This will result in three in-depth interviews with main stakeholders.

Additionally, the data reporting requirements are defined within the **M&E Plan**. The purpose of reporting is to provide information to assist the implementation team and stakeholders in comparing performance against plans so that (i) the current or potential problems can be analysed and mitigated, (ii) the monitoring process is enhanced and (ii) the decision-making process is well supported. Four (4) major reports are needed such as quarterly monitoring reports, annual monitoring report, mid-term evaluation and end of project evaluation.

Finally, the **M&E Plan** includes a guidance framework of the required activities during its implementation, such as the staffing requirements, the estimated costs of data collection, the adoption of a management information system as a tool to analyse and visualize the M&E information and, the analytical schedule of M&E activities within the time period of the Limassol SUMP (for more details on the Programme of M&E Activities please see **Annex XI, Table A-XI 2**).

17 Promotion and Marketing Strategy

The Promotion and Marketing Strategy consists of 2 parts:

- PART ONE – BACKGROUND
- PART TWO – STRATEGIC PROGRAMME

Part one provides a theoretic background for the marketing and communication strategy. It summarises those parts of proposed SUMP objectives, strategies, measures and approach that need to be communicated and marketed. This includes the description of vision, objectives and targets of the SUMP for Limassol, the communication challenges, risks and barriers, the prerequisites for success, the SUMP stakeholders involved in the change of transport and mobility system, their reaction to date and an initial marketing and communication SWOT analysis. While the first two of these subsections are quite theoretic, the analysis of stakeholders is already more specific and related to the actual stakeholders of the Limassol metropolitan area. These stakeholders are also distinguished into different levels of influence on the SUMP and levels of being affected by the SUMP, as these different levels need to be addressed individually and in parallel, as they influence each other (see Figure 108):

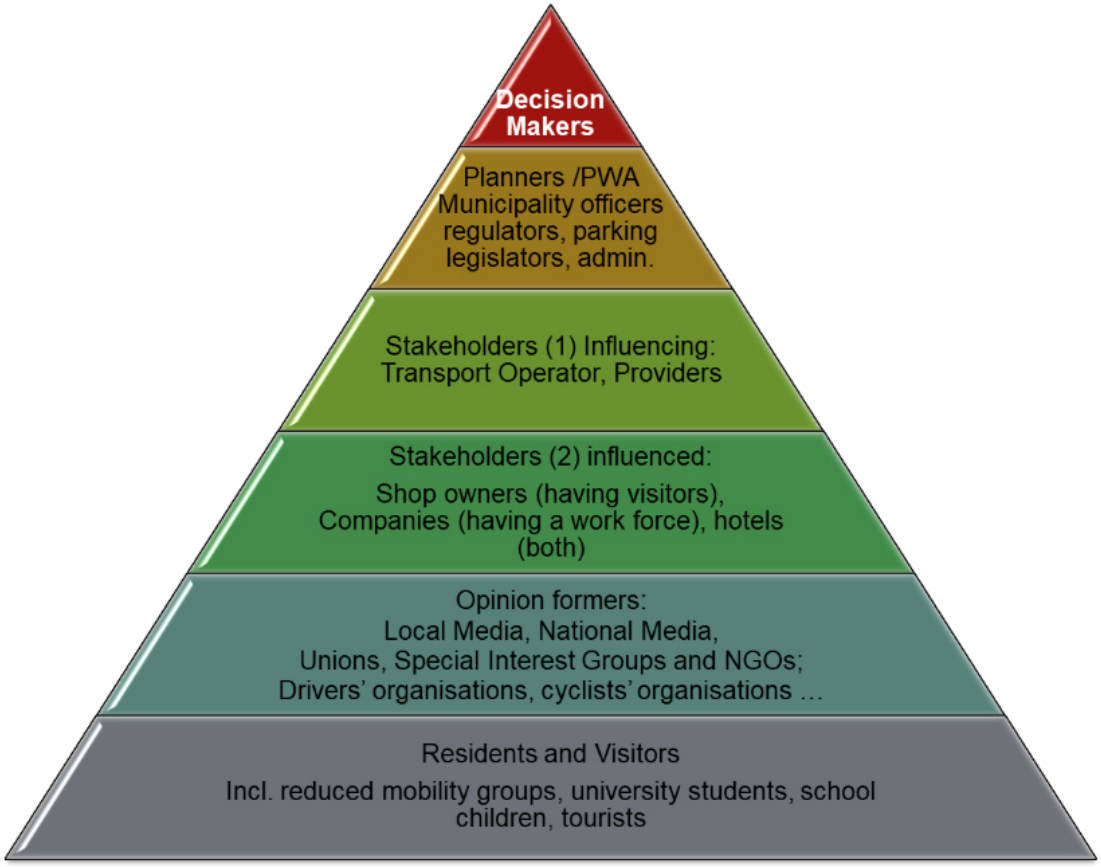


Figure 108: Stakeholders in Limassol and their levels of influence on the SUMP

Part two describes the strategic approach to the Marketing and Communication Strategy.

The programme for the SUMP is what is often called a Public Awareness Programme. It should comprise both marketing and two-way communications.

UK's Chartered Institute of Marketing defines marketing as 'The management process responsible for identifying, anticipating and satisfying customer requirements profitably'. Traditionally it is acknowledged to be about the four Ps: product, price, place, and promotion, that is selling a product or promoting a service at the right time, in the right place, at the right price. These are often extended to form 7 Ps, adding packaging, positioning and people.

