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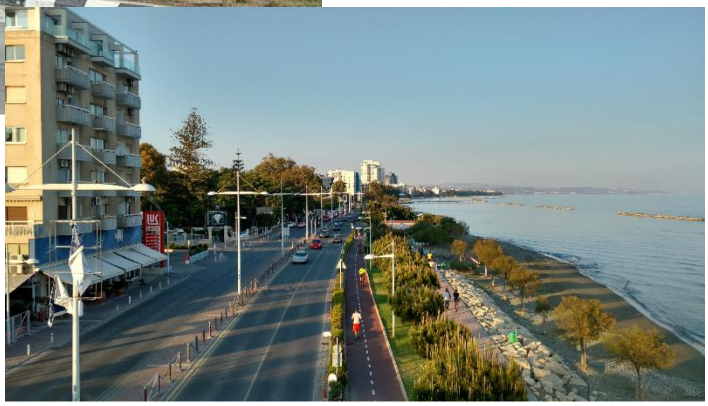
D14.1

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 - ANNEXES

SUSTAINABLE URBAN MOBILITY PLANS



Karlsruhe, 11.06.2019

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

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FINAL SUMP REPORT – ANNEXES

Client:

Republic of Cyprus

Public Works Department, Ministry of Transport, Communication and Works

Contractor:

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Transport Consult GmbH
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76131 Karlsruhe
Germany

In partnership with:

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

Karlsruhe, 11.06.2019

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Document information

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Explanatory Notes

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 official 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 Final SUMP Report is a summary of the process of developing the Sustainable Urban Mobility Plan including different steps.

In addition to the Final SUMP Report, this Annex provides detailed information, figures and tables to individual topics.

ANNEX I – The Vision

High-Level Objectives and Targets for 2030

High Level Objective	Operational Objectives	Indicators	Base line value	Indicative Target (Year 2030)
Economic Efficiency *Improve the efficiency and cost-effectiveness of the transport network in providing for the transportation of persons and goods* *5 INDICATORS*	Improvement of the efficiency and cost-effectiveness of the private & public transport network	Average travel time (min) by car	14,2	As it will be calculated for the preferred scenario
		Average operating costs of PT services per Km	2,39	2,20
		Capital investment costs of PT services	Very low	>25.000.000 euros
	Reduction of congestion	Vehicle/hours and/ or vehicle/kilometres over the network and/ or dominant corridors of movement	Chapter 4.4 - DEL4.1	about 70-75% of the base line value
		Delays and improvement of the Level of Service (LoS) during the peak hours over dominant corridors of movement	Chapter 4.4 & 4.5 - DEL4.1	-20% delays + 10% LOS
Environmental sustainability *Minimise emissions & pollutants associated with transport* *9 INDICATORS*	Reduction of traffic emissions	CO_2 (kg) emissions in road A1	587,853	24% decrease compared to 2005
		CO (g) emissions in road A1	1,943,451	40% decrease
		NO_x (g) emissions in road A1	2,207,477	40% decrease
		Particulate emissions (PM10) in road A1	51,837	50% decrease
	Reduction of traffic noise in the whole study area	Average Daytime Noise Emission in dB	Chapter 3.1 - DEL5.1	20% decrease
	Reduction of old technology private vehicles	Percentage of new electric / hybrid private vehicles purchased	Very few	10% of the national registry
		Number of electric car charging stations	6	about 50
	Increase of vehicle sharing	Number (or percentage) of shared cars	0	5% of the car trips
		Number (or percentage) of shared bikes	Very low	2% of bice trips

High Level Objective	Operational Objectives	Indicators	Base line value	Indicative Target (Year 2030)
Accessibility & Social Inclusion *Ensure all citizens are offered transport options that enable access to key destinations and services* *17 INDICATORS*	Improvement the Level of Accessibility (LoA) for Public & Private Transport	The LoA for Public Transport for 5 key locations (CBD, Marina, My Mall, Germasogeia Tourist Area, General Hospital)	Accessibility Analysis (Chapter 3.3 - DEL5.1)	Accessibility Analysis for the preferred scenario
		The LoA for Private Transport for 5 key locations (CBD, Marina, My Mall, Germasogeia Tourist Area, General Hospital)	Accessibility Analysis (Chapter 3.3 - DEL5.1)	Accessibility Analysis for the preferred scenario
	Improvement of Public Transport services both in time and space	Public Transport share (including PT on demand)	1.8%	10%
		Number of adapted new public transport services in accordance to demand	0	50% of feeder lines
		Ratio of the buses with easy accessibility including disabled people	Very low	100% of all active bus vehicle
		Number of Park and Ride places	0	5
		Length of exclusive bus lanes and/or corridors (km)	0	39.5 km (equivalent length of bus lane)
		Number of bus stops equipped with telematics infrastructure	3% of the total number of bus stops	80% of the total number of bus stops
		Number of bus stops with an appropriate bus shelter	Very low	100% of the total number of bus stops
	Increase of options to use sustainable modes of transport	Pedestrian share	5.7%	10%
		Cyclists share	0.7%	4%
		Length of pedestrian streets (km) in CBD	about 1.5 km	24 km *the length of the existing infrastructure is excluded*
		Continuity/ integration pedestrian ways (km) along pedestrian ways network (footways)	about 17 km	21 km *from those 10 km new infrastructure – included 1.5 km of Aktea street*
		Continuity/ integration cycling ways (km) along cycling ways network	about 15 km	215 km *the length of the existing infrastructure is excluded*
		The number of bicycle-sharing stations	about 22	about 40
		The number of bicycle-parking spaces	24	72
	Improvement of accessibility for disabled people in the city centre	Number of accessible points of interest for disabled people	0	about 30

High Level Objective	Operational Objectives	Indicators	Base line value	Indicative Target (Year 2030)
Road Safety *Ensure personal safety & security within the transport system* *7 INDICATORS*	Reduction of road accidents (black spots) in central area	Number of the overall fatal road accident casualties in CBD, buffer 1 & buffer 2 & Number of the overall road accidents with injuries in CBD, buffer 1 & buffer 2	Will be defined by the black spot analysis (WP10) *35 fatal road accident casualties in study area (2014-2016)* *716 road accidents with injuries in study area (2014-2016)*	50% reduction & 50% reduction (respectively)
	Reduction of road accidents (black spots) in the whole study area	Number of the overall fatal road accident casualties & Number of the overall road accidents with injuries	Will be defined by the black spot analysis (WP10) *35 fatal road accident casualties in study area (2014-2016)* *716 road accidents with injuries in study area (2014-2016)*	50% reduction & 50% reduction (respectively)
	Reduction of accidents involving vulnerable people (primary school pupils, pedestrians, cyclists, disabled)	Number of "safe buffers" around primary schools	0	25
		Number of "safe pedestrians' & cyclists' crossing" along pedestrian & cycling ways network	Very low	80
		Number of accessible points of interest for disabled people	0	30
Quality of Life *Contribute to enhancing the attractiveness & quality of the urban environment and urban design for the benefits of citizens, the economy and society as a whole* *4 INDICATORS*	Enhancement of the attractiveness & quality of the urban environment & urban design for a balanced allocation of road network to private and active modes of transport	The extent/area covered by "environmental zones" in CBD	1	10
		The length (km) of streets transformed to calming areas in buffer 1	Very low	about 7 km
		The length (km) of streets transformed to low speed roads (home zones) in buffer 2	Very low	about 10 km
		The length (km) of roads transformed to greening urban arterials	about 7 km (pedestrian walkway) about 7 km (cycle way)	about 14 km (pedestrian walkway) about 21,5 km (cycle way) *the length of the existing infrastructure is included*

Table A-I 1: Objectives' description and quantification for the city of Limassol

ANNEX II – City centre detailed traffic management

1. Implementation area of traffic management measures

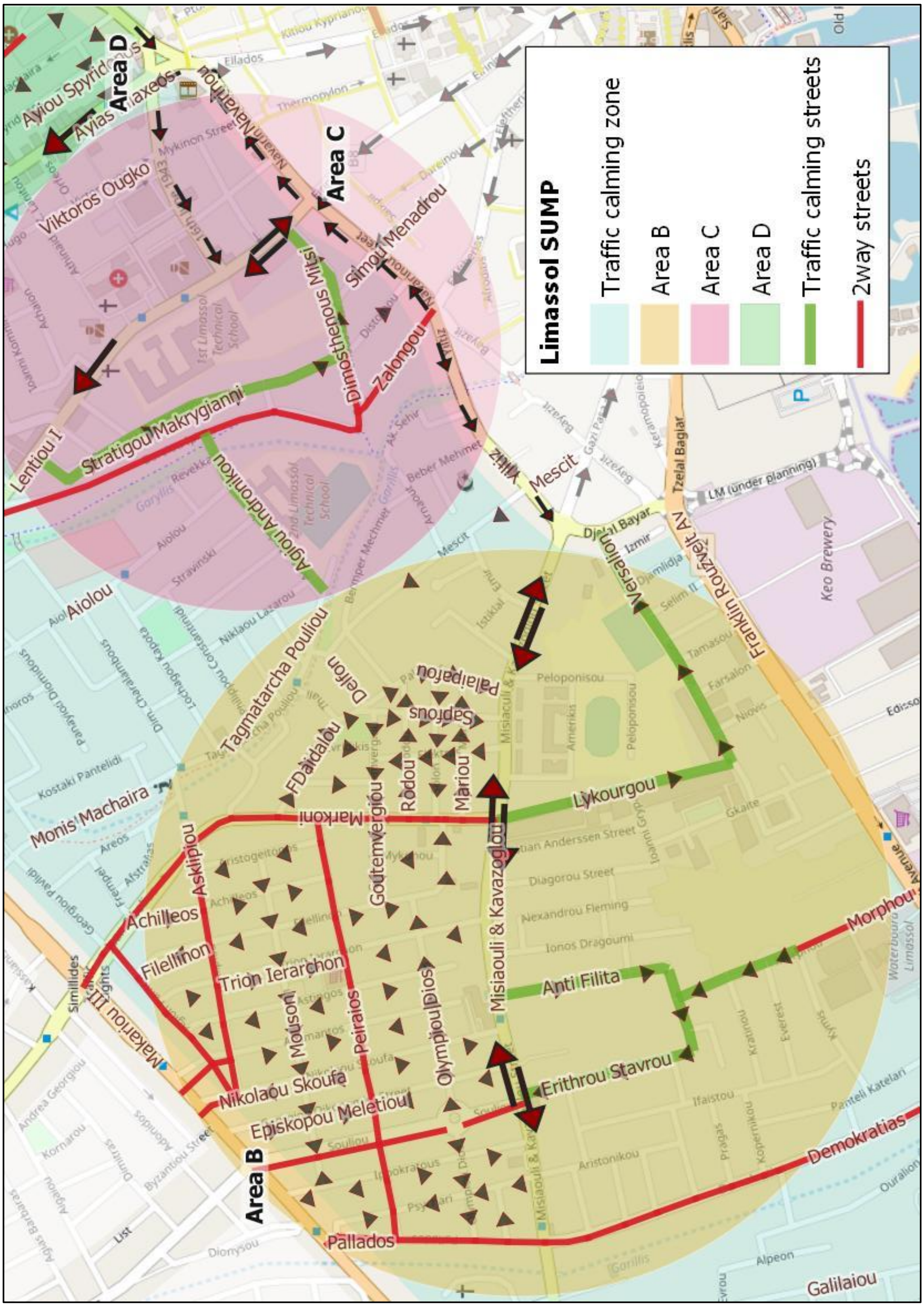


Figure A-II 1: Implementation area of traffic management measures (Areas B & C zoom)

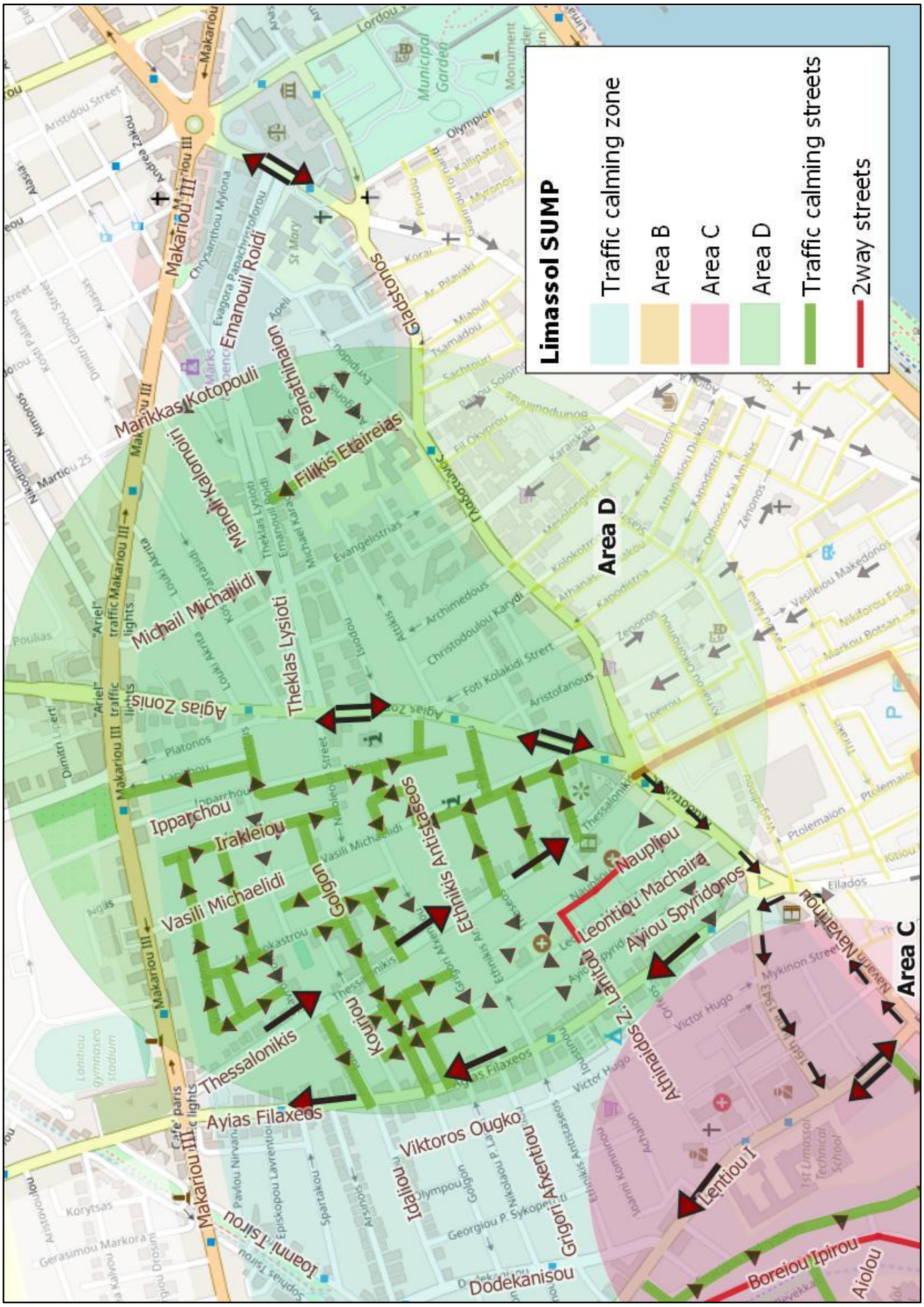


Figure A-II 2: Implementation area of traffic management measures (Area D zoom)

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

- **Mini-roundabouts - An island located at the centre of an intersection, which requires vehicles to travel through the intersection in a clockwise direction around the island**

Figure A-II 3: Mini roundabout

- **Raised crosswalks - A controlled pedestrian crosswalk at an intersection or mid-block constructed at a higher elevation than the adjacent roadway**

Figure A-II 4: Raised crosswalks

- **Chicanes - Chicanes are a series of curb extensions or islands on alternating sides of the road which narrow the roadway and deflect the travel path of a vehicle. Typically, two or three are implemented in a series**

Figure A-II 5: Chicanes

- **Speed humps - A raised section of the road that causes a vertical deflection of both the vehicle's wheels and frame**

Figure A-II 6: Speed humps

- **Woonerfs (shared space) – a road that is designed with special features to reduce the amount of traffic using it, or to make the traffic go slower**

Figure A-II 7: Woonerfs

ANNEX III – Public Transport

1. Proposed future bus networks in Limassol

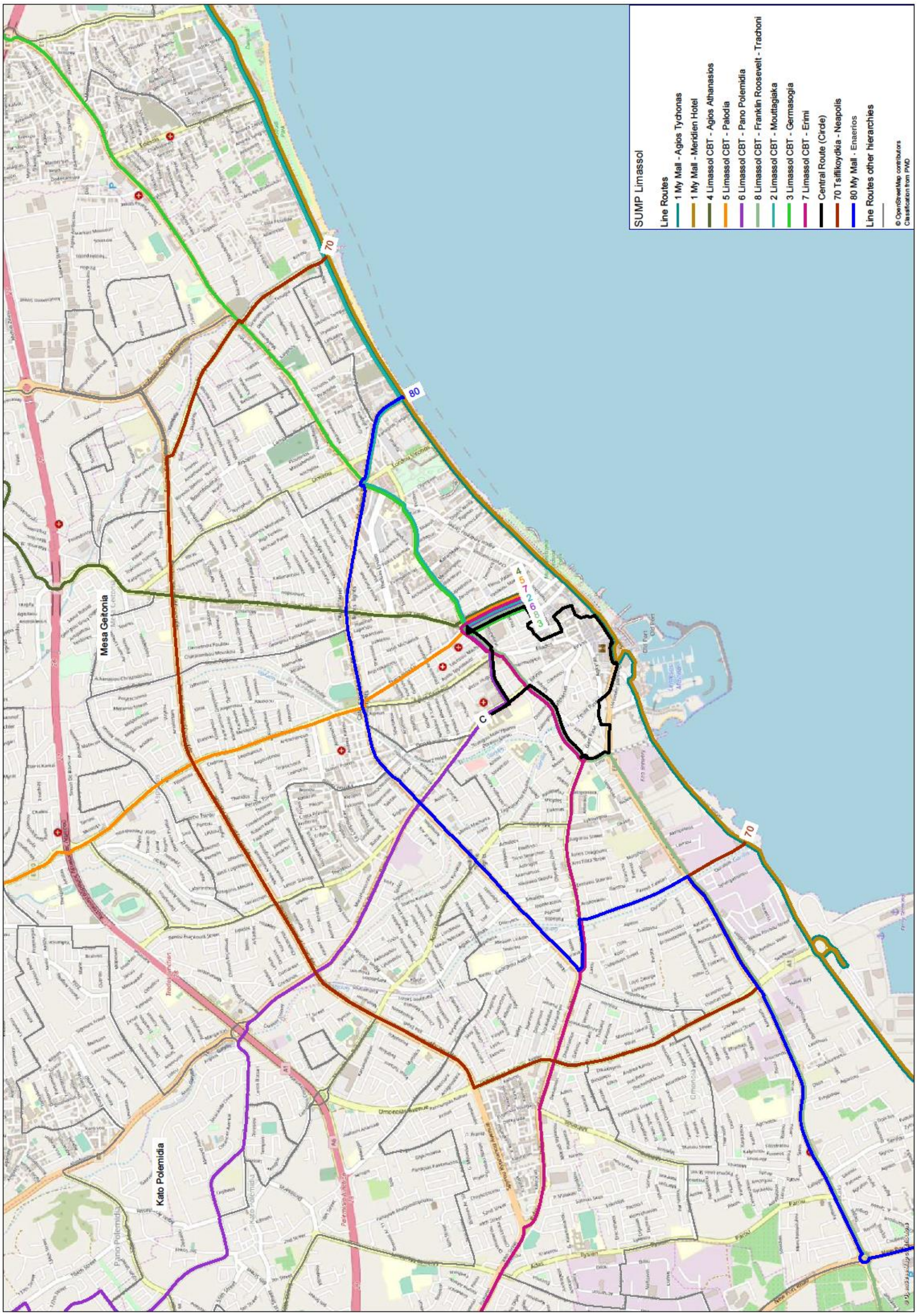


Figure A-III 1: City map: Proposed future bus network for Limassol (Primary)

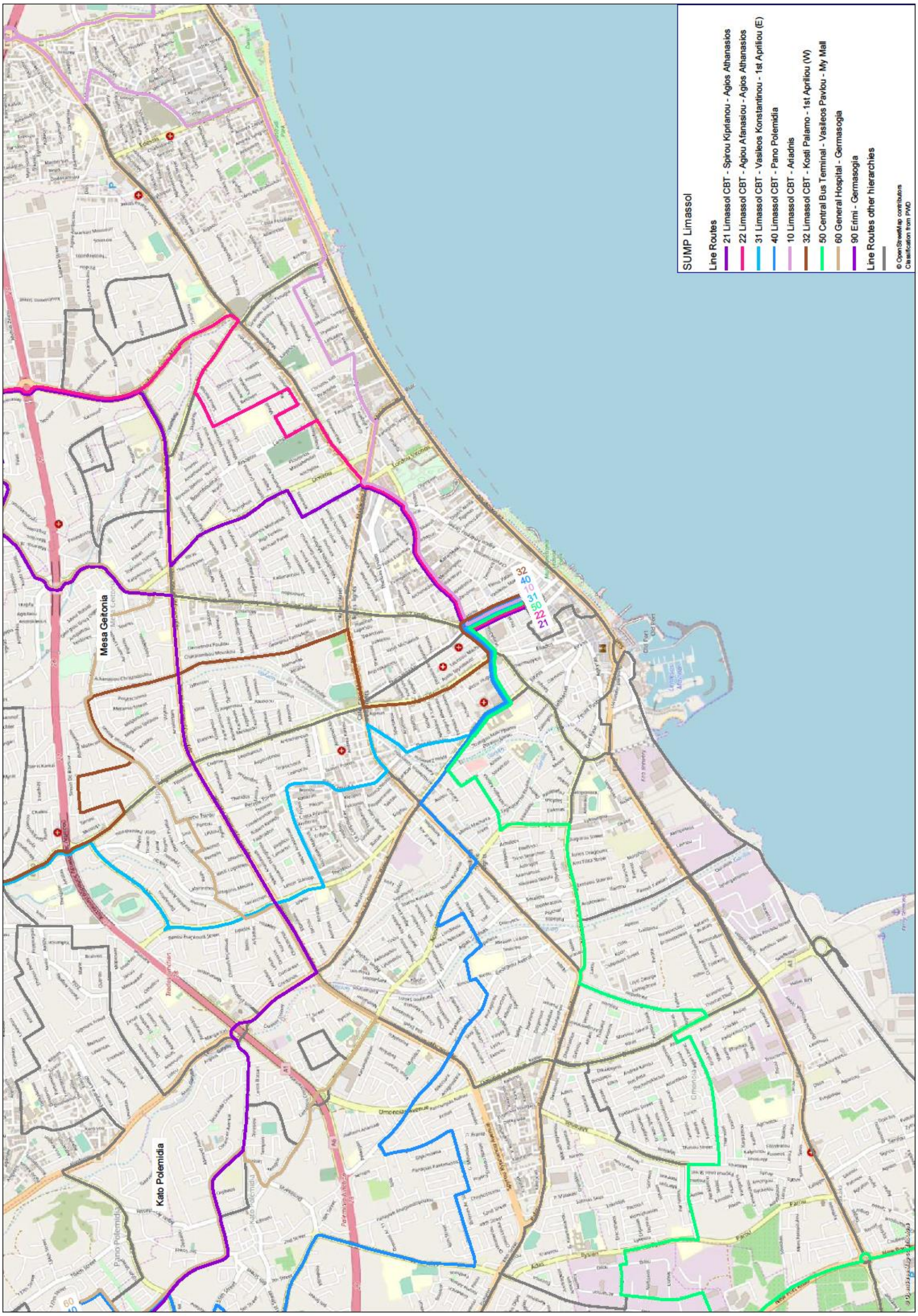


Figure A-III 2: City map: Proposed future bus network for Limassol (Secondary)

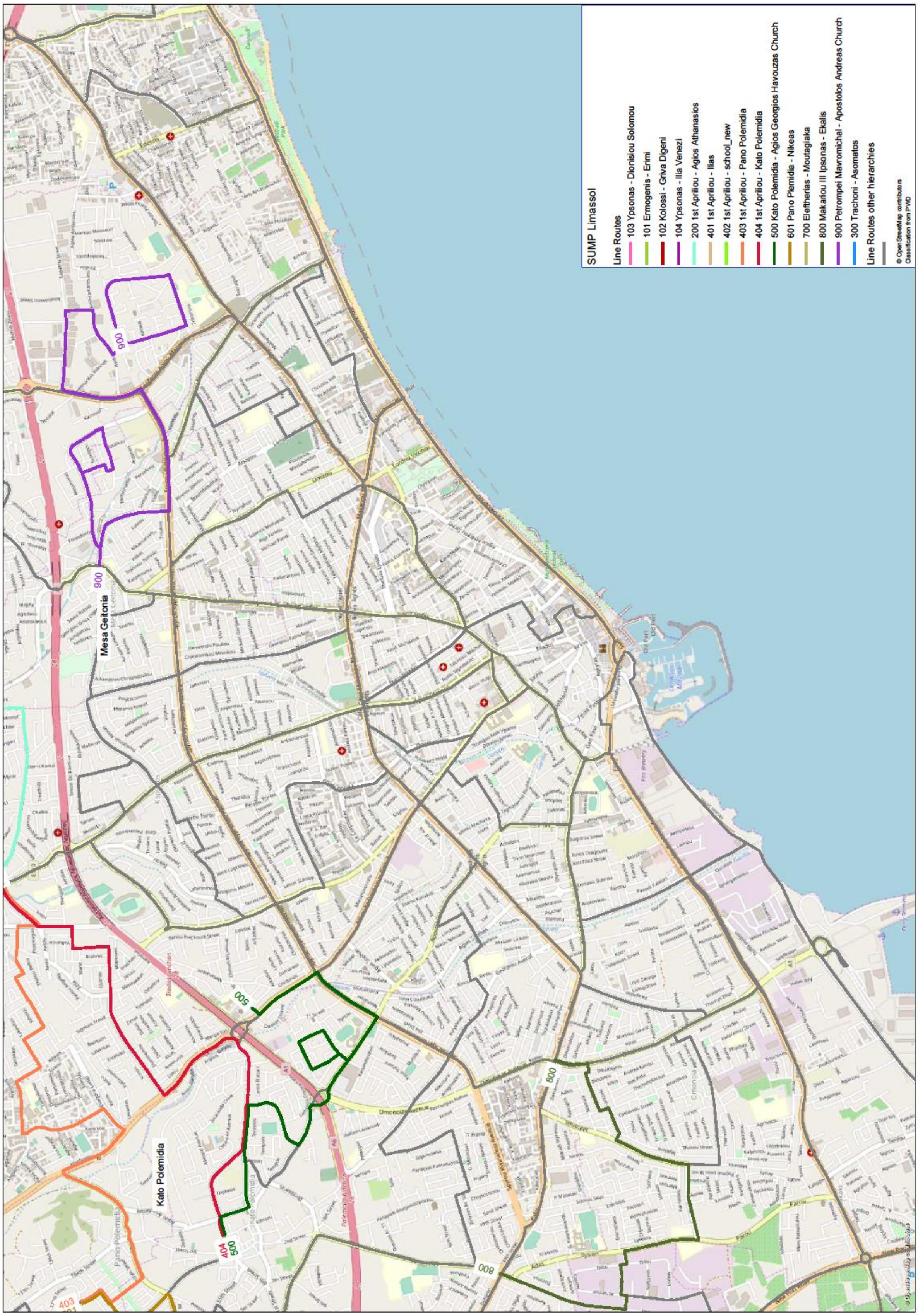


Figure A-III 3: City map: Proposed future bus network for Limassol (Tertiary)

2. Assessment on Bus Rapid Transit (BRT)

A Bus Rapid Transport (BRT) is a bus-based public transport system designed to improve both capacity and reliability compared to a conventional bus service. BRT systems are usually characterised by a number of infrastructural requirements, such as dedicated right-of-way lanes, bus stops with restricted access, platform-level boarding, off-board fare collection and large stop distances. In addition, vehicles and services have to fulfil certain requirements, such as (ideally) articulated vehicles with increased number of doors and high frequency schedules.

BRT systems have specific system characteristics compared to other modes in public transport (see table below).

Modes	Average Stop Distance [m]	Com-mercial Speed [km/h]	Vehicle Capacity	Vehicle Seats	Headway Peak Range [min]	Max. Capacity Range [pphpd]	Vehicle Length [m]
Bus	300 – 500	15	100 – 250	30 – 60	5 – 30	3.000	10 – 25
Bus Priority	300 – 600	15 – 20	100 – 250	30 – 60	5 – 15	3.000	10 – 25
Bus Rapid Transit	400 – 800	15 – 25	100 – 250	30 – 60	2.5 – 10	20 000	10 – 25
Tramway	300 – 600	15 – 25	120 – 750	40 – 100	5 – 15	9.000	20 – 75
LRT	400 – 750	20 – 45	200 – 750	60 – 100	2.5 – 10	30.000	25 – 120
Metro		30 – 60	300 – 1.500	70 – 500	1.5 – 10	30.000 to 60.000	30 - 140

Table A-III 1: System characteristics of public transport modes

The different system characteristics result in advantages and disadvantages of BRT systems in comparison to other modes (see table below).

Advantages of BRT Systems	Disadvantages of BRT Systems
➨ high passenger capacity ➨ high travel speeds and reliability due to seg-regated busways and prioritisation at signals ➨ long distances between stations, longer ac-cess times ➨ high user acceptance due to short headways (almost as rail-based system) ➨ possible to mix sections of BRT at the out-skirts with more traditional bus services in dense central areas	➨ heavy infrastructure with high grade of seg-regation ➨ higher platforms at stations to allow at level boarding and alighting ➨ expensive station equipment ➨ barriers to access the platforms (ticket con-trol) ➨ special vehicles with high comfort and capac-ity (articulated buses or double articulated buses) but less flexibility in operation ➨ high investment costs for infrastructure and vehicles

Table A-III 2: Advantages and disadvantages of BRT systems

For Limassol, a BRT scheme was taken into consideration mainly along the coast from the Mall in the West via Aktea Street and the coastal avenue to the eastern parts of Limassol.

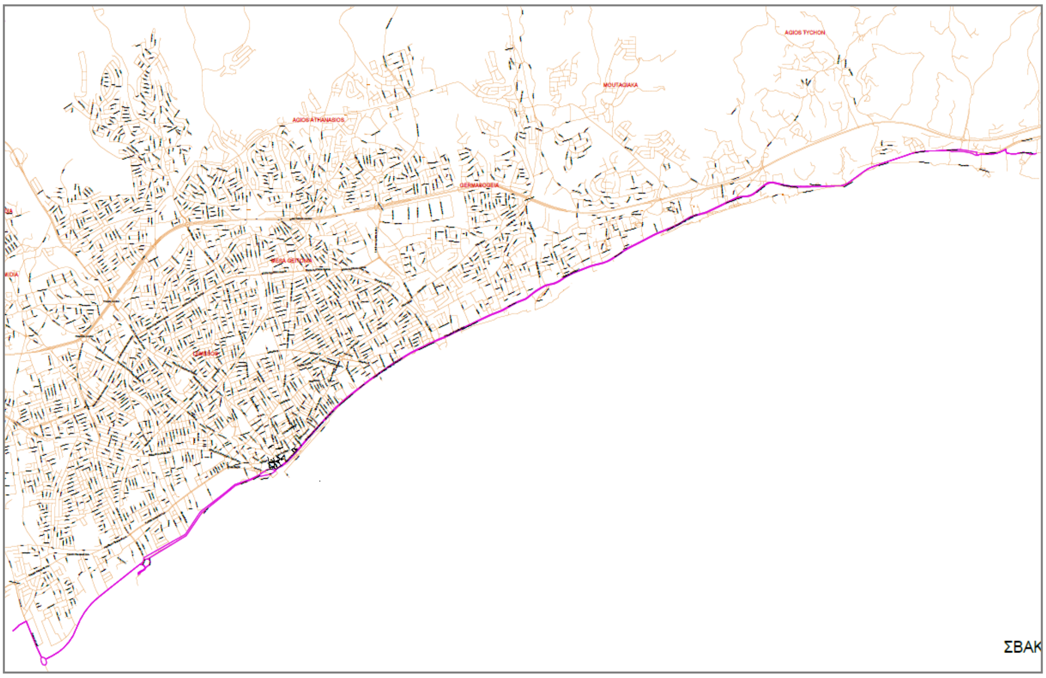


Figure A-III 1: Potential BRT route on Limassol's Aktea Street and the coastal avenue

A pre-feasibility study to assess the possibility and the economic sense of replacing one or several bus lines by BRT routes addressed three aspects: (1) current and future passenger volumes (base year 2017 and forecast year 2030), (2) the typical characteristics of different public transport systems, and (3) the capacities of the different public transport systems. The study focused on all proposed Primary Bus Lines.

The study produced the following results:

- Currently, the maximum passenger volume on the most crowded bus lines in Limassol (line 30) is less than 1,000 passengers per direction per day.
- By 2030, the maximum passenger volumes in the bus network is expected not to exceed 2,500 passengers per direction per day.
- The capacity of the system „Standard Bus" is sufficient to accommodate the demand of up to 3,000 passengers per hour per direction!
- Costs for infrastructure and vehicles of a BRT system are very high compared to a standard bus system. With respect to the low maximum passenger volumes, the investment would be economically inefficient!
- The physical infrastructure results in high separation function, e. g. from Central Business District to seaside!

- **Conclusion: A BRT system is not recommended for the passenger volumes in public transport in Limassol!**

Alternatives as predecessor of a BRT system could be:

- **Metro Bus System (seen as predecessor of Metro, Tram, BRT) with**
  - high quality buses,
  - bus lanes where possible, prioritisation at signals,
  - high frequencies: maximum of 5 minutes headway.
- **Express Bus on lines /at times of high demand with**
  - peak hour service,
  - service of main stations only outside of the city centre.

3. Requirements on the Layout

From the public transport user's viewpoint, the design of interchange stop points at crossroads should allow for both safety and comfort aspects:

- Synchronisation of timetables should address the main transfer passenger flows between crossing bus lines (if priorities must be set).
- Walking distance for the main passenger flows should be as short as possible. Short walking distances can be ensured by a smart arrangement of stop points (see the following tables).
- Traffic safety for crossing passengers can be increased and transfer times can be reduced by limiting the number of required crossings of carriageways by positioning the stop points
  a) either in the same quadrant of the crossroad, or
  b) in two facing quadrants of the crossroad (only one carriageway has to be crossed).
  Avoid traversal crossing for the main transfer passenger flows (two carriageways have to be crossed)!
- If bus lines split up to different destinations after an overlapping section, the last stop point serviced by both lines should be located either in front of the crossroad before the split-up, or behind the crossroad after both lines are joined. This layout ensures smooth transfer opportunities between both bus lines at the same stop point; no crossing of carriageways is required.

The following figure displays the main principles.

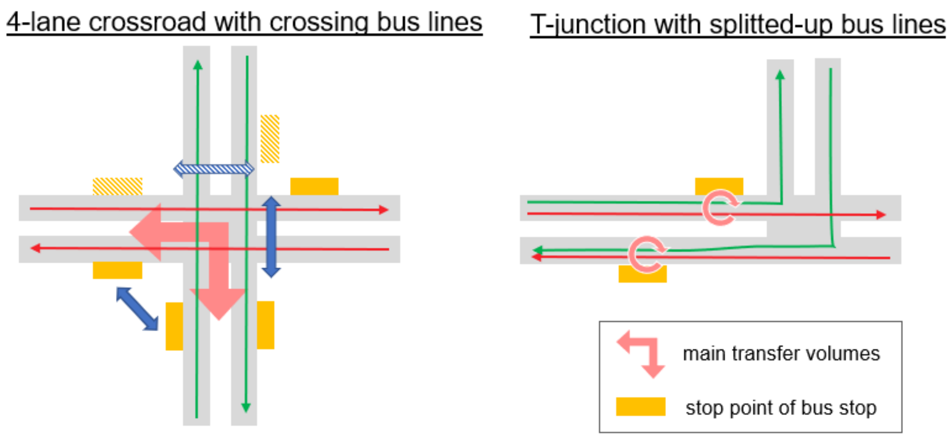


Figure A-III 2: Principle of stop point locations at crossroads

The following figures depict examples for transfer points in the proposed bus network with recommended locations for stop points and traffic safety measures.

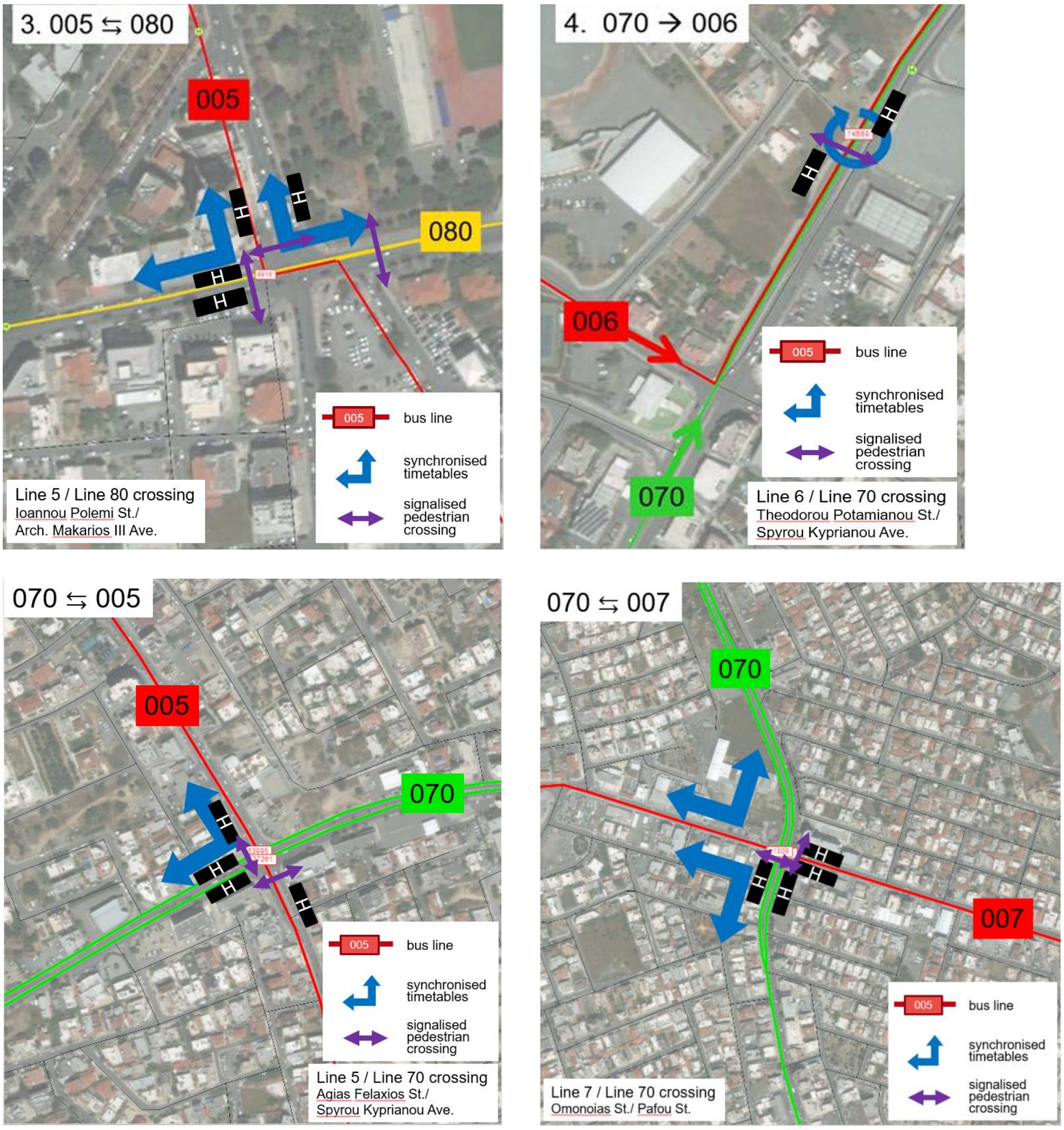


Figure A-III 3: Limassol examples for optimised transfer points in the bus network

The following figure represents a design concept for the second transfer bus stop from the selection above. Here passengers can safely cross the road to transfer between the line at opposite stops.