In the case of the SUMP the marketing refers to:

- Product: The SUMP, its infrastructure and all its components (bus lanes, pedestrianisation etc)
- Price: The cost of implementing the SUMP
- Place: Where the SUMP has been incorporated, e.g. bus lanes, pedestrianisation etc. and where physically and by whom it is being promoted
- Promotion: The tools and communication channels used to communicate the SUMP
- Packaging: The visual elements of the programme (corporate identity, websites, literature etc.)
- Positioning: How the SUMP is seen and thought about by all its stakeholders
- People: The people who are concerned with marketing the SUMP

For the purpose of this report broadly marketing concerns the collateral used to promote the product, in other words, the tools with which it will be promoted such as literature, website, presentation material, workshop materials, images etc (please see D12.1 for the whole P&M Plan). .

Communication is a vital part of the ingredients as it comprises all the channels used to gain the understanding and support of the stakeholders of the key planks of the programme (such as sustainability, economy, health and wellbeing) and to change behaviours. The channels include printed and broadcast media, social media, blogs, articles, presentations and face-to-face meetings.

It is most important that the communication is not just one-way but that stakeholders are encouraged to feel as involved and invested in the SUMP aims. Indeed, some of this has already been achieved through stakeholder and public consultations and through website involvement.

Part 2 of the marketing and communication strategy provides more details on the following implementation aspects:

- Marketing and communication objectives: the key objectives for marketing are basically the SUMP objectives, aiming at influencing mobility behaviour towards more sustainability and the necessary planning and implementation steps. The specific marketing objectives are the creation of awareness amongst Limassol's stakeholders at the different levels, e.g. create understanding amongst businesses, retailers and hoteliers of the economic implications of a successful SUMP strategy and create understanding amongst the residents of the historic centre of Limassol of the overall benefits of the SUMP. Key Performance Indicators will be defined to measure the success of the marketing programme.
- The marketing strategy aims at changing long-standing habits of decision-makers, planners, stakeholders and the residents. In order to achieve this, alternatives have to exist and have to be attractive, particularly if the strategy wants to be effective in the Cypriote conditions. The significant behavioural change which will be necessary to make Cypriots less reliant on cars must come from a mix of pan-Cypriot government laws and initiatives, powerful public awareness programmes. Factors that are important for a behavioural change are
  - Collective objective factors
  - Collective subjective factors
  - Individual objective factors
  - Individual subjective factors

Broadly, the marketing and promotion strategy should be based on three key areas: health and wellbeing, the environment, and the economy

- PESO – Channels of communication: The main channels of communication will be based on the PESO model: Paid, Earned, Shared and Owned and various media will be used to form an integrated marketing programme. These channels are adapted to the Cypriote conditions, e.g. the current use of "social media" on the internet.
- Key messages: These messages will vary depending on the target audience and will be based on visions and objectives of the SUMP Limassol and on experience from other regions.
- New brand identity: A strong visual brand identity will be developed for the SUMP, which will be striking, attractive and immediately recognisable as the Limassol SUMP project. It would be used on all printed and online information and must therefore be versatile. A specialist designer will be employed to create this.

- Website: The website http://sump4cyprus.org already exists. It should be developed further and updated regularly. The sections are denoted in the report.
- Key partner programme: Key partners for this purpose include all relevant national and local government agencies, as well as some others listed as stakeholders, such as the Police, civil servants etc. They are key to the success of the programme, as each one can become an unofficial ambassador for the SUMP.
- Educational initiatives: If the programme is to succeed in the long term, it will be essential to educate children about the benefits of a green city with healthy citizens. They will not only have an impact on their parents' thinking children and become young ambassadors for fitness for the whole family but are also the responsible citizens of the future. This includes mainly school initiatives as in other regions (example of Swindon (UK) "walking bus"), a sponsorship programme and a student's programme.
- Retailers: This group of stakeholders is highlighted in the report as they are directly affected by the SUMP and the proposed changes in the historic centre of the city of Limassol. Obviously, these concerns have to be taken very seriously. And in fact, accompanying strategies should by implemented, improving the commercial attractivity of town centre locations for shopping. Shop-owners have to be convinced of these and strategies have to be implemented also to change shopping behaviour, to become less car-dependent. Consequently, more and sufficient marketing and communication with the shopkeepers are appropriate and necessary in order to convince the majority if not all of them, as they could exert considerable influence on the programme.
- Residents of the Historic Centre: There are concerns from some of the residents of the historic centre of Limassol, relating to accessibility as a result of pedestrianisation, parking arrangements, security etc. The results of meetings with the residents showed that residents are in favour to SUMP strategies and measures, even if it affects their immediate environment. However, care has to be taken when limiting the access to the residents themselves. It will be useful to follow the recommendations, e.g. to install a council for the concerns of the historic centre and its residents, and certainly to have regular meetings between planners and residents.
- Media Programme: The media programme is of course one important component of the marketing and communication strategy. It includes all relevant media, traditional and new media, like Press, radio and TV, "Social" Media and "Influencers" on the Internet, advertising on Facebook, bloggers and influencers. It is important to use all channels and media to reach all population groups, particularly the younger generation, as these are the residents of the future.
- Advertising: It is suggested that the investment in advertising is modest as very much can be done by other methods of public relations, communication and marketing.
- Stakeholder matrix of behaviours and communication channels: this section is the core of the marketing strategy as it identifies the relevant stakeholders, classifies them on the different levels if influence on the SUMP and of being affected by the SUMP. The strategy then identifies the desired behaviour for the different groups of stakeholders and proposes the appropriate measures of achieving this. The desired behaviour starts with accepting the SUMP, taking ownership of its vision, objectives, targets and approach, accepting the own role, implementing the measures and changing the own behaviour. The measures include targeted presentations, small meetings, emails, webpage, newsletters, workshops, coverage in the media and many more.
- Marketing and communication measures: particular and specific measures are identified for different stakeholders and summarised under
    - Who to be addresses?
    - What to be communicated and how?
    - When to carry out the specific measures?
    - Where to carry them out?
    - Why?
    - And giving an estimated budget for these specific measures.