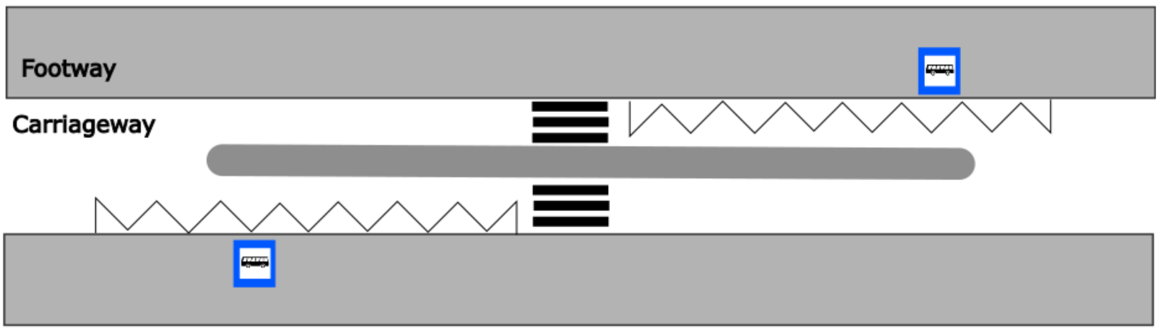


Figure A-III 4: Transfer point with opposite stops

The following figure represents an example for the allocation of a bus stop near an intersection to allow for safe crossing with short walking distances at transfer points.

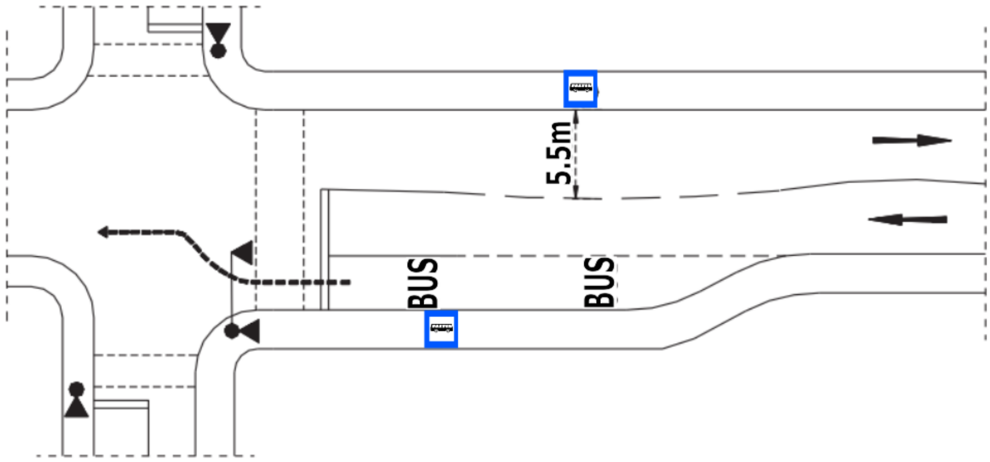
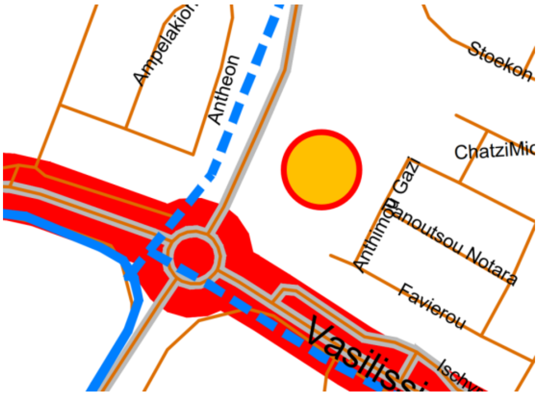


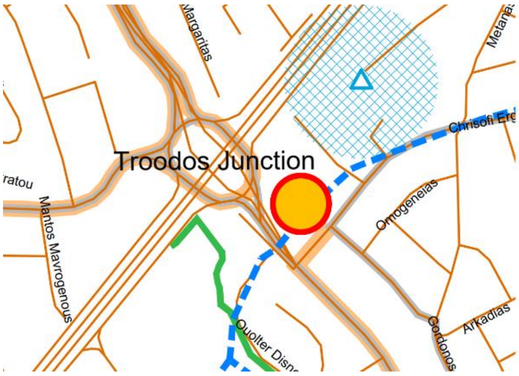
Figure A-III 5: Bus stop near an intersection with optimized transfers

4. Park + Ride

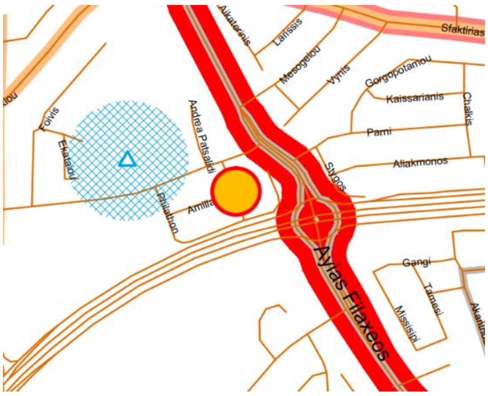
P+R Station 1 – Paphou St. & Vertical Road



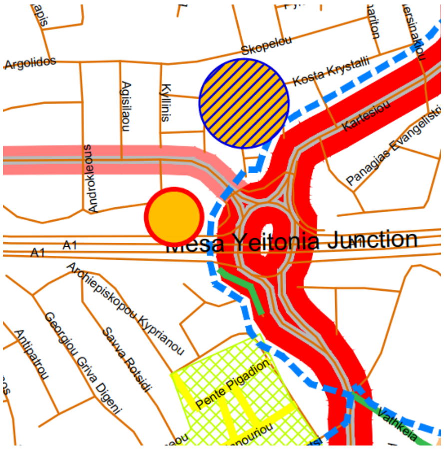
P+R Station 2 – Polemidia Roundabout / A1

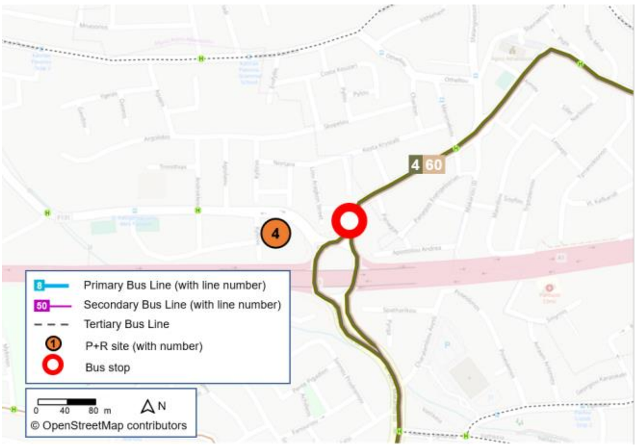


P+R Station 3 – Agias Filaxeos Roundabout / A1



P+R Station 4 – Mesa Geitonia Roundabout / A1





P+R Station 5 – Germasogia Roundabout / A1

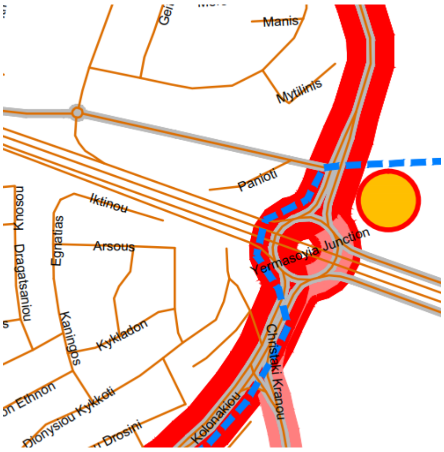


Figure A-III 6: P+R Stations in Limassol

ANNEX IV – Pedestrian Measures

Cross section Pedestrianised street

On some road sections, the pedestrians (and cycles) share the space with public transport services.

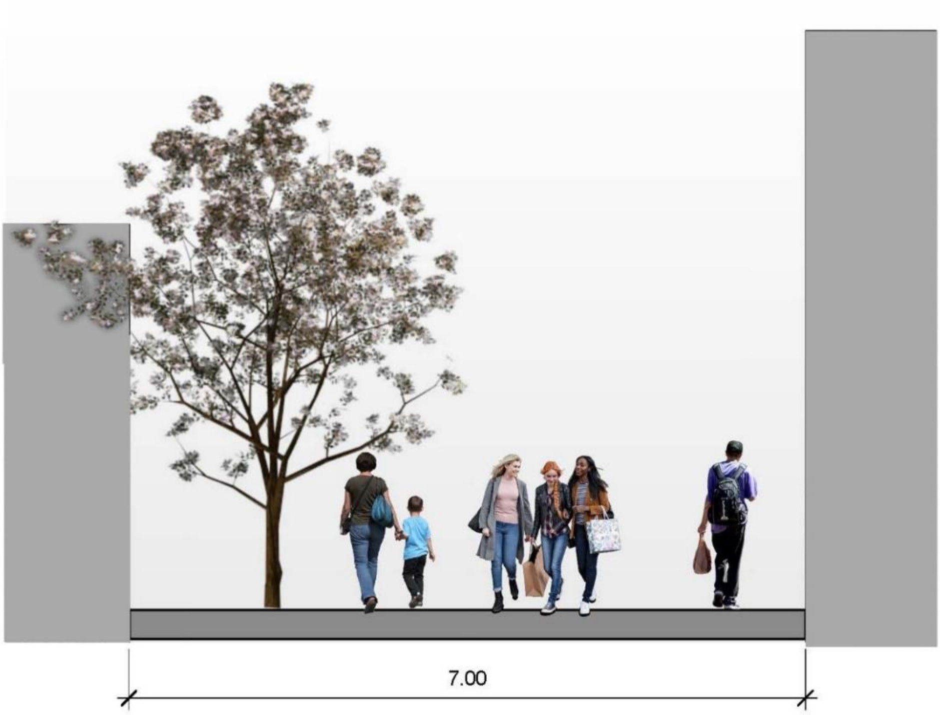


Figure A-IV 1:Cross section Pedestrianised street

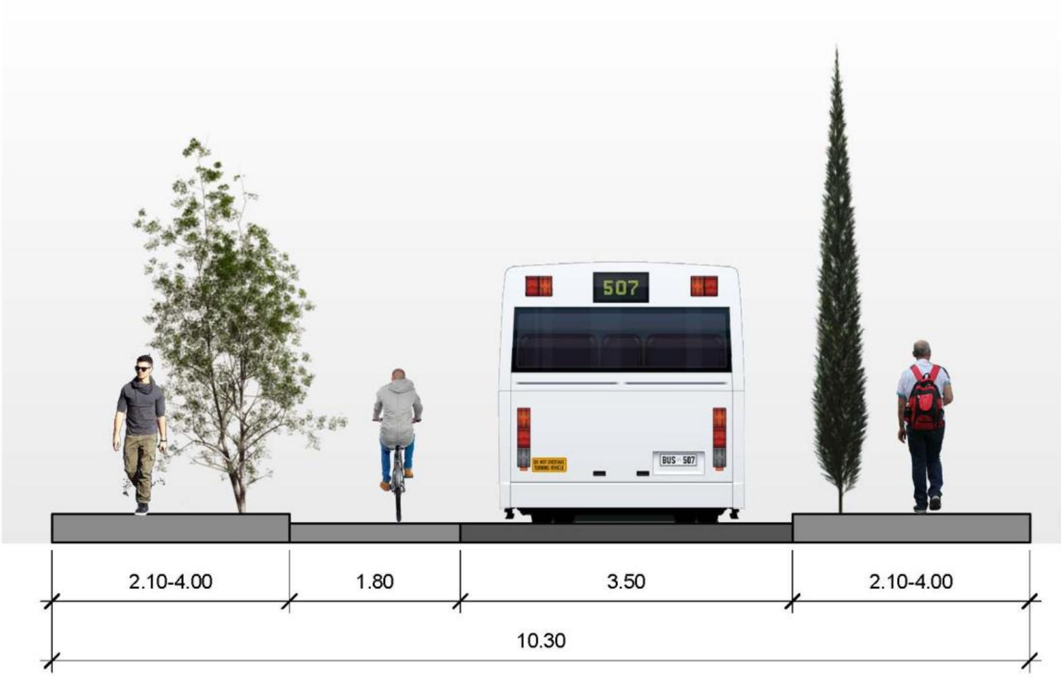


Figure A-IV 2:Cross section one-way street with cycle lane and footways

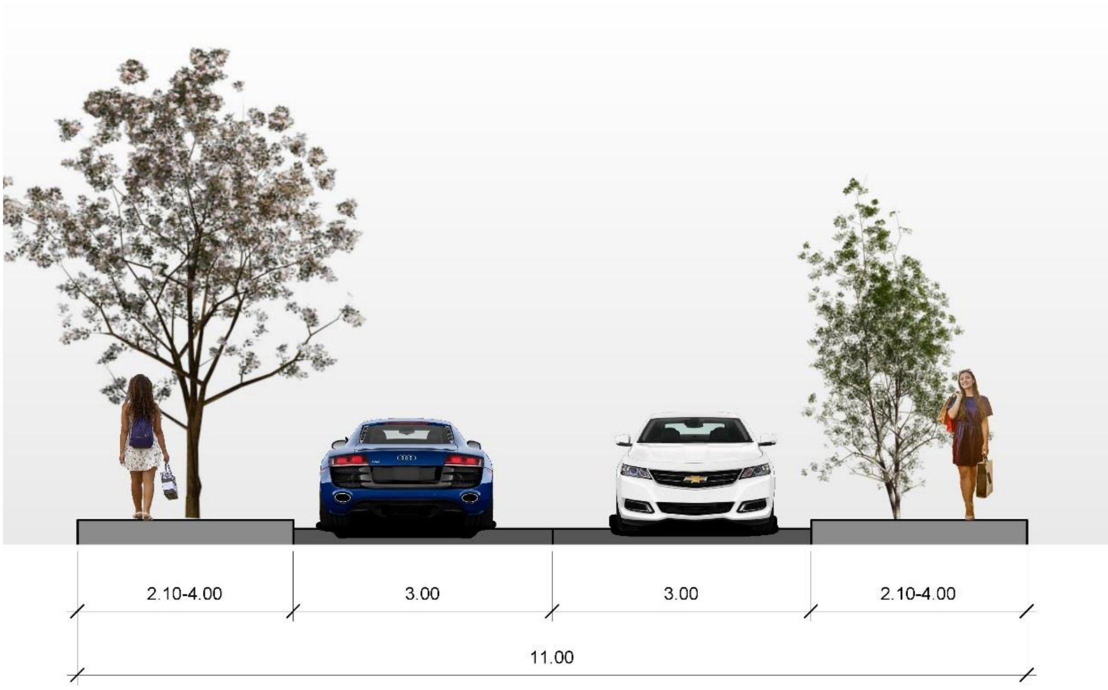


Figure A-IV 3:Cross section two-way street with footways

ANNEX V – Cyclist Measures

Associated Bicycle infrastructure: Bicycle stands

General

Bicycle stands should be capable to cater for all sorts of bicycles, with different tyre diameters and widths. Good accessibility of the stands is important to allow for convenient parking of the bikes with little effort and low risk in entangling with other bikes. Moreover, the increasing number of bikes with child seats or trailers as well as space for loading and unloading racks and bicycle bags needs to be taken into consideration. Therefore, an appropriate distance between the racks is important. Another essential aspect is to design the racks in a way that anti-theft protection can be guaranteed, with appropriate locks being provided. A simple, reliable and most common type of bicycle racks is one where the bicycle is leaned against an (most commonly used) iron structure.

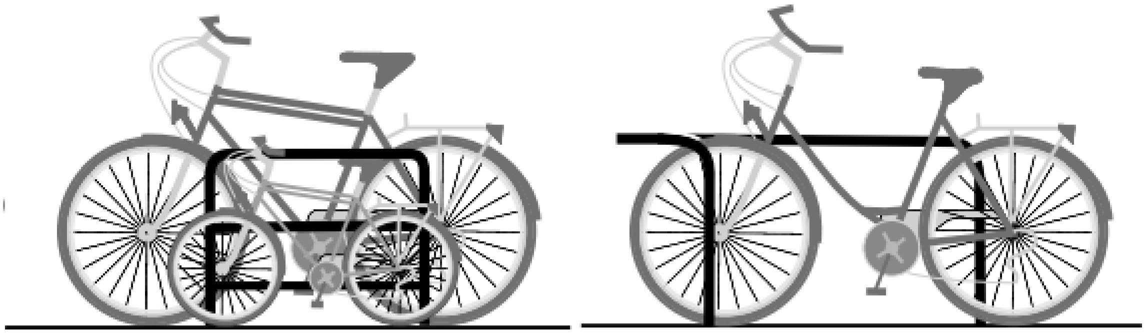


Figure A-V 1: Examples for bicycle racks

One of the advantages of this type of bicycle rack is the double-sided parking opportunity it offers. To allow for convenient access to the bikes, a distance between the racks of 1,5m is advised. Reducing the distance lowers the convenience and increases the risk of inefficient use since some racks will not be used.

Different requirements apply for parking facilities in different environments:

- In residential areas, some parking stands should be envisaged for short-term parking visitors. For the residents though, theft-protected space inside the buildings or premises are advised to allow for long-term and over-night parking
- For schools and for the university premises, parking facilities with sufficient access space are required to cater for the peak times at school day start and end. Sanitary (namely showers e.g. in sports hall) should be accessibly all day to all pupils/ students and teachers
- Similar requirements apply for cycle stands in the vicinity of working places. Since parking duration is even longer, roofed facilities or even space inside buildings is preferable. Sanitary (namely showers) may be provided
- Parking facilities for retail and various kinds of services should take into account more space requirements due to bicycle bags or bicycle baskets. Moreover, bicycle trailer use will hopefully become more common in the future so additional space should be reserved
- Bicycle parking facilities increase catchment areas of public transport stops. Roofed and possible theft-protected facilities increase attraction for those locations. Also, as applicable for schools and work places, the access space should be dimensioned sufficiently to cater for the peak-times.

Demand

One way to determine the demand for bicycle stands is by means of an empiric approach, e.g. counting guests, pupils, students, visitors or passengers. In this case, an average period of the year (May / June) should be chosen and to reflect peak demand, good weather conditions are preferred.

An alternative approach is a characteristic value or parameter-based approach. Here the demand is estimated based on empirical average parameters for different demand groups.

The fundamental basis for the estimation is the modal share level of bike trips. Taking into consideration the low current share of less than 1% the demand is in fact very low. For the preferred scenario, shares of up to 6% are estimated with room for further increase. A potential target might be at least 10%, taking into consideration values exceeding 50% in Gronningen (Netherlands) or approximately 20% in some Italian cities.

The following table represents empirical average values to estimate the demand for bicycle parking facilities (racks) at modal share level of 10%.

Use	**Demand (racks)**
Residential Building	1 per 40sqm
Student hall of residence	1 per 2 places
Office without visitors	1 per 220sqm floor space
Administration with low visitor numbers	1 per 180sqm floor space
Customer oriented office with frequent visitors	1 per 70sqm floor space
Retail (convenience goods)	1 per 25sqm retail space
Retail (other goods)	1 per 50sqm retail space
Retail (supermarkets)	1 per 100sqm retail space
Shopping Mall	1 per 150sqm retail space
Cinema etc.	1 per 9 seats
Gymnasium	1 per 9 exercise machines
Restaurant	1 per 9 Seats
Schools / Universities	1 per 5 heads

Table A-V 1: Parameter for demand calculation

ANNEX VI – Parking

Methodology for the development and implementation of an integrated parking policy in the central area of Limassol

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 and f) the functional characteristics transportation system 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.

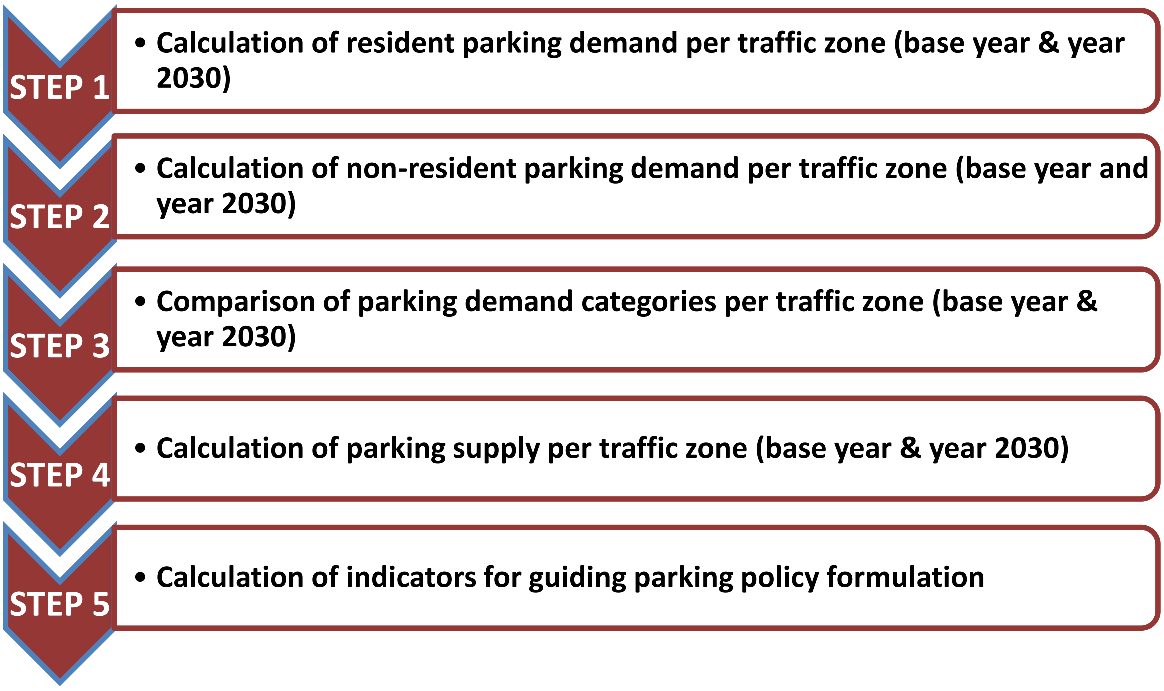


Figure A-VI 1: Methodological steps for Limassol integrated parking policy

Step 1: Calculation of resident parking demand per traffic zone (base year & year 2030)

Resident parking demand within the traffic zones under study is calculated through the following equation that transforms resident population data at the traffic zone level into vehicles by multiplying resident population with the Car Ownership Index for the respective years.

$$\boldsymbol{Resident\ Parking\ Demand_{Year}^{Traffic\ Zone Year}} = Car\ Ownership\ Index_{Year} * Resident\ Population_{Year}^{Traffic\ Zone}$$

The values that were adopted were:

- 592 vehicles per 1000 inhabitants for base year (2020) and
- 667 vehicles per 1000 inhabitants for year 2030

The overall results presented in the Figure below show that the total amount of parking demand for residents in all traffic zones included in this Parking Policy Study will increase by 18.6% in year 2030, reaching a total of more than 14,600 parking spaces as compared to the calculated 12,331 for base year, being a result of both increases of population and of the car ownership index.

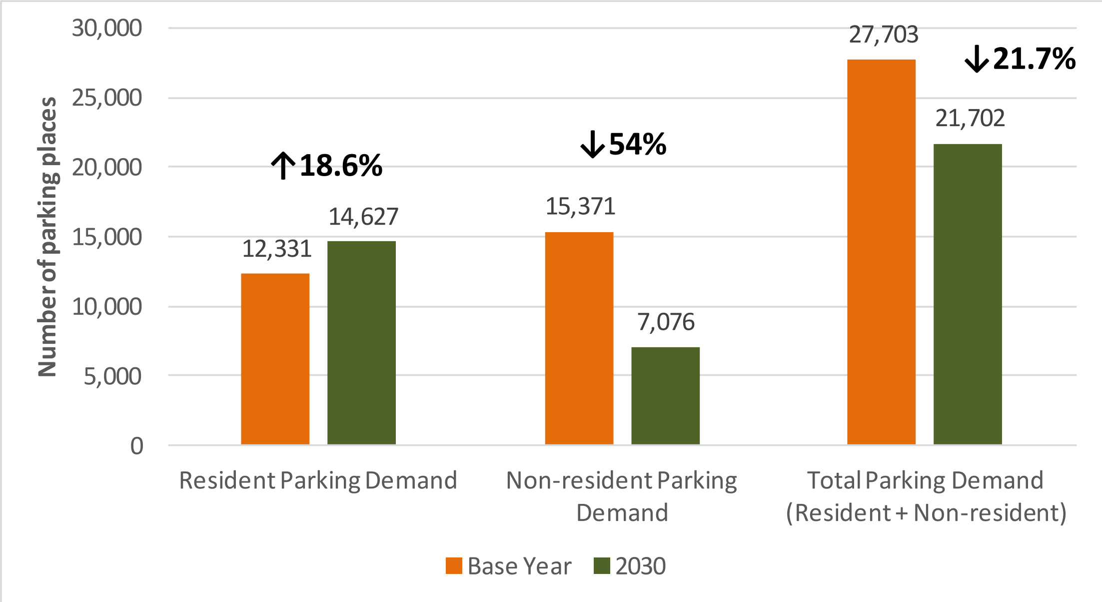


Figure A-VI 2: Total parking demand in the 33 Traffic Zones under study (base year and 2030)

Step 2: Calculation of non-resident parking demand per traffic zone (base year and year 2030)

Non-resident parking demand within the traffic zones under study is calculated based on the following equation that transforms attracted car trips per Parking Policy Study traffic zone, as presented in the Origin-Destination Matrices for the base year and year 2030, into non-resident vehicles and then into non-resident parking places

$$\boldsymbol{Non-resident\ Parking\ Demand_{Year}^{Traffic\ ZoneYear}} = Attracted\ Car\ Trips_{Year}^{Traffic\ Zone} / \ Car\ Occupancy\ Rate_{Year} \ / \ Average\ Parking\ Turnover\ Rate_{Year}^{Traffic\ Zone}$$

The available data refers to the daily number of trips by car that have one of the Parking Policy Study Traffic zones as their destination and the trip purpose relates to commuting, business or other activities. The number of attracted trips is translated into vehicles by using the average car occupancy rate (equals 1.54 for both time periods) and the average parking turnover rate that is diversified for groups of traffic zones, based on their land use characteristics and utilizing data collected through the SUMP surveys the Limassol SUMP surveys. As it is shown in Figure above, non-resident parking demand decreases by 54%, as a result primarily of modal shift from car to other transport modes.

As mentioned earlier, according to the methodology adopted, the average parking turnover rate is diversified by groups of traffic zones. More precisely, zones that are high attractors of non-resident trips are considered to show a high turnover rate, thus the value of 4.4 vehicles/parking place is used, that corresponds to the observed legal parking place turnover rate along the corridors that were surveyed. Accordingly, for areas with a highly residential character and lower expected turnover, the low observed value of 2.33 is used which bibliographically refers to residential areas. The value used for the rest of the traffic zones is the average between the observed legal and illegal parking place turnover rate that results in 3.4 vehicles/parking place. For year 2030 the average parking turnover rates are expected to increase and a differentiated increase rate of 15%, 20% and 25%, inversely related to the Base Year values in increasing order.

Step 3: Comparison of parking demand categories per traffic zone (base year & year 2030)

Total demand for parking places per traffic zone is the sum of resident and non-resident parking demand, as calculated in the previous steps and is presented in Figure above (Fig. A-VI 2). The result of the calculations shows that a reduction of total parking demand is expected in 2030, at the level of -21.7%, compared to the base year parking demand. This already shows that the SUMP measures for shifting passengers from private car to public transport and other green modes may have a positive impact, as far as parking is concerned.

In order to define parking policy for city areas, it is important to study the demand profile regarding the categories of users. For this purpose, the ratio of the resident over non-resident parking demand was calculated for both time horizons and is presented in the figure A-VI 2 and the figure below. As it can be observed in Figure A-VI 2, in the current situation non-residential demand shows slight dominance over existing residential demand within the majority of traffic zones. Today, the areas where residential parking demand is slightly higher than the respective non-residential one are those of Agia Zoni 01 & 02, Katholiki 03 & 07, Agios Ioannis 01 and Arnaouti 02.

In the future (2030) this situation is expected to change. Residential parking demand dominates the non-residential parking demand in a great number of traffic zones and by much higher values, as seen in Figure below. In areas like Agia Zoni 01 & 02, Agia Triada 01 & 02, Arnaouti 02 the ratio of parking demand of the residents over the non-residents demand increases considerably. In these areas therefore measures for supporting/ safeguarding residents parking should be considered in the form of creating a protective buffer where resident parking permits will be the main policy measure employed.

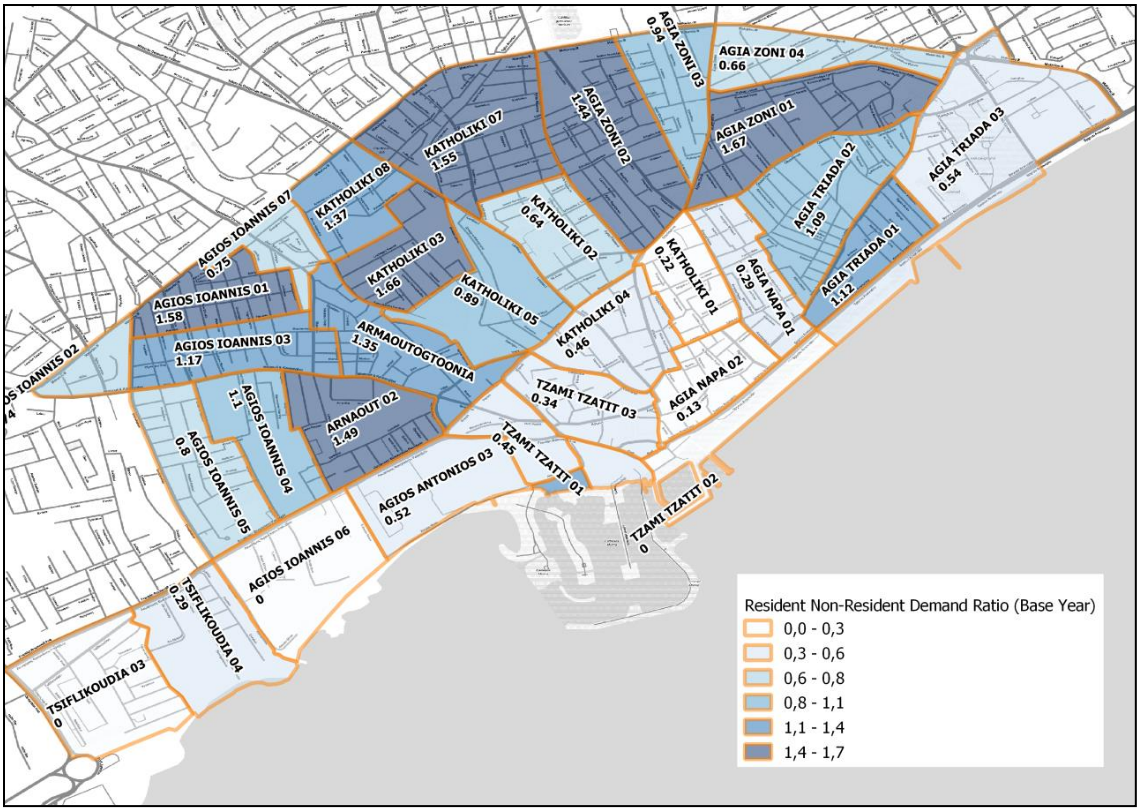


Figure A-VI 3: Resident over non-resident parking demand ratio for base year

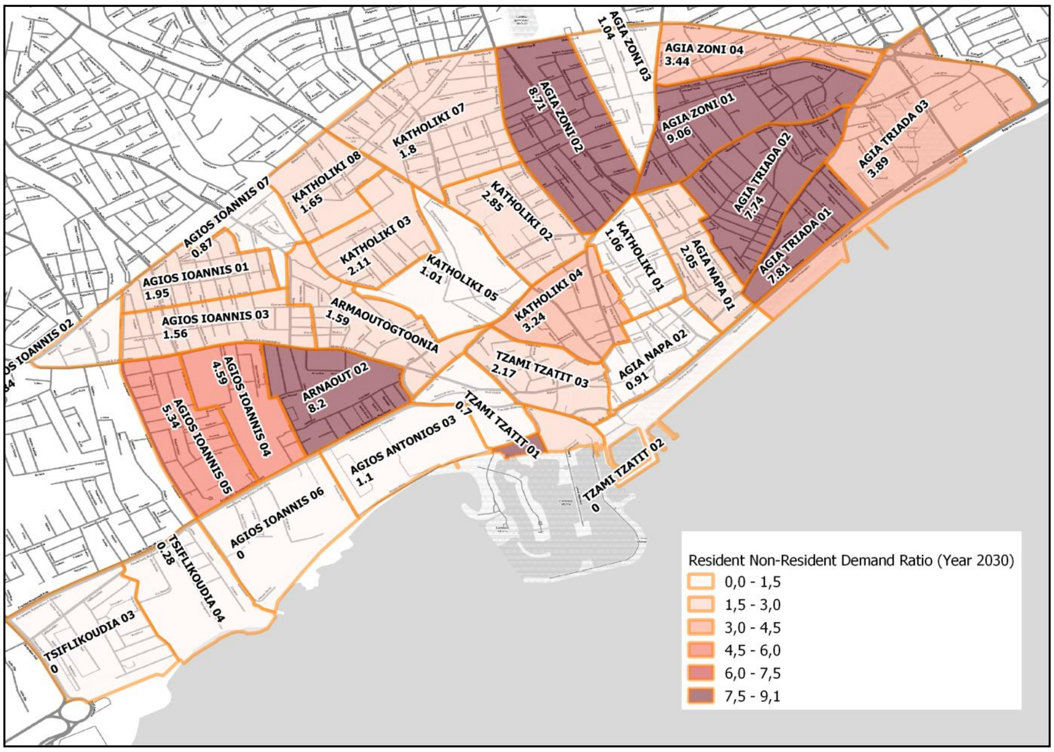


Figure A-VI 4: Resident over non-resident parking demand ratio for year 2030

Step 4: Calculation of parking supply per traffic zone (base year & year 2030)

Parking supply in Limassol includes on-street and off-street parking, while parking places can be distinguished based on regulation applied: a) no restrictions, b) paid, c) special, d) residents, e) loading areas and f) disabled users. A detailed description of the database that incorporates the different parking supply categories is presented in Appendix II of D.10. It should be noted that a distinction was made between off-street parking sites, designated as non-resident off-street parking, and resident off-street parking sites that refer to open air locations where parking is performed by residents. *Total supply* per category is presented in Figure below, and the mapping of the o*n-street/off-street parking supply ratio,* for each zone, is shown in Figure above.

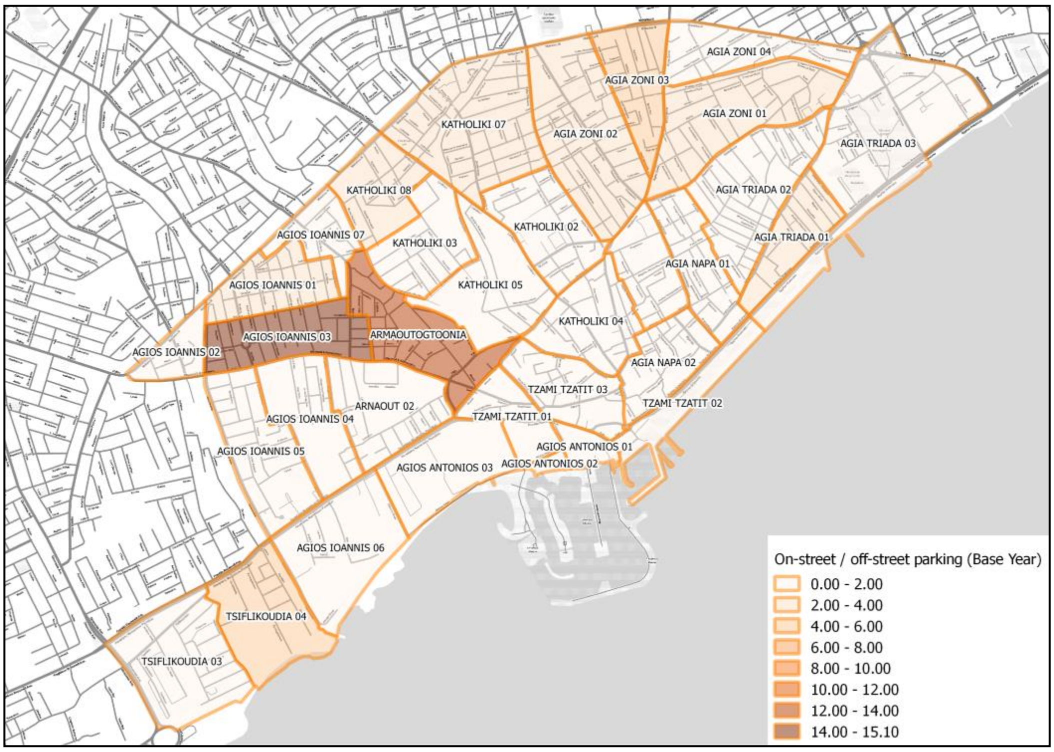


Figure A-VI 5: On-street/ off-street parking supply ratio (base year)

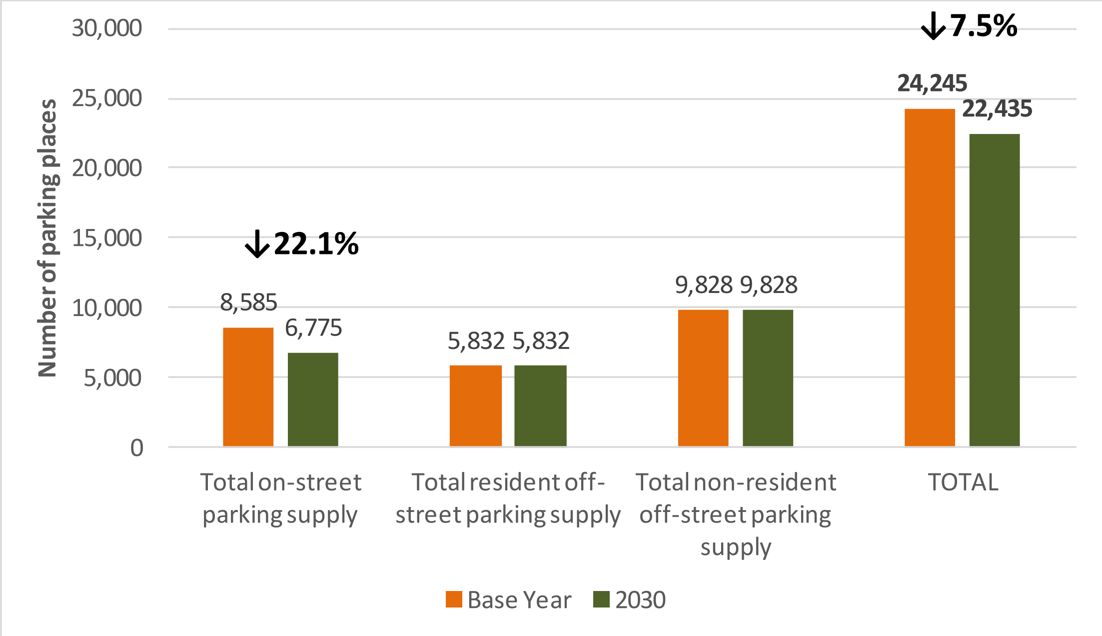


Figure A-VI 6: Total parking supply in the 33 Traffic Zones under study

The total parking supply in 2030 is estimated to reduce by 7.5%, compared with the current situation, mainly due to important reduction by 22.1% of the on-street parking supply. Off-street parking places exist in many zones of the study area, however two zones, Armaoutogtonia and Agios Ioannis 03, have the lower level of off-street parking supply.