	SIZE / CHARACTERISTICS	QUANTITY	PRICE[€]	ESTIMATED ANNUAL COST YR 1 €
Office costs				
Lead manager		1	25,000	25,000
Administrative assistant		1	15,000	15,000
Office rent		1	1,250 pm per 100m2	15,000
Office equipment	Printer, scanner etc – one off		6,500	6,500
New brand identity development				
Design of brand identity for all visual material (logo etc)	One off		3,000	3,000
Quarterly, printed, A4, 8 pages, colour newsletter for all stakeholders	A4 8 pages colour newsletter	1000 per issue; 6 p.a.	500	3,000
Design & printing of some of marketing collateral:				
Leaflets with sections on 'What is the SUMP', benefits, key overall messages, map showing new bus routes, pedestrianized streets, Park & Ride etc	A5 4 pages Colour	1000	350	350
	A5 4 pages Black and White	1000	250	250
Poster promoting the SUMP, benefits and key messages	A1/colour	100	700	700
	A2/colour	100	450	450
Exhibition stands (pop-up boards)	80*200	4	125	500
Schools walking clubs				
cost of leaflet design (gatefold – A4 folded 3 times)	A4 folded 3 times	-	300	300
Print leaflet (gatefold – A4 folded 3 times)	A4 folded 3 times	1000	500	500
Other:				
Advertising in newspapers - 12 a year in Limassol weekly newspaper, Evdomadiea Lemesos.	One full page 25cm(width)*35.5cm (height)	12 posts	3000	3000
	¼ colour 12cm(width)*17cm (height)	12 posts	800	800
On bus stops/shelters/terminals – at selection of all six Limassol municipalities – e.g. two per municipality, duration 6 months, changed every 6 months		12 for 6 months	21,600 (300 each month)	36,000
On bus vehicles- displaying key SUMP messages inside and on the exterior, i.e. using visual display panels or graphics on the body of the vehicle	Body	6 For 3 months	850 pm	5,100
	Printing of stickers on bus exterior	For 3 months	1,896 x 6	11,376
On hoardings in road in key sites – say 12	Printed both sides	12 for 3 months	10,000 both sides = 36,000 for 3 months	36,000
In Tsirio Stadium – for key matches		1 for a year	12000-15000	13,500
On road VMS electronic sign displays		12 for 3 months	20000	20,000
Development of an app with walking/ cycling maps (app developer costs - for Android and iPhone)			15.000-20.000 (extra 1.000 pa for maintenance)	17,250 + 12,000
Estimated total costs Year 1: 225,576 Euros				
Estimated total costs Year 2+: 215,276 Euros				

Table 35: Marketing and communication measures

- Measurement and evaluation: The key measurables for the SUMP marketing and promotion programme are whether the marketing and communication objectives stated previously are being met. The related measurements are described including the objective, how it can be measured and how frequently.
- Resources: The resources necessary for the implementation of the marketing and communication strategy are defined, consisting of SUMP marketing and promotional team staffed at least by a lead manager and administrative assistant, Office space and equipment, Targeted surveys, Engagement of a specialist company to design a logo and marketing collateral, Printing of marketing collateral and finally a Modest advertising budget.
- Budget: The cost of the marketing and promotions programme is estimated for year 1 and for the following years (see Table 35). As some costs are a one-off, the budget will reduce in ensuing years. The costs for specific marketing measures as described above are additional costs to these annual costs. The regular annual costs include office costs, costs for development of new brand identity, costs for design & printing of some of marketing collateral, costs for schools walking clubs and other costs. Total costs for marketing and communication are estimated at € 225,576 in the first year and € 215,276 in the following years.

18 Strategic Environmental Impact Assessment

18.1 Introduction

A Strategic Environmental Assessment (SEA) Study was conducted for the Sustainable Urban Mobility Plan (SUMP) of Limassol in accordance with the Terms of Reference of the SUMP Study and the provisions of Directive 2001/42/EC on the assessment of the effects of certain plans and programmes on the environment (SEA Directive) and the respective national Assessment of the Impact on the Environment from Certain Plans and/or Programmes Law (No.102(I)/2005).

The main objective of the SEA study is to identify the likely significant effects on the environment and the reasonable alternatives of the Limassol SUMP and to propose measures envisaged to prevent, reduce and as fully as possible offset any significant adverse effects on the environment from the implementation of the Plan.

The SEA study commenced in WP9 with the scenario assessment exercise and was fully completed in WP14 with the finalisation of the Limassol SUMP. The main environmental effects of the SUMP identified by the SEA and the mitigation measures proposed to address these impacts are summarised below.

18.2 Summary of Main Environmental Impacts

18.2.1 Air Quality

The implementation of the SUMP will have a positive effect on air quality as the proposed package of strategies aims to achieve a shift from car use to more sustainable and less polluting modes of transport such as PT, walking and cycling.

With regards to core emission pollutants, based on the Transport Model results, relative to the "business as usual" scenario, the implementation of measures included in the SUMP will cause a general reduction of emissions by 2030. Specifically, a 4.2% decrease is predicted for CO, followed by a 2.8% reduction for HC, 2.7% for NMHC, 2.6% for PM 2.5% for PN. The smallest decreases are expected for NOx and NO2 with 1.7% and 1.8% respectively.

However, during the implementation period of the SUMP, a minor and temporary negative impact to air quality may occur due to the use of heavy vehicles and equipment for the construction of the proposed infrastructure schemes as well as road closures and traffic diversions will need to take place during the transition period.