Step 5: Calculation of indicators for guiding parking policy formulation

At this step, a number of indicators are calculated and analysed in order to:

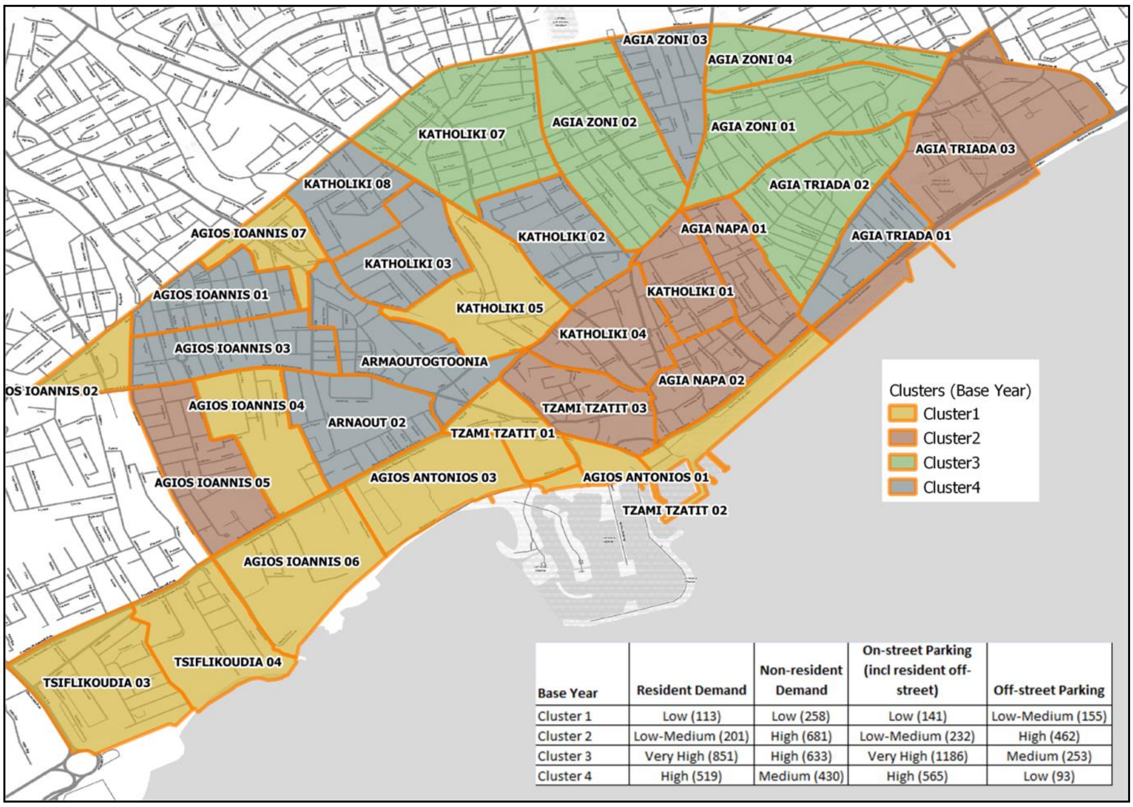
a) define groups of traffic zones where common parking policy can be applied,

b) identify detailed strategy for each zone, in order to manage the parking situation in accordance to SUMP policy and measures and verify feasibility of the proposed parking strategy.

For clustering traffic zones to parking policy zones, a two-step clustering methodology was applied, considering the following indices: resident parking demand, non-resident parking demand, on-street supply and off-street supply. Figure A-VII 7 provides the results of the clustering for the base year, while Figure A-VII 8 presents the same results for the 2030 time horizon.

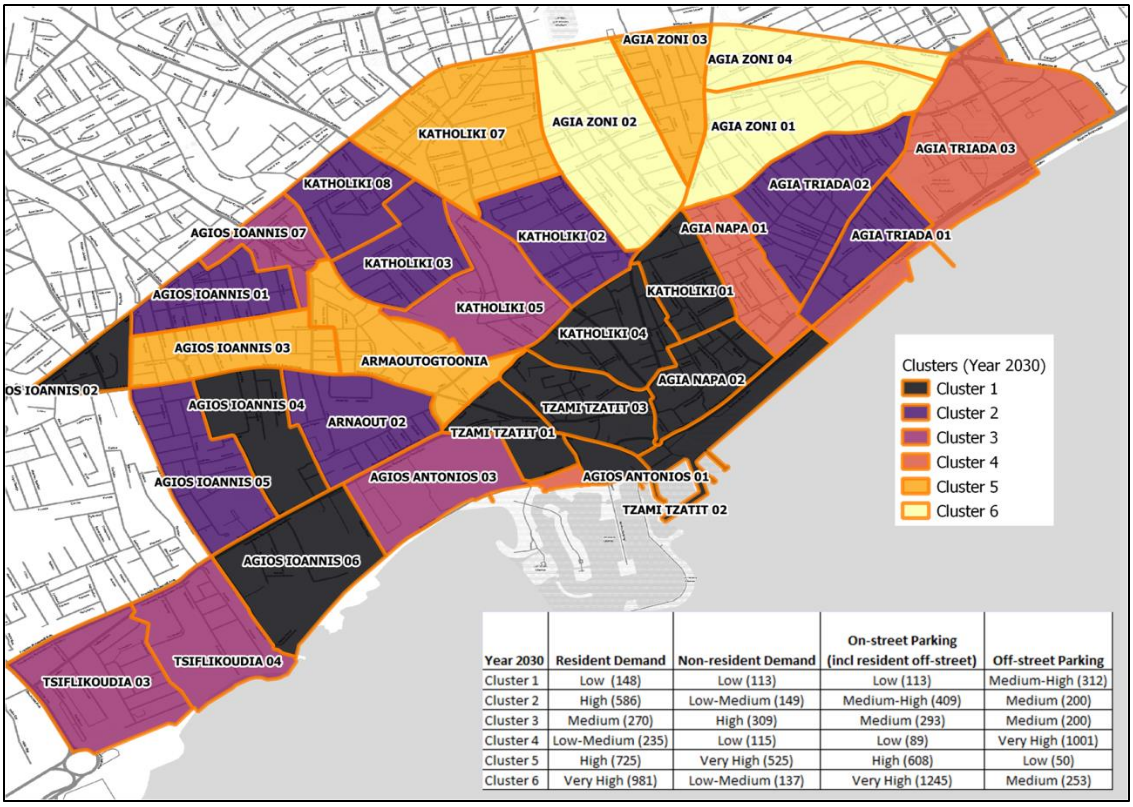
The statistical analysis for the base year resulted in four (4) clusters, where the classification criteria received values ranging from very high to low. For the time 2030 time horizon, the process resulted in six (6) clusters, ranging from very high to low, as well. For each of the criterion the median value for each cluster is presented in brackets.

It should be noted that the clustering methodology classifies traffic zones into clusters according to the absolute values for each parameter, but the qualitative classification is relevant, meaning for example that characterization as low does not necessarily indicate a low absolute value but a value that falls within the lower range compared to values in the other traffic zones.



Base Year	Resident Demand	Non-resident Demand	On-street Parking (incl resident off-street)	Off-street Parking
Cluster 1	Low (113)	Low (258)	Low (141)	Low-Medium (155)
Cluster 2	Low-Medium (201)	High (681)	Low-Medium (232)	High (462)
Cluster 3	Very High (851)	High (633)	Very High (1186)	Medium (253)
Cluster 4	High (519)	Medium (430)	High (565)	Low (93)

Figure A-VI 7: Traffic zone clustering based on demand and supply parameters (base year, median value in brackets)



Year 2030	Resident Demand	Non-resident Demand	On-street Parking (incl resident off-street)	Off-street Parking
Cluster 1	Low (148)	Low (113)	Low (113)	Medium-High (312)
Cluster 2	High (586)	Low-Medium (149)	Medium-High (409)	Medium (200)
Cluster 3	Medium (270)	High (309)	Medium (293)	Medium (200)
Cluster 4	Low-Medium (235)	Low (115)	Low (89)	Very High (1001)
Cluster 5	High (725)	Very High (525)	High (608)	Low (50)
Cluster 6	Very High (981)	Low-Medium (137)	Very High (1245)	Medium (253)

Figure A-VI 8: Traffic zone clustering based on demand and supply parameters (year 2030, median value in brackets)

In order to conclude to the parking policy zones and related measures, the balance of supply and demand in the base year and the respective estimated figures in the future (2030) need to be taken into account. Figures A-VII 9 and 10 present the results of the parking supply and demand balance analysis for the base year and year 2030, at the level of traffic zones.

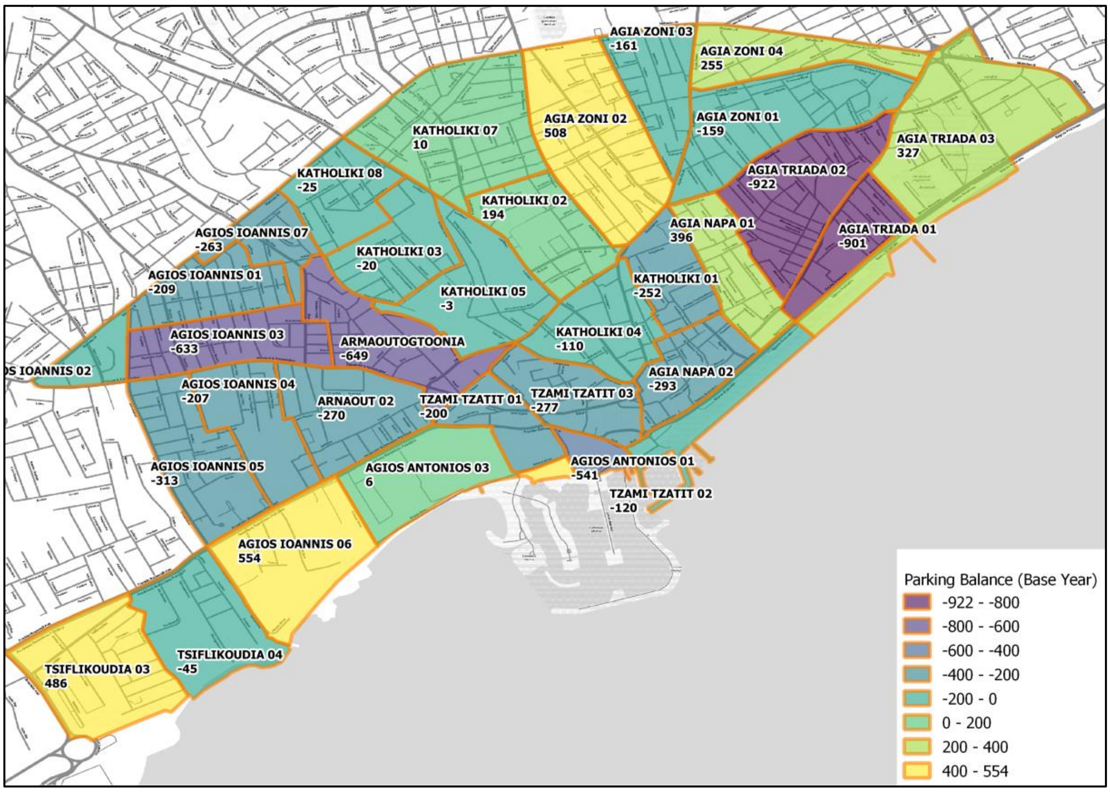


Figure A-VI 9: Parking balance per traffic zone for base year

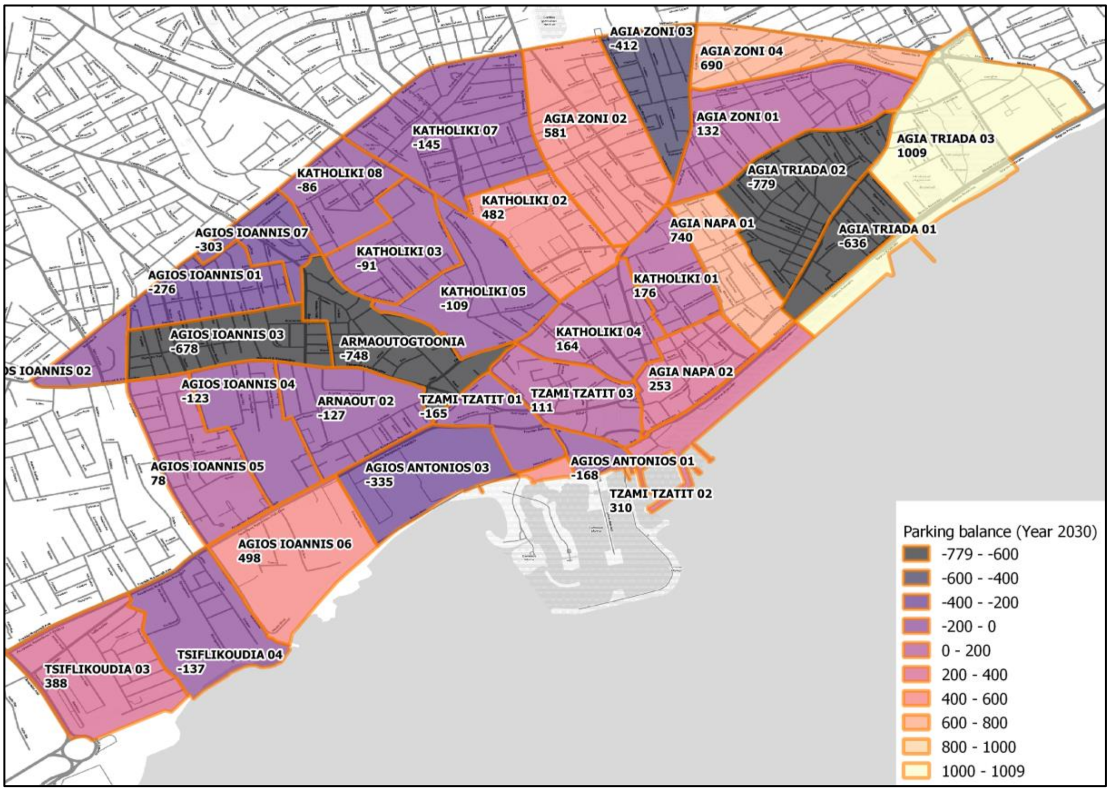


Figure A-VI 10: Parking balance per traffic zone for year 2030

As it can be seen in the previous maps, 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.

'ANNEX VII – Traffic Safety

1. Measures for Road Accident Accumulation Zones (RAAZ) in Limassol

In addition to the measures presented in the Final SUMP Report, you find below constructional measures as well as mitigation measures for some selected locations.

Especially at the analysed black spots, measures to improve the current situation should be implemented as soon as possible. The measures in the following chart are mainly related to constructional changes but vary between changing or extending of markings and redesigning the intersection layout.

Table A-VII 1: Measures for Road Accident Accumulation Zones (RAAZ) in Limassol

	Location	Road safety measures
RAAZ 1	Arch. Makarios III Ave / Agias Fylaxeos	➨ Closely neighbouring intersection should be signalised together, so that road users of minor priority roads can safely drive into mayor roads. Therefore, a compact inter-section design is needed. ➨ Include separated / protected right turning signal phase ➨ Improve the understanding of the intersection by adding leading lines (markings) in the inner part of the intersection ➨ Signalised pedestrian crossings with medians to shorten the crossing distances at all arms of the intersection should be implemented ➨ Bus stations should be located next to signalised intersections to provide safe pedestrian crossings.
RAAZ 2	Spyrou Kyprianou Ave / Omonoias Ave	➨ Add overhead signals to improve the visibility of the intersection ➨ Improve the visibility of markings especially the stop line ➨ Include separated / protected right turning signal phase ➨ Improve the understanding of the intersection by adding leading lines (markings) in the inner part of the intersection ➨ Wide intersection layouts with large corner radii contribute to high turning speeds. The higher speeds are critical for the crossing of pedestrians as well as for stopping or slower driving vehicles around the corner. Intersection layouts should be as compact as possible for safety reasons. ➨ Signalised pedestrian crossings with medians to shorten the crossing distances at all arms of the intersection should be implemented
RAAZ 3	Arch. Makarios III Ave / Despoinas kai Nikou Patichi	➨ Add overhead signals to improve the visibility of the intersection ➨ Signalised pedestrian crossings with medians to shorten the crossing distances at all arms of the intersection should be implemented ➨ Improve visibility of markings especially the stop line ➨ Include separated / protected right turning signal phase (if not yet). ➨ Improve the understanding of the intersection by adding leading lines (markings) in the inner part of the intersection

RAAZ 4	Arch. Makarios III Ave / Agias Sofias	• Include separated / protected right turning signal phase (if not yet). • Improve the visibility of markings especially the stop line • Signalised pedestrian crossings should be implemented
RAAZ 5	Anemonis / Lotou	• Traffic calming in residential area can be implemented by means of speed bumps at frequent distances • Markings that show the edge of the road should be added to prevent road users from running-off the road • Add stop lines to mark the intersection • Improve the lighting of the intersection
RAAZ 6	Kolonakiou / Agiou Athanasiou	• Wide intersection layouts with large corner radii contribute to high turning speeds. The higher speeds are critical for the crossing of pedestrians as well as for stopping or slower driving vehicles around the corner. Intersection layouts should be as compact as possible for safety reasons. • Improve visibility of markings especially the stop line • Add overhead signals to improve the visibility of the intersection • A sufficient lane width for urban roads is 3.25 m. Wider road spaces are not necessary and can have a contrary effect regarding safety. Wider lanes can contribute to higher speeds and overtaking even when there is just one lane per direction.
RAAZ 7	Parou / Fragklinou Rousvelt	• Wide intersection layouts with large corner radii contribute to high turning speeds. The higher speeds are critical for the crossing of pedestrians as well as for stopping or slower driving vehicles around the corner. Intersection layouts should be as compact as possible for safety reasons. • Signalised pedestrian crossings should be implemented • Improve sight distances for road users of all directions by avoiding plants and trees inside the intersection
RAAZ 8	Arch. Makarios III Ave / Georgiou Averof	• Signalised pedestrian crossings should be implemented • Include separated / protected right turning signal phase (if not yet). • Wide intersection layouts with large corner radii contribute to high turning speeds. The higher speeds are critical for the crossing of pedestrians as well as for stopping or slower driving vehicles around the corner. Intersection layouts should be as compact as possible for safety reasons. • Improve the lighting of the intersection
RAAZ 9	Nikou kai Despoinas Pattichi / Christofi Ergatoudi	• Parking vehicles reduce the sight on passing and crossing pedestrians. Parking lots must be ordered and marked to separate the parking and moving traffic.
RAAZ 10	Spyrou Kyprianou Ave / Agias Fylaxeos	• Include separated / protected right turning signal phase (if not yet). • Add overhead signals to improve the visibility of the intersection • Improve the understanding of the intersection by adding leading lines (markings) in the inner part of the intersection

RAAZ 11	Arch. Makarios III Ave / Vasili Michaelidi	➨ A sufficient lane width for urban roads is 3.25 m. Wider road spaces are not necessary and can have a contrary effect regarding safety. Wider lanes can contribute to higher speeds but also leave less space for non-motorised road users. Lanes that are wider than necessary also encourage illegal parking of vehicles on the roadway. This demand for parking rather needs to be addressed by a sufficient cross-section design. ➨ Safe crossing aids for pedestrian are necessary at wide roads: Add signalized pedestrian crossing because of wide street or at least a safe median ➨ Improve the lighting of the intersection
RAAZ 12	Polemidia Junction	➨ Wider roadways (due to more lanes) do not achieve the safety relevant speed reduction that roundabouts with single-lane elements normally have. Lower speeds inside the roundabout are crucial for a sufficient safety level. ➨ Multi-lane elements are contributing to sight obstructions because of other vehicles, e.g. in entry situations. Also, exit situation (leaving circle road) from inner lanes is harder to realise because of vehicles driving straight in the outer lanes. ➨ Multi-lane entry and exit roads are critical to safe pedestrian crossings because vehicles block the visual contact between the pedestrian and ALL vehicles. ➨ Multi-lane roundabouts can safely be operated only with traffic lights.