The planning policies included in the SUMP support the development of residential uses along the A1 motorway and in some parts recommend the densification of such areas. This might potentially lead to long term negative health impacts to the local residents, from noise and air pollution caused by the operation of the motorway.

18.2.2 Climatic Factors

The SUMP aims to boost the availability and effectiveness of more sustainable modes of transport and discourage the use of the car resulting in a direct reduction of greenhouse gas (GHG) emissions from transport.

The Transport Model has also estimated a 3.0% reduction in the volume of CO2, emissions, in relation to the "business as usual" scenario, which however proportionally is not considered significant, particularly when measured against the National Binding target for a 24% total reduction of GHG emissions in 2030 in relation to 2005 levels (non-ETS sectors). Therefore, additional or more extensive measures to achieve a greater modal share of greener forms of transport may be needed if these targets are to be met.

However, during the subsequent stages of the development of the SUMP the operation of public transport has been optimised and bus service kilometres have been reduced by about 25–30%. As a result, the implementation of the SUMP may potentially achieve better results than the ones predicted by the Transport Model.

Furthermore, some measures proposed by the SUMP (e.g. parking enforcement, park and ride stations) could not be modelled and are therefore not reflected in the CO2 reduction results. Other external factors which can support further reductions in GHG emission include the natural penetration of electric vehicles, the promotion and deployment of clean vehicles and the decrease in the average age of public bus fleets required by the new concession contracts of 2020.

During the implementation period of the SUMP infrastructure projects, emissions from construction and changes to traffic flows, may result in a temporary minor increase in CO2 emissions, until the SUMP's proposals are fully in place and operational.

A number of transport proposals are located within or adjacent to the 1 in 100- year return flood risk zones, putting their integrity and normal operation, in the event of a flood event, at risk. In the event that infrastructure is not correctly designed with regards rainwater drainage management, it may potentially affect drainage patterns and increase the risk of floods in sensitive areas.

18.2.3 Soil/Geology

The majority of proposed schemes incorporate existing infrastructure and will be developed on brownfield land, with only a small number of greenfield sites affected, located outside the central urban area of Limassol.

Additionally, the promotion of the polycentric land use model is expected to restrict further expansion of the city and current trends of dispersed development and encourage a more compact and better organised urban environment. This will facilitate regeneration/utilisation of brownfield space and safeguard greenfield sites from uncontrolled development with moderate benefits for soil.

Most of the coastal area within the SUMP Study Area is prone to erosion, but there are no new major schemes proposed in coastal areas with steep slopes or areas prone to erosion. Some erosion may be observed along open channels due to surcharging during high-flow events, however, it is assumed that for individual projects, erosion control measures will be incorporated into their design. Also, proposed infrastructure inside flood risk zones, like bicycle and pedestrian paths extending along watercourses, might be subject to long-term erosion, but as with the previous case, this can be avoided with the implementation of appropriate design and the mitigation measures proposed by the SEA.

The construction of a new road at Aktea Odos is planned to take place on brownfield land and depending on the final design, the scheme may also require reclamation works to create the required land width which may affect the Coastal protection Zone.

18.2.4 Water resources

Apart from the implementation of Aktea Odos the SUMP does not propose major transport projects that will cause significant changes to riverbanks and coast lines or obstruct flow.

The construction of Aktea Odos will result in some soil sealing, which can affect drainage, however, it should also be assumed, that all transport schemes will be constructed by incorporating SUDS where possible (such as the use of permeable materials), according to best practice guides to allow for infiltration. With SUDs in place water quality will not be affected negatively and may even be improved. Runoff from these paths will be of better water quality compared to that from the roads because car use along the footpaths and cycle paths will be prohibited. The modal share of cars is also expected to generally decrease with further positive effects.

In the event that the construction of Aktea necessitates relevant reclamation works, some consequences to marine water quality and species may occur from the release of fine sediment into the sea and the resulting sediment plume.

The implementation of Aktea Odos may affect drainage patterns due to the construction of a new drainage network along the road, however any changes are expected to be small and manageable. Similarly, it may also affect the coastline, depending on the final design of the road, which may require minor sea intervention. This may have further long-term impacts with regard to silt deposition.

18.2.5 Fauna, Flora and Biodiversity

The proposed schemes mostly use existing infrastructure and are not expected to directly impact important habitat areas or areas with red book species. Exceptions are (i) the Aktea Odos scheme

which may, depending on the scheme design) affect coastal habitats, and (ii) cycleway and walkway schemes along riverbanks which may affect river habitats. For the Aktea Odos scheme, it is expected that an EIA will be carried out which will propose specific mitigation measures regarding the protection of biodiversity.

Indirectly, the habitats and species may also be affected by air pollution, GHG emissions and noise. According to the transport model results the plan implementation is expected to lead to the reduction of CO2 emissions in the SUMP Study Area. Similarly a reduction of NOx and SO2 emissions will occur, according to the transport model results. These air pollutants are the main components for the creation of acid rain which can cause harmful effects on ecosystems.

Green Infrastructure is linked with a range of environmental benefits, but the SUMP does not specifically propose green infrastructure as part of new transport schemes. These however are expected to be included in the final design of infrastructure in line with the SUMP's environmental sustainability principles, for example to segregate cycle paths from roads.

The promotion of the polycentric land use model supported by the complementary Strategic Planning Policies will be beneficial for the surrounding natural environment as it anticipated that current trends of dispersed development and further intrusion of the city into important habitats will be restricted. Furthermore, disturbance to wild species from human presence, noise and light pollution will be reduced as new anthropogenic activity will generally be confined within/near the proposed cores.

18.2.6 Material Assets

The Limassol SUMP aims to drive a holistic improvement and shift of the transport modes of the study area towards more sustainable means and it is expected to have a significant positive impact with regards the number/length of existing transport corridors and infrastructure being utilised by sustainable modes.