2. Conceptual Design for Selected Road Accident Accumulation Zones (RAAZ) in Limassol

Three of the analysed Accident Accumulation Zones (RAAZ 8, 4, and 11) will be further explained by drawing a conceptual design on the following pages.

Accident Accumulation Zone 8 (see figure below) is located at the intersection of Arch. Makarios III Ave and Georgiou Averof. This intersection has a wide layout with large corner radii which contribute to high turning speeds. Especially the free left turn from Georgiou Averof to Makarios III Ave abets these. Higher speeds are critical for crossing of pedestrians as well as for stopping or slower driving vehicles around the corner. Intersection layouts should be as compact as possible for safety reasons. Therefore, the curb side should be moved towards the centre of the intersection as shown in the following figure.

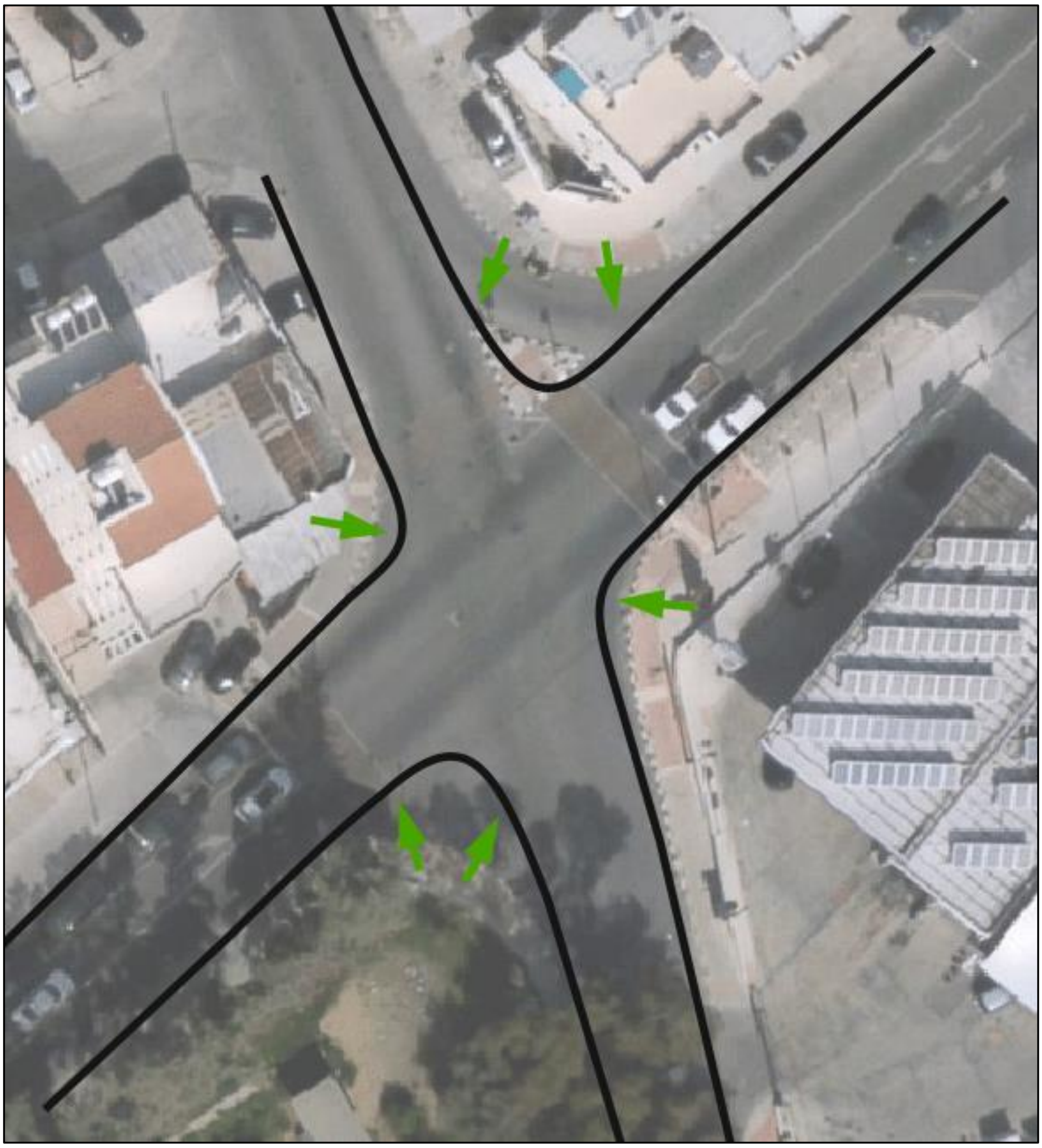


Figure A-VII 1: Accident Accumulation Zone 8: compact intersection design, picture: © Google earth

To ensure safe pedestrian crossings operating pedestrian signals should be implemented at all four pedestrian crossings as shown in next figure. In addition to that the crossings should be marked clearly. Either by using long-lasting red colour to mark the surface or, as seen in the picture, by implementing white guidelines. Pedestrian crossings should have a sufficient width to allow parallel and opposed crossings, recommended is a width of 4 meters. As it is already implemented in the existing sidewalk design, elements and aids for people limited in their mobility (disabled, blind…) should be transferred to the new curb side.

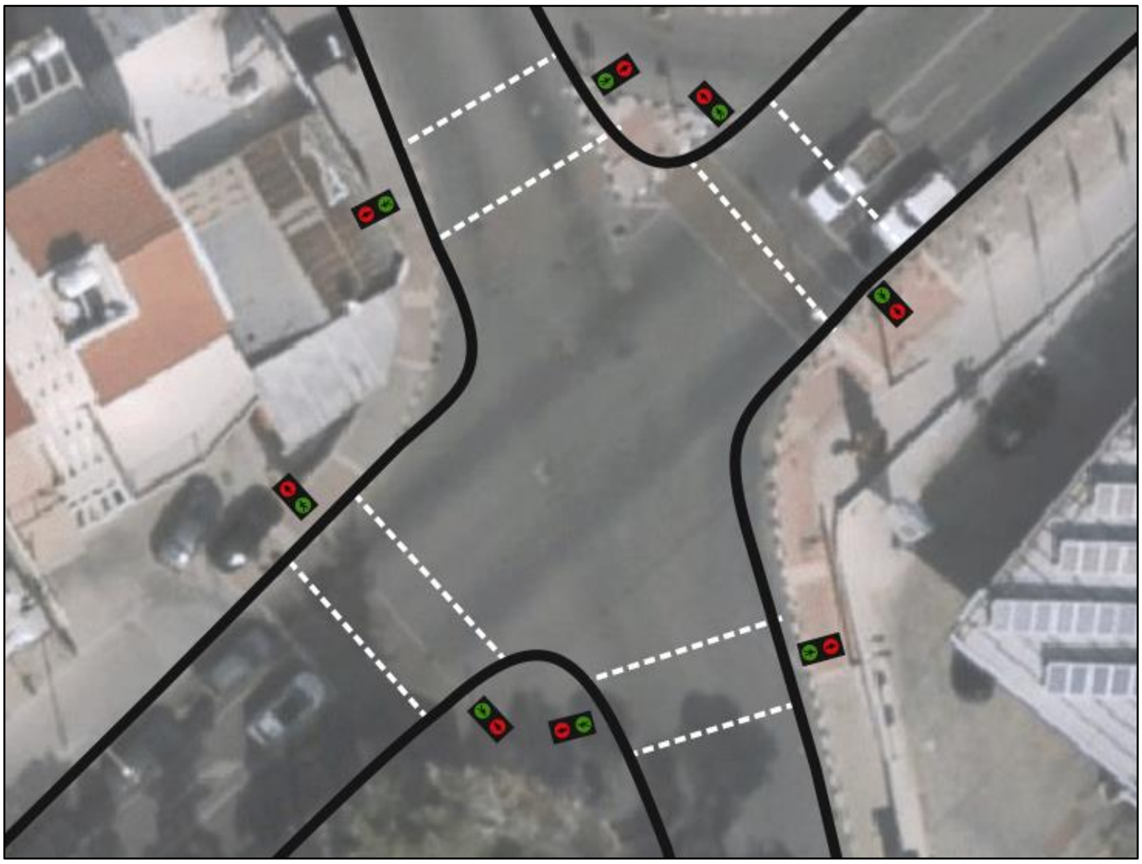


Figure A-VII 2: Accident Accumulation Zone 8: signalised pedestrian crossings, picture: © Google earth

To avoid accidents with right turning vehicles separated and protected right turning signal phases should be implemented in the phase program. Therefore, the right turning vehicles need their own lane in the approach to the intersection, as it is already marked. Over-head signals for right-turning vehicles, as shown in figure, assure that the traffic signals will be seen from further distance and will be assigned to each lane correctly. In addition to that, long lasting markings should be added as separation of lanes and especially as stop lines. The markings support the intersection layout and signalized traffic control.

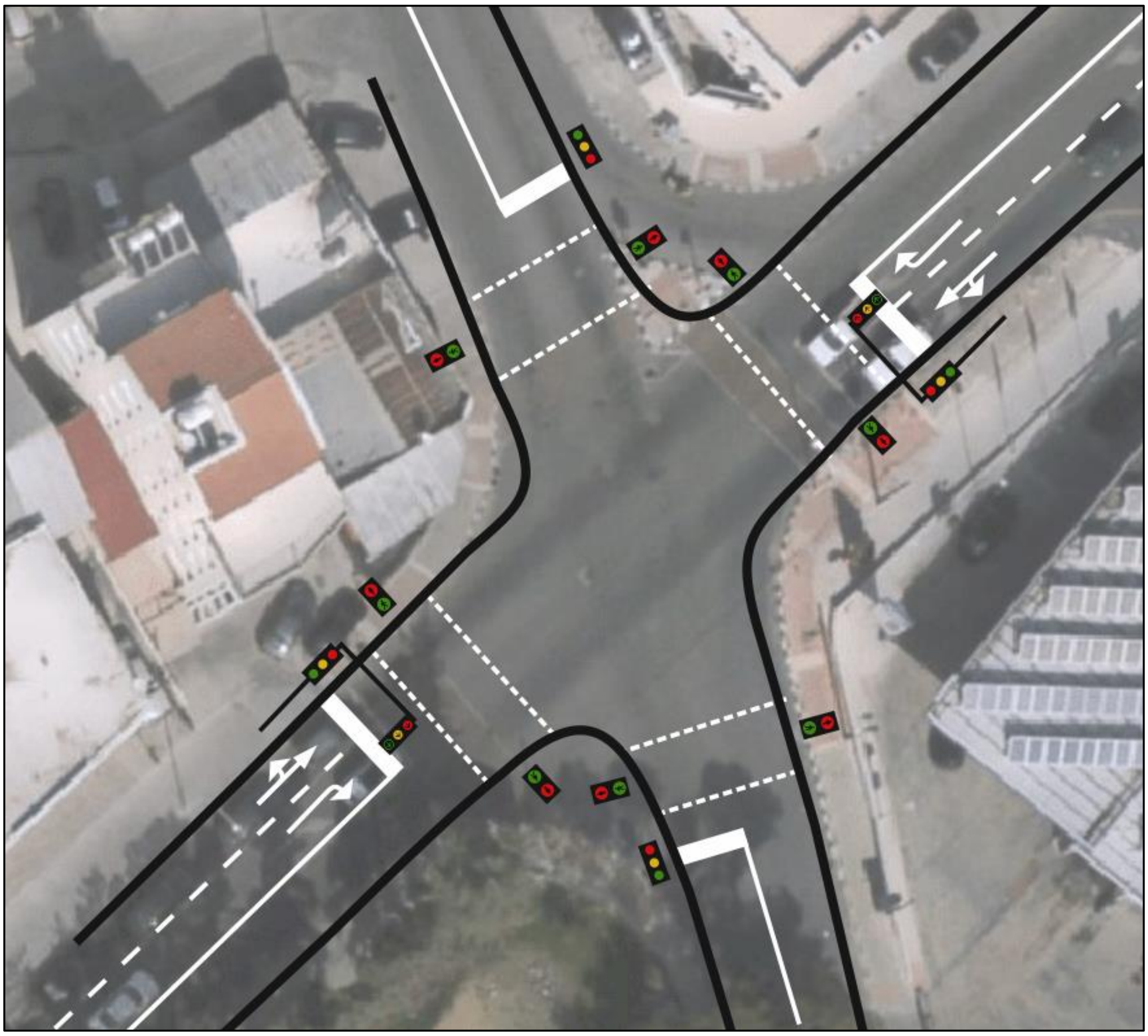


Figure A-VII 3: Accident Accumulation Zone 8: signalisation of right turns and markings, picture: © Google earth

Accident Accumulation Zone 4 is located at the intersection of Arch. Makarios III Ave and Agias Sofias. At this intersection four measures are proposed to improve the safety of all road users at this intersection. The first measure is to improve the visibility of markings especially stop line. This is to prevent vehicles to drive at red signals and to structure the whole intersection as shown in following figure. Markings should be long-lasting and visible during day- and night-time as well as in the rain.

Figure A-VII 4: Accident Accumulation Zone 4: compact intersection design, picture: © Google earth

The second measure is the extension of existing signals by operating pedestrian signals at all four pedestrian crossings as shown in the following figure. In addition to the signals the crossings should be marked clearly. Either by using long-lasting red colour to mark the surface or, as seen in the picture, by implementing white guidelines. Pedestrian crossings should have a sufficient width to allow parallel and opposed crossings , recommended is a width of 4 meters. As it is already implemented in the existing sidewalk design, elements and aids for people limited in their mobility (disabled, blind…) should be transferred to the new curb side.

Figure A-VII 5: Accident Accumulation Zone 4: signalised pedestrian crossings, picture: © Google earth

The third measure aims to avoid accidents with right turning vehicles. Therefore. separated and protected right turning signal phases should be implemented in the phase program. Right turning vehicles need their own lane in the approach to the intersection, as it is already marked. Over-head signals for right-turning vehicles, as shown in the following figure, assure that the traffic signals will be seen from further distance and will be assigned to each lane correctly.

Figure A-VII 6: Accident Accumulation Zone 4: signalisation of right turns and markings, picture: © Google earth

Despite these measures which result mainly from the accident analysis, the site visit led to another deficit and proposed improvement. During the site visits parts of the sidewalks, especially at the north-western and south-western corner of the intersection, were occupied by parking cars. This reduces the usable width of sidewalks for pedestrians and leads them to use the roadway instead. Therefore, parking on sidewalks must be prevented effectively for example by using poles in regular distances so that vehicles cannot drive on sidewalks. The following figure shows an example for the position of these poles.

Figure A-VII 7: Accident Accumulation Zone 4: position of poles on sidewalks

Accident accumulation Zone 11 is located at the intersection of Arch. Makarios III Ave and Vasili Michaelidi. At this T-junction it is proposed to implement a signalized pedestrian crossing, shown in the following figure, which can solve several issues at this junction:

- Pedestrians can safely cross the wide road.
- Left turning vehicles can safely turn onto the main road during pedestrian phases.

To achieve a safe pedestrian crossing it has to be seen by vehicles in advance, so an over-head signal should be used for the southern lanes and long-lasting stop-lines should be marked. It is necessary that all pedestrian can use the pedestrian crossing. Therefore, the median should be interrupted and elements and aids for people limited in their mobility (disabled, blind…) should be added to sidewalks and signals.

Not integrated in the conceptual design but necessary to improve the road safety at this junction are new lightings in the nearer surrounding of this intersection. Several accidents happened during night-time, so these accidents could be prevented by sufficient lightings and visible markings.