It is anticipated that all transport schemes proposed by the Limassol SUMP will be implemented utilising modern and sustainable design, construction techniques and materials in line with sustainability principles. Therefore, it has been considered that an increase in the number and length of new transport schemes within the study area will lead to a general increase in the quality and lifetime of transport infrastructure while reducing the need and frequency for maintenance.

Also, the urban planning strategies proposed aim at achieving the polycentric and compact development of the Study Area, improving the quality of life of citizens and promoting multi-modal transportation which further supports the wider SEA objective for the sustainable use of material assets

18.2.7 Landscape

The SUMPs proposals will result in the creation of a homogeneous and attractive streetscape but also lead to positive effects to the natural features of the landscape. This will help in the formation of the visual image of a sustainable, attractive and safe Limassol.

Significant positive effects will occur from proposed pedestrianisation schemes likely to be designed in line with sustainability principles (with appropriate paving finishes and materials, street furniture and landscaping) to reflect the local context and positive features of the prevailing streetscape character while enhancing its elements. Properly designed road lighting will create the desired ambiance for people to congregate outdoors during night and improve the sense of security.

Use of materials in harmony with the historic buildings is likely to instigate conservation, repair and restoration of historic structures and other key architectural features. The combination of pedestrian and community-level commercial streets will help enhance the liveliness of historic and cultural districts, further promoting the preservation and development of these neighbourhoods.

Tree planting and landscaping created in the context of infrastructure schemes, will formulate more aesthetically pleasing streets. Existing services will also be moved underground thereby removing unsightly power lines and poles and other surface or overhead utility infrastructure, which can also impede street tree growth. The changes to the Seaside boulevard and the development of Aktea road in line with sustainable mobility principles will add a new improved dimension to the presently car dominated seascape.

Additionally, the proposed Planning Policies can restrict further expansion of the city and encourage a more compact and better organised urban environment based on appropriate design principles while safeguarding historic buildings and the diversity of their local character.

18.2.8 Built Environment and Spatial Planning

Collectively, the SUMP study and its recommendations will have a strong direct impact on the availability of sustainable travel modes and the quality of transport infrastructure. The strategies will result in less space being gifted to cars and instead more space to other road users. This will create induced demand for cycling, walking and traveling by bus as citizens are influence from their positive travel experience.

The proposed polycentric urban development will directly contribute to strengthening the effects of the transport policies. Through the concentration of population growth in specific urban and peri-urban centres, the SUMP will enhance the existing built environment, reduce travel distance and discourage uncontrolled urban sprawl. The Area Action Plans will ensure that the densification areas are well designed, attractive and integrate the proposed transport infrastructure into the built environment. These will create highly functional urban spaces, with active ground floor uses animated by people congregating, waiting or passing through.

Additionally, the recommended SUMP actions and strategies are in line with the provisions, goals and sustainable urban mobility measures of the existing Planning Documents and included a rigorous participatory procedure that facilitate their smooth integration into the local planning framework.

18.2.9 Cultural, Archaeological, Architectural and Natural Heritage

The level of access to the identified areas of cultural, archaeological, architectural and natural importance will be directly improved from the implementation of SUMP. Particularly, the cycling and public transport interventions will enable more people to travel to the identified sites in a fast, safe and comfortable manner ensuring that all the identified sites are more accessible for all ages and social groups and not only exclusively to car owners.

Additionally, the pedestrianisation schemes proposed in urban and peri-urban areas and the Area Action Plans will enhance the surroundings of the sites and make the visiting experience more enjoyable. As a result, it is likely that the sites will increase their revenues and visitor numbers, which will also subsequently instigate and result in more funds for their protection, promotion and restoration. These conservation efforts will act cumulatively with the fiscal measures published by the Ministry of the Interior that promote the restoration and re-use of the listed/preserved buildings.

The reduction of car presence and the pedestrian-oriented design of the built environment might also act as a branding tool for the region attracting investment from national and international institutions.

18.2.10 Socio-economic Environment

The consortium of strategies proposed by the Limassol SUMP will enhance the employment opportunities in the urban and peri-urban centres of the study area. The key positive changes that will be delivered include the increase in the number of visitors in the urban and peri-urban centres, new jobs and better access to the commercial areas as people live closer and can travel in a safer and comfortable manner. This comfort will also influence visitors to travel more often the central areas, visiting for different reasons and further increasing the size of the market. As the image of the centres will be improved, it will attract investment for new entrepreneurships and encouraging existing business to upgrade their facilities and services. Moreover, the changes in travel patterns will enable citizens to reduce their monthly travel costs allowing them to spend their money on other services or amenities.

However, the SUMP will also result in a temporary transition period for residents and shop owners, where a reduction in turnovers might be recorded. Particularly, in the first phases of the implementation when road congestions and closures might take place, while at the same time locals will still travel by car. Additionally, the expected economic growth and rise in real estate values might also lead in the displacement of existing local population if the increase in rent prices is not met by appropriate housing policies and rises in salaries.

18.2.11 Population, Human Health and Quality of Life

Collectively the SUMP's strategies will have multiple positive impacts on the quality of life of locals and their health. The recommended policies and measures will result in directly improving the availability of open green spaces and encourage people to walk and cycle more, by promoting active transport. Improving safety will ensure that the public realm is inclusive for a wide variety of users and accommodating the needs of mobility impaired persons, whereas today the present street scape hinders their movements. The SUMP will also promote the upgrade of the aesthetic quality of public spaces, ensuring that walking and cycling is a pleasant activity that provides a multi-sensory experience, with multiple opportunities to stop and linger. Moreover, the reduction of distances between housing, work and services through the densification of centres, will directly facilitate an easier and functional daily routine for citizens.