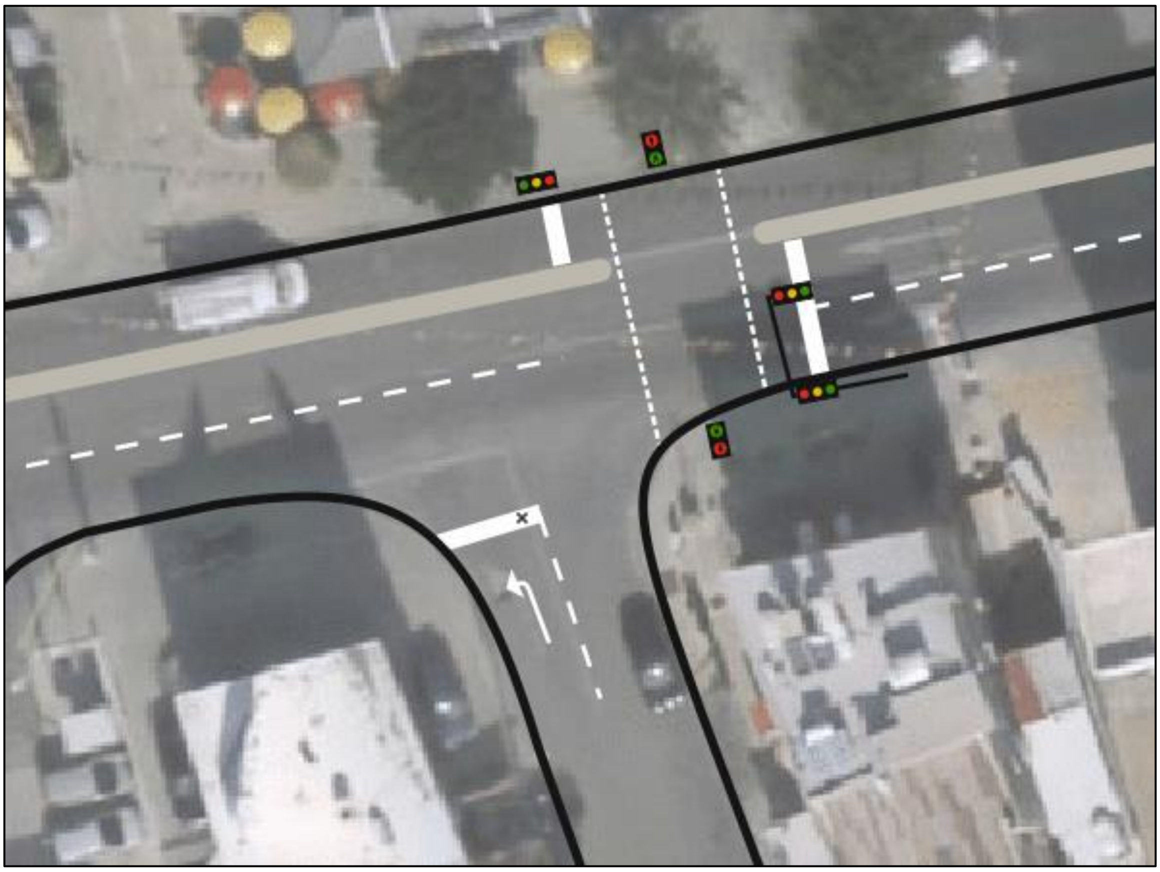
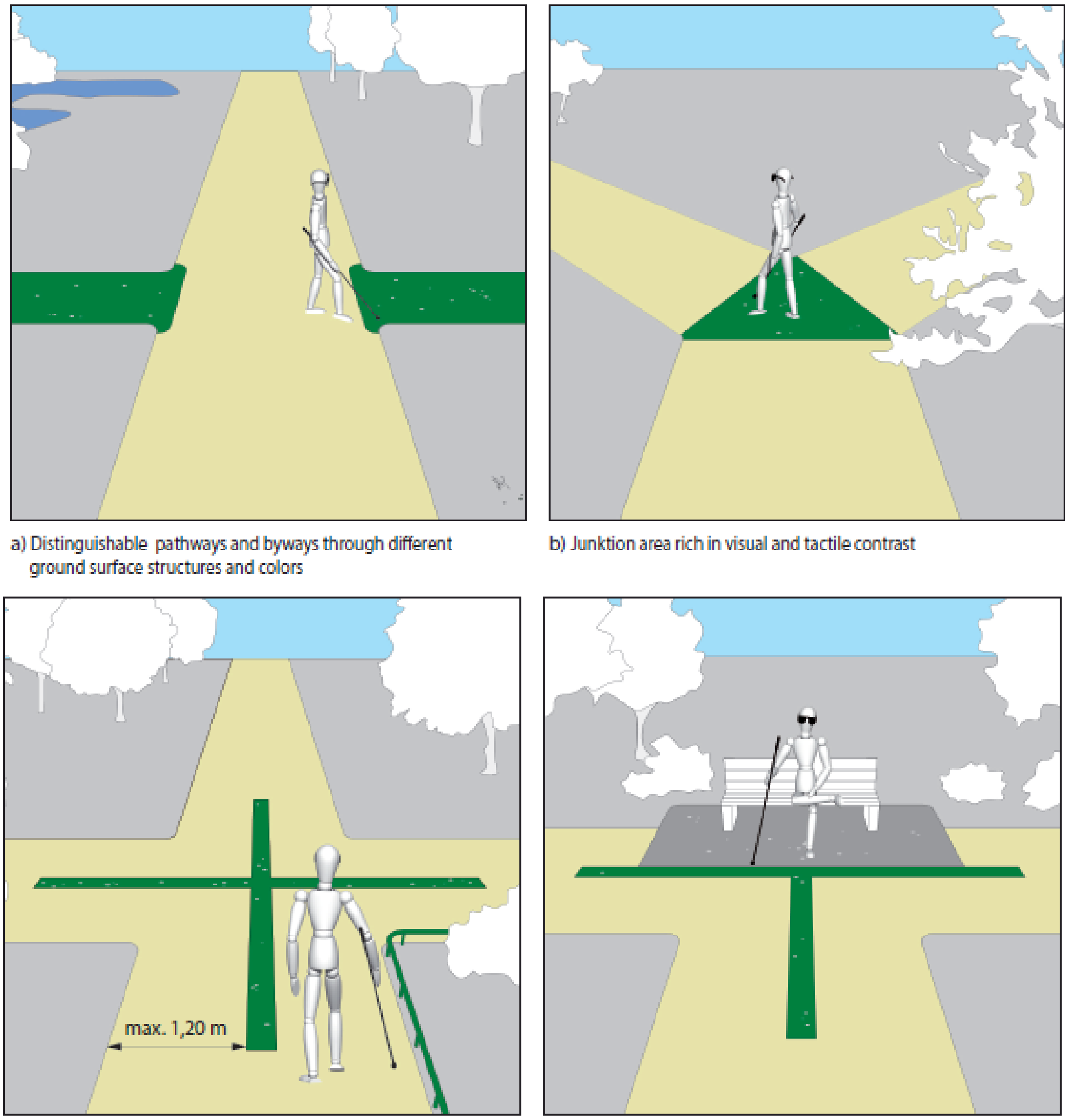


Figure A-VII 8: Accident Accumulation Zone 11: signalised pedestrian crossing , picture: © Google earth

ANNEX VIII – Needs of specific groups

1. Visual and tactile orientation

Visual and tactile orientation is possible be using different surfaces:



a) Distinguishable pathways and byways through different ground surface structures and colors

b) Junktion area rich in visual and tactile contrast

c) Midway routing strips rich in visual and tactile contrast, pathway boundary (example: low ironwork fence - Tiergartengitter)

d) Identification of a rest area through visual and tactile contrast Guidance system leading to a bench

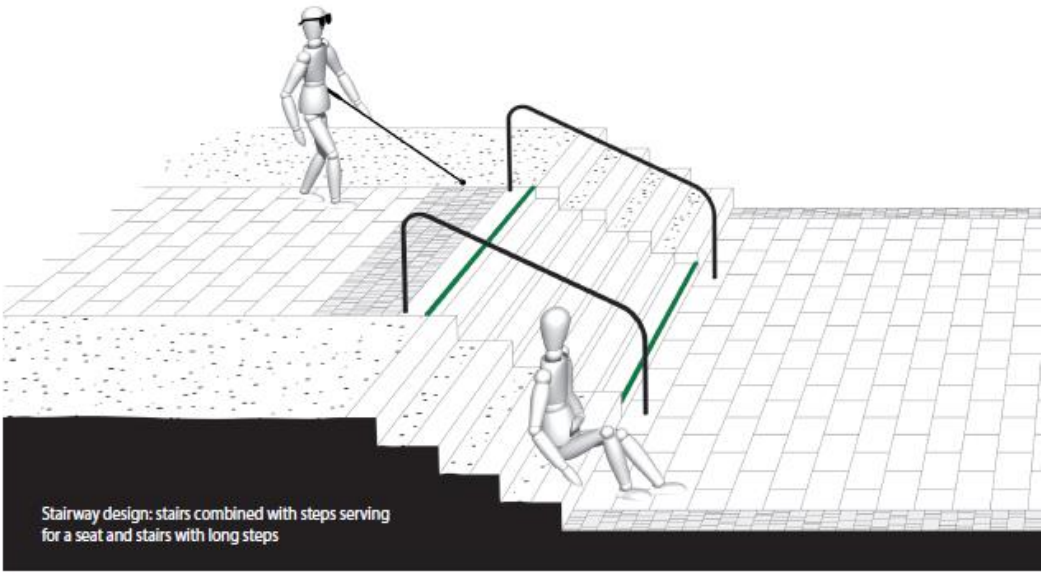
Figure A-VIII 1: Visual and tactile orientation for pathways and crossings

(Source: Berlin Design for all, Berlin Senate Department for Urban Development, 2011. Online available: http://stadtentwicklung.berlin.de/bauen/barrierefreies_bauen/download/designforall/pos_green_broschure_en.pdf (accessed 09 March 2019)

2. Pedestrian infrastructure: Stairways and steps

Minimum requirements for stairways include slightly ascending stairs with marked steps, handrails, integrated detectable warning surfaces with visual and tactile elements. The following figures are taken from the source:

(Source: Berlin Design for all, Berlin Senate Department for Urban Development, 2011. Online available: http://stadtentwicklung.berlin.de/bauen/barrierefreies_bauen/download/designforall/pos_green_broschure_en .pdf (accessed 09 March 2019)



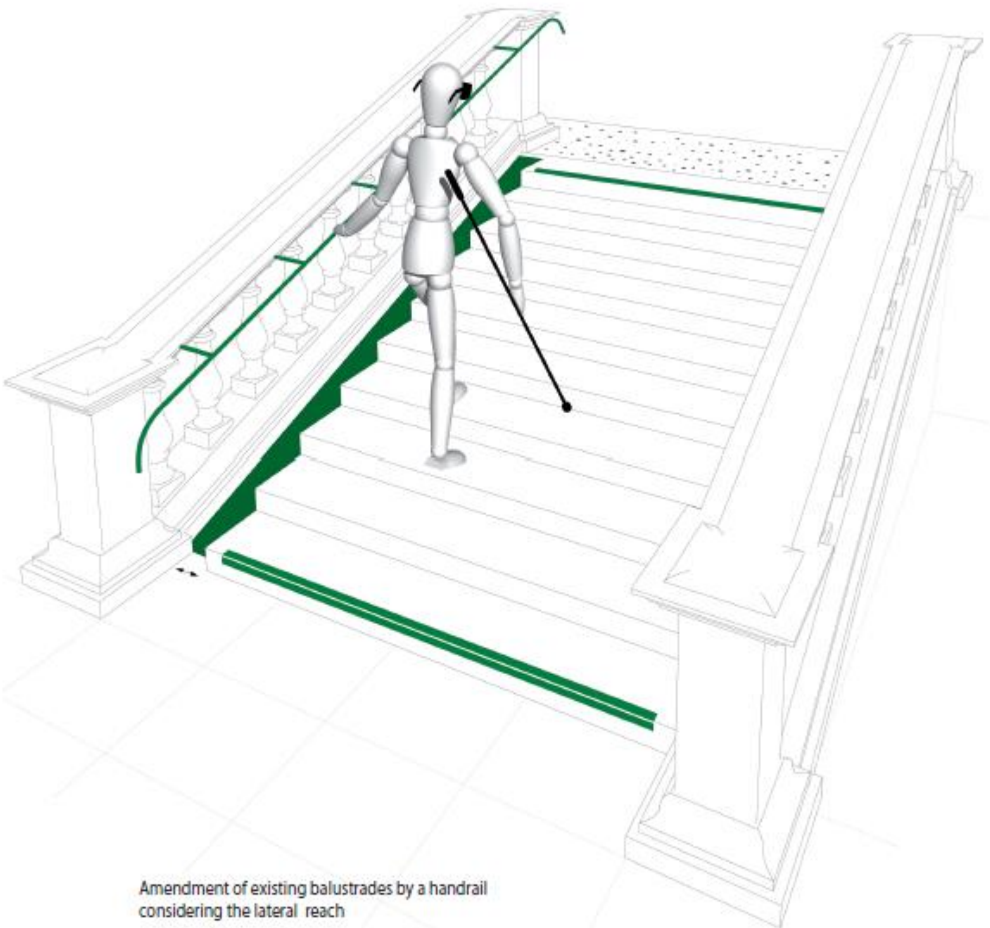


Figure A-VIII 2: Examples of barrier-free stairs

When feasible, ramps also ease to overcome heights in the terrain.

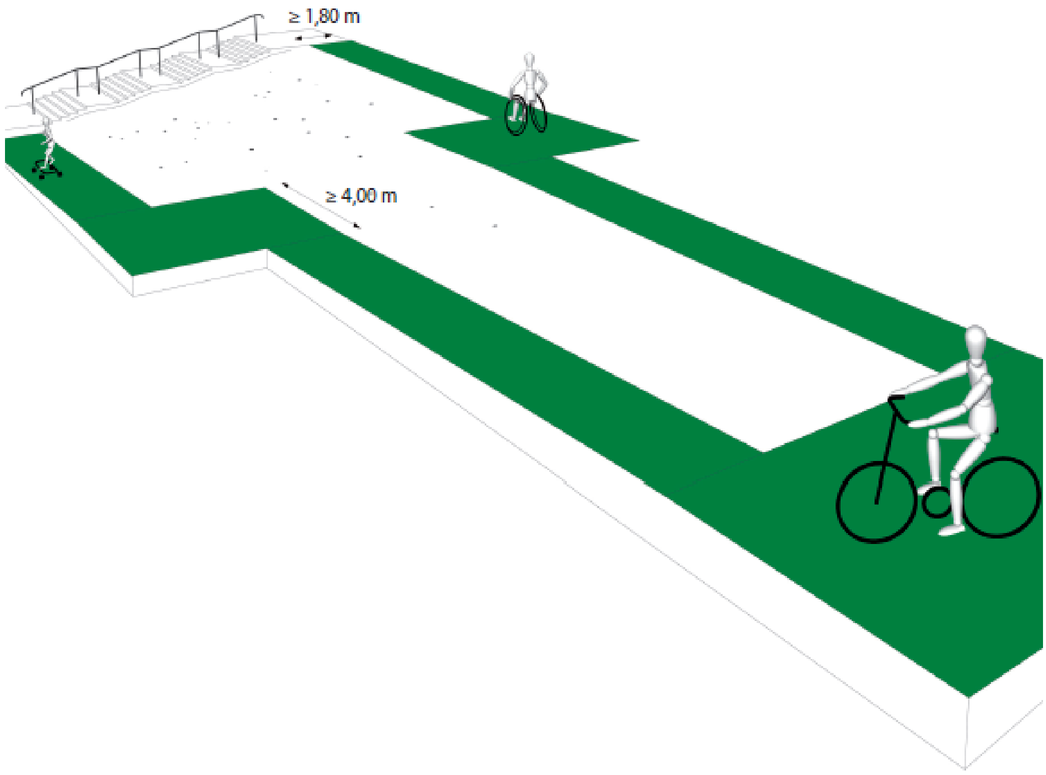


Figure A-VIII 3: Spacious ramp

ANNEX IX – Intelligent Transport Systems – ITS

1. ITS measures in relation to Limassol SUMP measures

The suitable ITS measures in relation to Limassol SUMP measures (approved by scenario 6) are depicted on the following table; the ITS measures prioritization is also shown.

Table A-IX 1: ITS Measures Vs Limassol SUMP Implementation Measures & ITS Measures Prioritization

SN	Field of Application/ Measure	Systems	Urban ITS Service	Legacy Systems (Yes/No)	Priority
1. Improving the layout / structure of the PT network to better respond to desire of movements and promoting the complementarity of transport systems					
1.1	3 PT network levels - Primary bus lines, Secondary bus lines, Feeder/ On Demand Services (geographic coverage - density of bus lines)	Bus Fleet Management System	Demand & Access Management	Yes	N/A
1.2	Main bus terminal located in central CBD location (reduction as much as possible in the transfer needs)	Dynamic Bus Display Signs	Local Travel & Traffic Information Systems	No	+++
1.3	Transportation centres / Intermodal stations (combined urban and intercity lines)	Dynamic Bus Display Signs	Local Travel & Traffic Information Systems	No	+++
1.4	Park & Ride Stations (facilitating the accessibility of PT network from the road network - improvement of the long-distance connection)	Dynamic Bus Display Signs	Local Travel & Traffic Information Systems	No	+++
		Bike Sharing Reservation System	- Integrated Ticketing & Mobility Services - Demand & Access Management System	Yes	N/A
		Parking Guidance System for P&R Stations	Local Travel & Traffic Information Systems	No	++
		Web Platform for Dynamic Public Transport Information Systems	Local Travel & Traffic Information Systems	Yes	N/A

SN	Field of Application/ Measure	Systems	Urban ITS Service	Legacy Systems (Yes/No)	Priority
2. Upgrading the PT services					
2.1	Operation hours: 1. 05:30 am - 00:00 am 2. 05:30 am - 01:30 am	N/A	N/A	N/A	N/A
2.2	Primary Line Headway: 1. 15 min 2. 10 min Secondary Line Headway: 1. 20 min 2. 15 min Feeder Line Headway: 20 min	N/A	N/A	N/A	N/A
2.3	Vehicle characteristics / acceptable service levels (improved & very modern bus fleet: low floor, air conditioning, etc.) accessible to persons with disabilities	N/A	N/A	N/A	N/A
2.5	Exclusive lanes for PT (bus lanes on the major corridors & prioritisation at signals)	Bus Priority System	- Cooperative ITS Systems - Traffic Management & Control	No	+++
		Bus Lane Enforcement System	Traffic Management & Control	No	+++
2.6*	New PT services: 1. BRT on Aktea Road & Seaside Boulevard 2. On Demand Services	N/A	N/A	N/A	N/A
3. Affecting costs of using PT					
3.1	Pricing system of PT services: 1. unified pricing & fixed fare 2. pricing zones Discussions at state level on new fare system (fare zones or flexible ticketing) are underway, but could be detailed within WP10	Bus Ticketing System	Integrated Ticketing & Mobility Services	Yes	N/A
3.2	Level of PT fares - Reduction of PT fares: 1a. seasonal tickets at 1euro/day 1b. single ticket at 0.50euro 2. no PT fares	-	-	-	N/A

SN	Field of Application/ Measure	Systems	Urban ITS Service	Legacy Systems (Yes/No)	Priority
4. 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 of traffic around these areas and increasing of the availability and level of service of PT					
4.1	Increase the length of travel / one-way streets: 1. Leontiou, Misiaouli, Agias Filaxeos, Thessalonikis, Yit-iz/Navarinou/Gladstonos 2. CBD area	Advanced Urban Traffic Control (UTC)	Traffic Management & Control	Yes	+++
		Traffic detection	- Traffic Management & Control - Cooperative ITS	Yes	+++
		Variable Message Signs	Local Travel & Traffic Information Systems	No	+++
		CCTV - Traffic Moni-toring	- Traffic Management & Control - Safety & Emergency Systems	No	+++
		Incident Detection Cameras	- Traffic Management & Control - Safety & Emergency Systems	No	+++
4.2*	Incentives for the use of Park & Ride Stations (no PT fares to/ from the city centre)	N/A	N/A	N/A	N/A
4.3	Strict and financially profitable control (through fines) of the violations of restrictive measures	Control Vehicular Access Enforcement System (as bullet 4.1)	Safety & Emergency Systems	No	++
		Speed Limit En-forcement System for "home zones" (as bullet 4.1)	Safety & Emergency Systems	No	++

SN	Field of Application/ Measure	Systems	Urban ITS Service	Legacy Systems (Yes/No)	Priority
5. Affecting operating costs of car and/ or costs of using the car					
5.1*	Increase the operational costs of the car (fuel, charges, etc.) Placing an environmental tax on fuel could be proposed. The funds raised could be used for enabling sustainable measures in Cyprus (goes beyond city level though)	-	-	-	N/A
5.2	Parking availability compared to existing supply & demand: 1. Providing car parks (on & off street) at reasonable distance to final destinations (minimize search time for parking) 2. Controlled parking in the central areas of all municipalities and in land use areas with high density of jobs or commercial activities based on a very thorough parking management regime. 3. Progressive reduction of road-side parking	Integrated Parking Guidance System	- Local Travel & Traffic Information Systems - Traffic Management & Control	No	+++
		Parking Reservation System (Lights/ Heavies)	- Integrated Ticketing & Mobility Services - Demand & Access Management System - Digital Urban Logistics	No	++
5.3	Parking pricing - Doubling / Tripling of parking fees in all central and sensitive locations	Advanced Parking Payment System	Integrated Ticketing & Mobility Services	No	+++
5.4	Strict and financially profitable enforcement (through fines) of the illegal on street parking	Parking Enforcement System	Demand & Access Management System	No	++
6. Increasing the road safety					
6.1	Increase of "safe buffer zones" - Pedestrianisation around primary schools (within a radius of 50 meters)	Dynamic Drivers Speed Warning System	Local Travel & Traffic Information Systems	No	++
		Speed Limit Enforcement System for "safe buffer zones"	Safety & Emergency Systems	No	+
6.2	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	Web-Platform - Accessible urban space per mode	Local Travel & Traffic Information Systems	No	++
		Pedestrian Guidance System	Local Travel & Traffic Information Systems	No	+