However, as noted previously, the SUMP will result in some temporary negative impacts in the region that include increase in road congestion, accessibility problems, construction related pollution and conflicts in regard to the shared road space between cyclists and car users. Additionally, the imminent delivery of the Andrea Themistokleous Central Bus Station will result in a rise of noise and air pollution in the city centre, that will particularly affect residents living in proximity. These impacts, although they are considered important will be appropriately dealt and controlled with the delivery of all projects proposed by SUMP.

18.3 Summary of Proposed Mitigation Measures

18.3.1 Air Quality

a. Preparation of Traffic Management Plans for the SUMP Implementation Period

It is recommended that a comprehensive Strategic Traffic Management Plan is prepared by the Competent Authority in accordance with the Implementation Plan of the SUMP, so as to manage traffic and associated pollution and limit disruption to travel routes/patterns during the implementation period of the SUMP. This should be complemented by project specific Construction Traffic Management Plans which should be prepared by all Contractors involved in the implementation of the SUMP. Indicative measures to be specified include alternative routes for the public, routes for heavy construction vehicles, signage, safety measures and dissemination of information to the public.

b. Provisions for Private Electric Vehicles (EV)

Apart from electric buses and small lorries that are proposed for the freight needs of the pedestrianized centres, the SUMP does not include suggestions for electric vehicle infrastructure, so the SEA proposes the consideration of such provisions either in the context of the SUMP, or of National Policy. Such infrastructure may range from the installation of charging stations at strategic points, so to cover the needs of the city and its periphery, to the creation of mobile apps for the promotion and functionality of the EV network

c. Incorporate Tree Planting at appropriate locations

The use of trees should be considered in appropriate locations to filter out pollutants and improve air quality at the project level but also at a wider scale. It is proposed that native tree and shrubs are incorporated into the scheme design of all proposed SUMP projects. Areas requiring particular attention and the creation of a green buffers to tackle air and noise pollution include the residential areas adjacent to the A1 motorway.

18.3.2 Climatic Factors

a. The preparation of specific measures/actions for the mitigation of climate change impacts, including flooding.

It is proposed that all schemes located within flood risk areas are designed and constructed appropriately with suitable permeable materials and incorporate the use of SUDs, wherever possible. It is also recommended that Competent Authorities (such as the Department of Town Planning and Housing, the Department of Public Works, the Department of Environment, etc) set specific measures and conditions in permits for all transport developments in Limassol, based on climate change adaptation and resilience principals.

b. Incorporate more extensive and/or additional measures for cycling and walking in the next SUMP review

It is recommended that during the next review of the SUMP, it is examined whether more extensive and/or additional measures to further decrease car use and increase the modal share of cycling and walking are necessary, with a view to achieving a greater reduction of GHG emissions from the transport sector in Limassol.

18.3.3 Soil/Geology

a. Minimise Soil Sealing

It is recommended that during the design process for the proposed schemes (particularly the Central Bus Terminal at Themistokleous Street and Aktea Odos) soil sealing is minimised and where this cannot be avoided, permeable materials should be used, wherever possible.

b. Prepare a list of measures for the prevention of erosion in the area

The application of erosion controls in the area is proposed in order to avoid sediment deposition and water turbidity. This can be achieved by the preparation of actions/measures which could be developed jointly between the competent Government Authorities e.g. regular monitoring of high-risk areas, measures to stabilise unstable slopes, measures to minimize river surcharge, measures for using SUDS and recommendations of corrective action in sensitive areas such as areas with erodible soils or steep slopes.

c. Carry out appropriate design measures to prevent erosion and overtopping for Aktea Odos (also linked to (b) above)

It is expected that an Environmental Impact Assessment study will be carried out for this study which will assess the impacts to the environment and propose specific mitigation measures. However, it is important to take the major expected impacts into account during the design stage so that these are mitigated early on and as much as possible prior to construction.

18.3.4 Water Resources

a. Measures to improve runoff and water quality in water receptors

1. Carry out regular monitoring in watercourses (during flow) and in the sea to identify pollutant sources measures such as SUDS (see below), oil/water separators can be located at appropriate locations.

2. It is recommended that all transport schemes will be constructed by incorporating SUDS where possible (such as the use of permeable materials), according to best practice guides to allow for infiltration.

18.3.5 Fauna, Flora and Biodiversity

a. Incorporation of Green Infrastructure into Transport Schemes

Green Infrastructure can make a significant contribution to achieving good water quality, enriching aquifers, mitigating the effects of hydromorphological pressures, and limiting the impacts caused by climate change and floods. Also, it can enhance scenic value and connectivity resulting in increased benefits from leisure and tourism. It is proposed that the Competent Authorities responsible for the design and implementation of the proposed SUMP schemes incorporate Green Infrastructure into the Transport Schemes at the Project Level.

b. Involve Environmental Groups and NGO's early on during the design stage of large transportation projects

Environmental Groups and NGOs should be involved early on during the design stage of large transportation projects such as Aktea Odos and the central bus terminal in Themistokleous Street. Such stakeholder involvement will gather the different viewpoints and identifying areas of consensus and disagreement early and affect decision making. The projects can then be planned by taking on the views of the stakeholders in order to minimize reactions.

18.3.6 Material Assets

a. Supplementary Guidelines for Public Transport Infrastructures and Facilities

Even though the Department of Public Works has guidelines for public transport infrastructures and facilities, supplementary guidelines are proposed that will enhance and further improve the existing and proposed transport infrastructure within the Study Area. The existing Guideline should be reviewed and updated in order to meet the sustainability principles and standards promoted by the Limassol SUMP. The guidelines could include the incorporation of appropriate design, better (more sustainable) material selection which will allow for climate change adaptation and construction standards.

b. Maintenance Guidelines of Public Transport Infrastructures and Facilities

The objective of the guideline will be to reduce replacement costs, reduce delays and provide environmentally friendly maintenance solutions for new and ageing infrastructure networks, taking into account the sustainability principles of the SUMP proposals. This supplementary maintenance guideline should also take into account Climate Change impacts and maintenance recommendations should focus on the ability of materials to adapt to or mitigate against climate change impacts.

18.3.7 Landscape

Preparation of a Streetscape Guidance Document

In order to ensure high quality streetscapes and homogeneity and to set a high standard for the design of spaces and transport infrastructure in the study area, it is recommended that a Streetscape Guidance Document is developed which shall complement and constitute an integral part of the Limassol SUMP. The Guide should specify the main criteria for good design, material selection, installation and maintenance and include specifications for the entire range of projects covered by the SUMP with a view to achieving a visually appealing, functional and sustainable streetscape.

18.3.8 Cultural, Archaeological, Architectural and Natural Heritage

Strict implementation of the Design Guidelines in Special Character Areas and Traditional Settlement Cores

Although the existing planning conservation and protection guidelines in Special Character Areas and Traditional Settlement Cores will be strengthened with the proposed Area Action Plans, based on the previous practises of urban development, it is proposed to enhance the existing Development Control mechanism of the Town Planning and Housing Department by promoting adjustments in the existing legislation This will ensure a stricter practise of the guidelines and a safeguard of sensitive areas.

18.3.9 Socio-Economic Environment

Package of measures and incentives to minimise the impacts on retail activity from the pedestrianisation of commercial streets

It is recommended that the Competent Authority develops a package of measures and incentives to minimise any impacts that may occur on retail activity throughout the implementation phase of commercial pedestrian streets but also during the brief transition period after the works are completed.

18.3.10 Built Environment and Spatial Planning and Population, Human Health and Quality of Life

a. Provide measures to avoid closing-off the city during the construction periods of large transport schemes.

The Competent Authority should consider appropriate measures to avoid closing-off the city and public space. An important measure is to provide the temporary use of areas (mean-while spaces) wherever possible, which can be used by the public during the extensive construction periods for large projects e.g. at Andreas Themistokleous Central Bus Station. These “mean-while spaces” can ensure that residents are not distanced from the city centre or avoid enjoying the public realm, during the implementation of SUMP policies.

A more radical measure is the inclusion of penalties for delivery delays, with residents and business owners compensated for delivery setbacks.

b. Reduce impact of gentrification and community displacement as a result of rising real estate values

The promotion of collaboration between new and old residents and entrepreneurs is proposed, through temporary events, social spaces and collaborative urban design schemes as they will enable people from different social groups to interact, creating a mutual bond and a common identity for the region. Such measures can be complemented by fiscal measures protecting the existing SME's and allowing local business to evolve instead of being replaced. Additionally, the setup of housing co-operatives and shared co-working spaces can be evaluated in order to complement the proposed affordable housing policy.

c. Design solutions to reduce the impact of noise and air pollution and on the landscape from the Andrea Themistokleous Central Bus Station

Due to the number of buses planned to pass through and stop at the proposed Central Bus Station, noise and air pollution is expected to increase in the area. Appropriate design tools can mitigate the negative impact, through the combination of nature and technology. The existing trees can help improve the air quality and can be complemented by innovative air purifier machines. Additional tree planting in strategically chosen locations proposed by the SEA may also further reduce noise impact, improve air quality and provide shade. It is also important to consider the aesthetic and functional qualities of the bus station that can hinder the quality of life of people through appropriate design.

d. Incorporate Sustainability Principles in the Proposed Area Action Plans

In order to mitigate against noise, air and light pollution which is expected to be caused by the polycentric development approach, it is recommended that sustainability principles are fully incorporated in the proposed Action Plans. A public dialog between residents and planners is recommended early on, in order to enhance the public spaces through local design inputs and preferences and to mitigate against any potential reactions.

e. Measures to mitigate against any potential threats to cyclists' safety in the short run

In order to improve road safety and protect cyclists in the short term and SUMP transitional period, awareness campaigns are proposed. Cycle to school and cycle to work schemes recommended by the SUMP can be further strengthened by schemes such as car-free Sundays. Similarly, initiatives that promote cycle training for all ages are encouraged.

In order to mitigate the potential negative outcomes of transport corridors with shared road space between buses and bicycles, it is recommended that in the long term and as travel behaviour changes, road space is taken from the private vehicle and given for bicycle use. Additionally, it is recommended to conduct cycling pilot schemes, in collaboration with residents, that support the collection of empirical evidence which can inform the delivery of cycling infrastructure.

18.4 Conclusions on SEA process

Based on the strategic environmental assessment conducted, the implementation of the Limassol SUMP is expected to result in considerable positive effects on the natural and human environment of the Study Area. This however is anticipated, since the SUMP promotes and has been prepared in line with environmental sustainability principles in order to address the existing transport related issues in Limassol. The majority of the negative impacts identified by the SEA are generally manageable and can be appropriately mitigated by the measures recommended by the SEA

19 Conclusions

Cyprus has recognised the environmental and economic consequences of cities dominated by cars. It has, therefore, involved itself in the European SUMP4Cyprus initiative and wishes to embrace the underlying philosophy of the programme. The promotion of 'sustainable transport' is, however, quite a complex idea and touches many areas: health, environment, socio-economic factors, quality of life and even happiness. This is further compounded by the average Cypriot's attitude to their cars, which they are unlikely to give up without a fight or incentives, which will make them change their behaviours. Any change programme can take years to bed in successfully. We are aiming to change long-ingrained behaviours of a whole country.

The project of developing a Sustainable Urban Mobility Plan SUMP for Limassol is not just a planning project. It includes planning of the future transport and mobility system, but it is a process. This process is based on a strong interaction between the team of planners, consultants, decisions-makers with the relevant stakeholders and the public, aiming at explaining and discussing the principles, the ideas, the background, the methodologies and the approach. This was carried out be a number of Key Stakeholder Committee meetings, by a number of public participation events, by communication via media, internet, by surveys of residents and stakeholders. Input, comments, critics and proposals by stakeholders, by affected groups and residents were taken on board, were discussed and responded. The result is a SUMP for Limassol that is broadly accepted.

Decision-makers and planning authorities have been involved, stakeholders and affected groups, NGO etc. making sure that these institutions and persons accept the SUMP for Limassol and take ownership of the SUMP, the approach, the strategies and the measures. Only with this interactive approach can it be ensured that the SUMP will not only be a study but will be a project that changes the mobility sector in Limassol completely over the next years, a paradigm change for mobility.

The proposed SUMP, the strategies and measures included in the plan are ambitious, require strength of planning institutions and will result in considerable behavioural changes. The impacts and effects have been modelled and calculated, they have been analysed and described in the various deliverables of the project. The strategies and measures are necessary, not always easy to implement. Still, in some cases these strategies and measures do not go far enough, can only be seen as a first step towards the final situation. But even a big change, even a paradigm change of mobility has to start with a small step. And this start is defined by the proposed SUMP for Limassol. The SUMP strategies include an integrated approach of adopting the future land-use development and the future transport and mobility system.

Relating to land-use, a polycentric planning strategy is proposed, reflecting the vision for sustainable transportation in Greater Limassol Area, proposed by the SUMP and ensures that the transport policies proposed are compatible with the urban form and land uses of the Greater Limassol Area. The strategy is divided in four policy sections which are developed in depth, in order to deliver the targeted densification of the peri-urban centres and to strengthen the role of the City Centre. Guiding future population and employment growth in proximity of existing centres and creating inclusive, mix-use and dynamic centres, where amenities and jobs are within close distance.

The integrated and holistic approach of the SUMP must be endorsed by the decision-makers and key stakeholders, through the integration of the recommend transport and land use policies in the Development Plans. Although the key principle of compact and mix-use urban form is imperative to the delivery of the SUMP objectives, it is recognised that the transport related measures of the SUMP can also work independently and do not completely rely on the full implementation of the proposed polycentric scenario.

Relating to transport and mobility, an integrated and well-balanced strategy between "carrots" and "sticks" has been designed, carrots being incentives for changing behaviour, more attractive alternatives for mobility, improved public transport systems, more space for pedestrians and non-motorised use of public urban space, less accidents and increases safety and security, less pollution and noise in the dense urban areas, the sticks being restrictions for car uses, pricing of parking, limitations of access to the centre by car etc. This well-balanced combination has been favoured by the stakeholders of Limassol and is the one that will lead to the necessary changes.

In the proposed future mobility system of Limassol, there will be a remarkable increase of the Public transport passengers. This is mostly because of the combined measures of more PT frequent services

with a respective in-crease in the itineraries, the bus lane and BRT schemes, the parking control measures and 5% increase in fuel costs. In spite of the very good performance in the increase of PT passengers from less than 2% to estimated 9.4%, the target of PT share of 10% by the year 2030 is only marginally reached. In the longer-term, a drastic measure for a bold increase in PT share in Limassol, similar to the "Congestion Charge" London scheme could be considered, particularly if objectives like a modal share of 20% for public transport are to be reached that would not be unreasonable for a city of the size and structure as Limassol.

Also, a significant increase of pedestrian trips from 5.7% to 10.1% and a modest increase of the trips with bicycles from 0.7% to 1.9% is calculated. This reflects the changes in the land use Polycentric Urban Policy, with a number of small distance trips that can be completed on foot or by bike and also the implementation of bicycle paths and new pedestrian areas.

The calculations show a very positive impact in the environmental indicators due to the proposed strategies and measures for the future years. All emission pollutants are significantly decreased. Also, the noise level in urban roads are restricted to an acceptable level of less than 65db during the day time. Still, the proposed plan is not sufficient to reach the target value of 24% reduction in CO2 by 2030. Supplementary policy measures would be necessary, restricting the car use further, increasing public transport shares and shares for non-motorised transport further and for the remaining car traffic including the promotion of electric cars and electric buses in Limassol.

The proposed SUMP for Limassol, discussed and accepted by stakeholders and residents is a milestone in the development of future mobility for Limassol. If implemented and if all necessary changes are accepted, then it achieves remarkable impacts in terms of sustainability,

- Environmental sustainability: reduction of Green House Gas emission from transport, mainly CO2, reduction of emission of pollutants and emission of noise,
- Social sustainability, increasing the share for non-motorised use of public urban space, reducing the negative impacts on safety, reducing number and severity of accidents, increasing the walkability in the city and the freedom of movement for all population groups, particularly, the children, the young, the old, the mobility impaired and generally those without access or without willingness of using a car, and
- Financial sustainability, increasing the profitability of public transport, increasing the potential for businesses in Limassol, particular shops, tourist attractions like hotels, bars, restaurants etc.

The months and years to come will show, whether the proposed and planned changes will be fully implemented to lead to the necessary change. If this is the case, then further development should be planned and implemented, limiting car transport further, improving alternatives even more. But these further and more severe limitations on one hand and improvements on the other hand can neither be politically proposed now nor can they be financed now. Both will only be possible when the first changes will become apparent and the positive impacts on the environment, the social life and the financial situation will become apparent and accepted by the public and the administration.