SN	Field of Application/ Measure	Systems	Urban ITS Service	Legacy Systems (Yes/No)	Priority
7. Affecting environmental conditions					
7.1	Incentives for the purchase of electric / hybrid vehicles by the citizens	Electric vehicle stations	Demand & Access Management	No	+
7.2	Incentives for the development of car sharing systems	Car sharing reservation system	- Integrated Ticketing & Mobility Services - Demand & Access Management System	No	++
7.3	Incentives for the development of shared bikes systems	Bike sharing reservation system	- Integrated Ticketing & Mobility Services - Demand & Access Management System	Yes	N/A
8. Increasing the public space to citizens					
8.1	Development of a coherent, comprehensive & safe (based on design criteria and standards) bicycle network: 1. bicycle lanes along all major corridors (Local Plan - first and second priority axes) 2. bicycle only roads for fast bicycle connections (Local Plan along streams / rivers) - "greening urban arterials" 3. safe and weather-protected bicycle stands at all major destinations	Traffic detection units for bicycles	Traffic Management & Control	No	+
		Bike Smart Reservation System (as bullet 1.4)	- Integrated Ticketing & Mobility Services - Demand & Access Management System	No	N/A
8.2	Improving safe pedestrian infrastructure (based on design criteria and standards): 1. Adequate & wide pedestrian pavements along all urban roads 2. Extension of pedestrian areas in Limassol & the Municipalities (Local Plan)	Red Light Enforcement System	- Safety & Emergency Systems - Cooperative ITS	No	++
		Flashing road pavement marking at junctions	Safety & Emergency Systems	No	+
8.3	Pedestrianization of commercial streets with great pedestrian traffic flows (Anexartisias Str.)	Control Vehicular Access Enforcement System (As bullet 4.4)	Safety & Emergency Systems	No	++

SN	Field of Application/ Measure	Systems	Urban ITS Service	Legacy Systems (Yes/No)	Priority
8.4	Reduction of road capacities to main areas to/ from & passing the city centre Seaside boulevard 2W/1L + exclusive bus lane only along the central area only	Advanced Urban Traffic Control (as bullet 4.2)	Traffic Management & Control	Yes	+++
		Traffic detection (as bullet 4.2)	- Traffic Management & Control - Cooperative ITS	Yes	+++
		Variable Message Signs (as bullet 4.2)	Local Travel & Traffic Information Systems	No	+++
		CCTV - Traffic Moni-toring (as bullet 4.2)	- Traffic Management & Control - Safety & Emergency Systems	No	+++
		Incident Detection Cameras (as bullet 4.2)	- Traffic Management & Control - Safety & Emergency Systems	No	+++
		Bus Lane Enforce-ment System (As bullet 2.5)	Traffic Management & Control	No	+++
		Traffic Signal Count-down timers	Traffic Management & Control	No	+

2. SCOOT implementation area

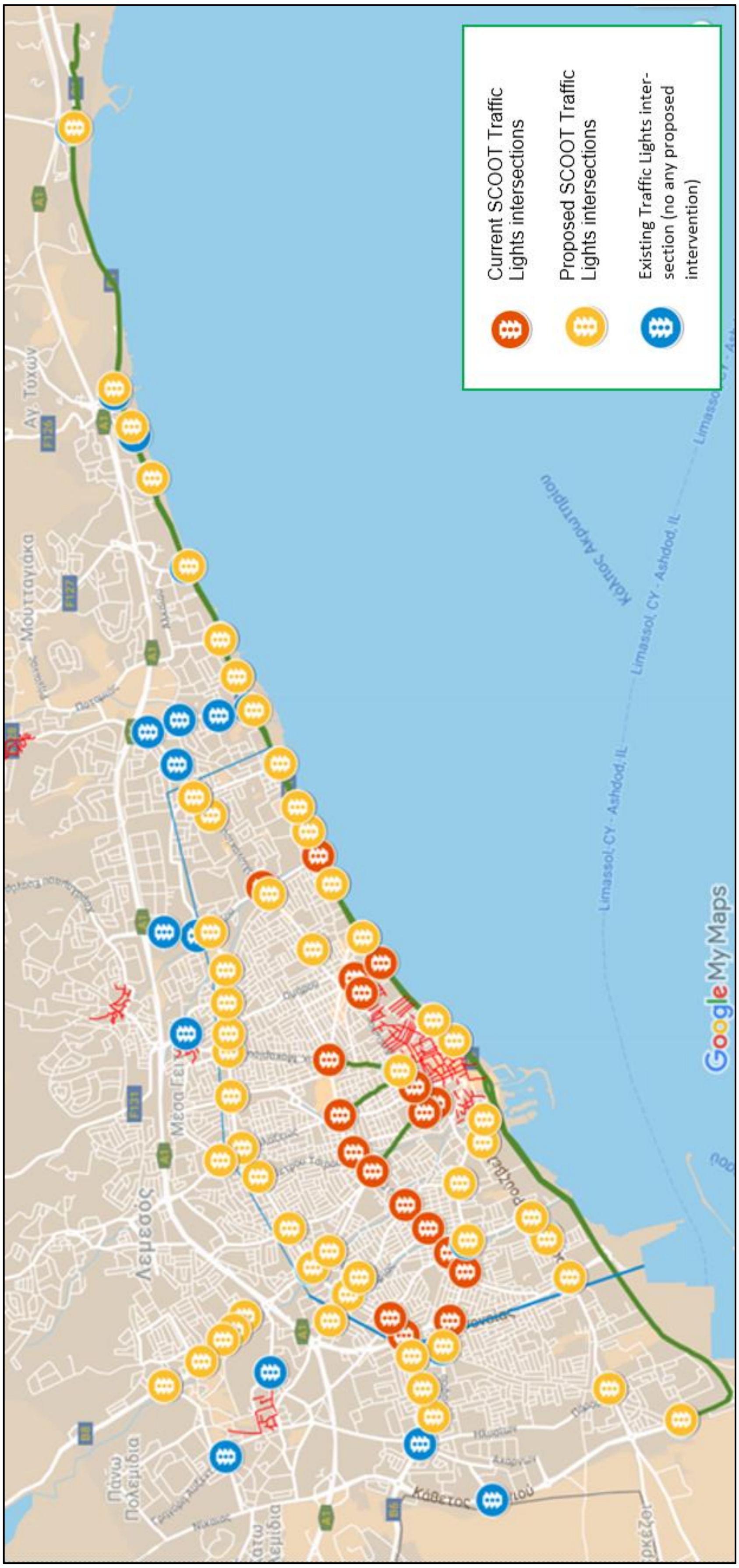


Figure A-IX 1: SCOOT Implementation Area

3. Traffic Detection Units Locations

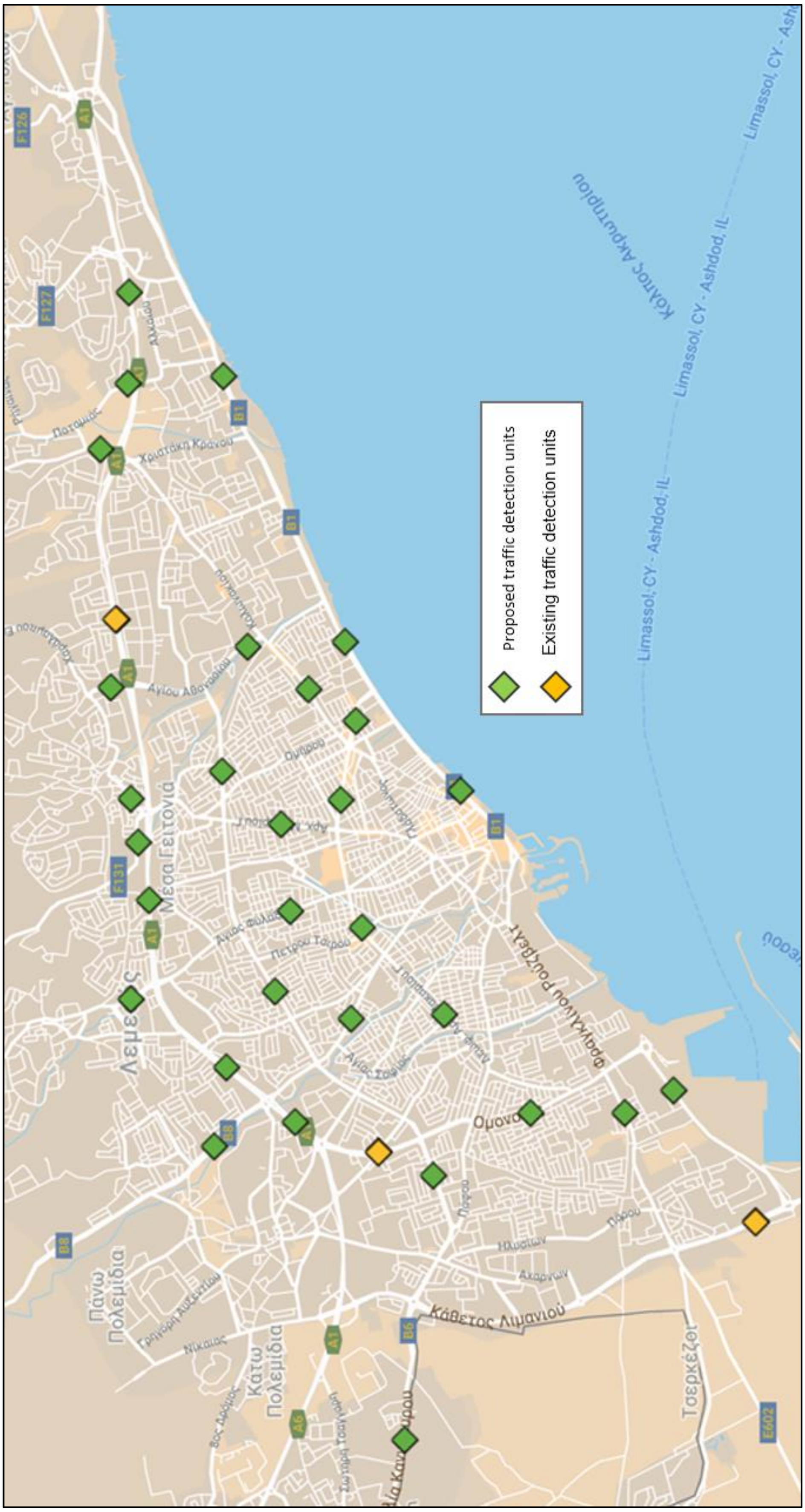


Figure A-IX 2: Traffic Detection Units Locations

4. Bluetooth Fixed Devices Locations for recording travel times of vehicles

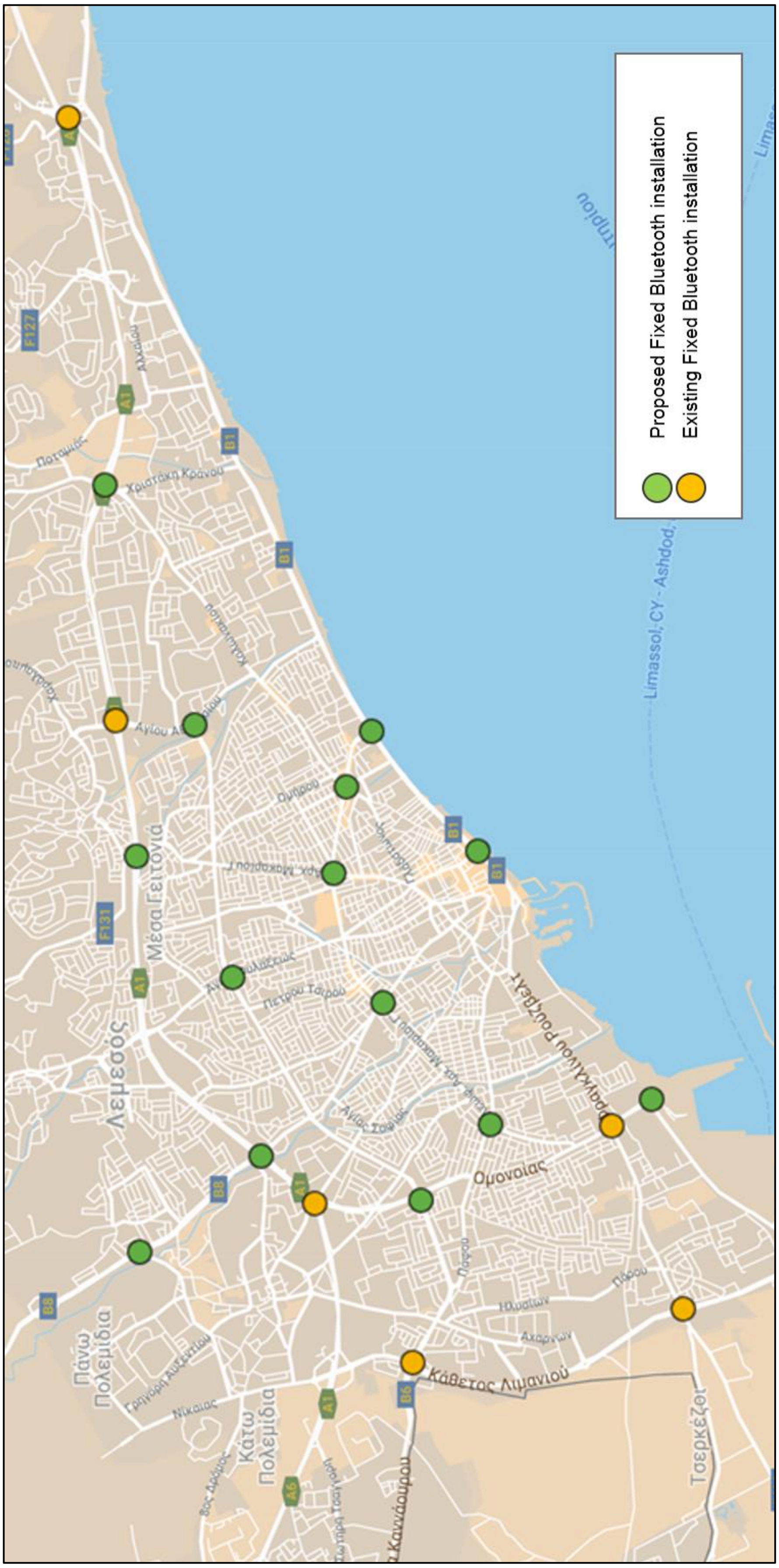


Figure A-IX 3: Bluetooth Fixed Devices Locations for recording travel times of vehicles

5. CCTVs System Implementation Area

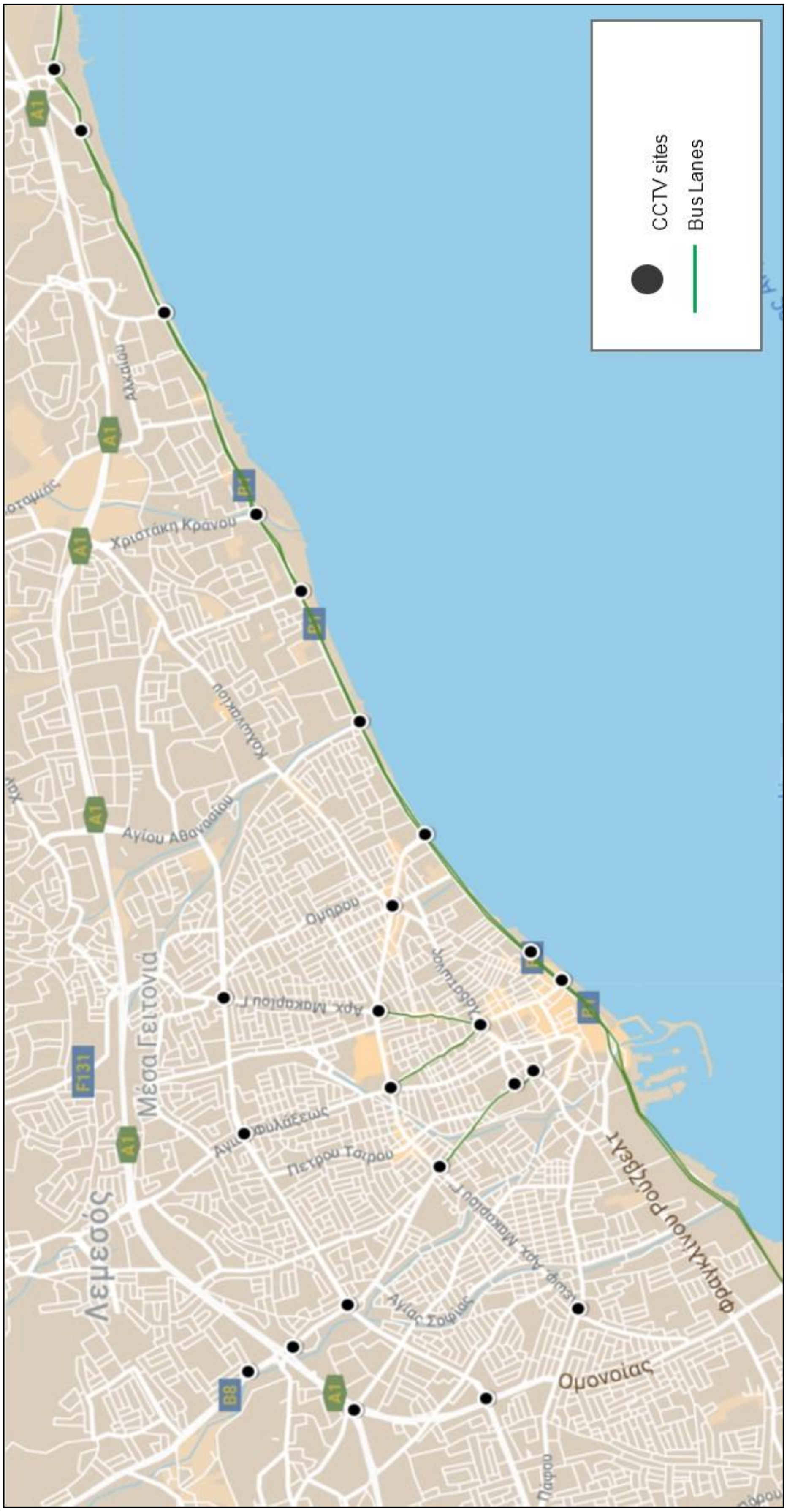


Figure A-IX 4: CCTVs System Implementation Area

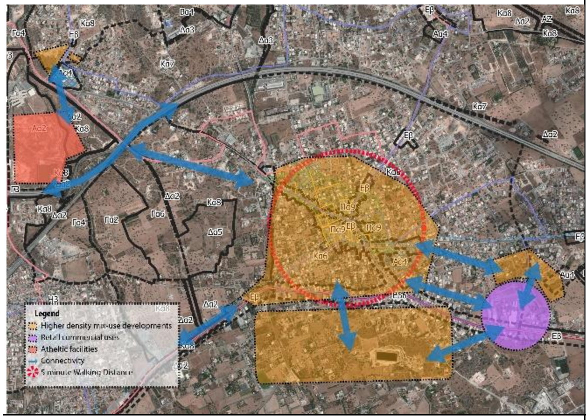
ANNEX X – Strategic Plans and Policies

Site specific mapping exercise

Below, there are some site-specific examples of implementing the recommendations for the polycentric and mixed land-use scenario. The exercise has been carried out at conceptual level, illustrating the concentration of housing and employment in specific areas and potential factors that will influence development.

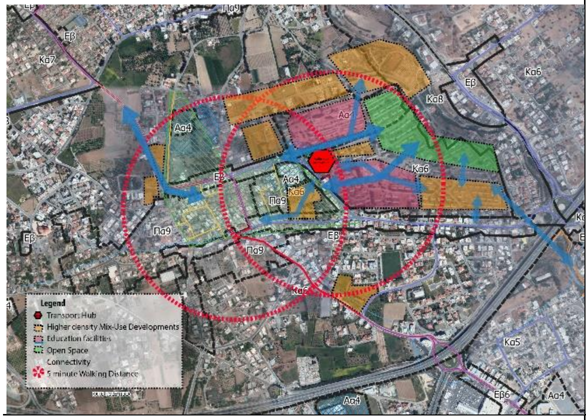
Figure A-X 1: Specific examples of implementing the recommendations for the polycentric and mixed land-use scenario

Ypsonas/ Kolossi/ Erimi



The area is investigated for the possibility of delivering Limassol's New Football Stadium, a Business and Technology Park and the expansion of the development zone (residential and commercial) into the Sovereign Base areas. Combined with the relatively low real estate values, the available land and the proximity to the Casino, Waterfront Regeneration and Verregaria Regeneration the area is identified as the most suitable to absorb the highest number of housing units. The creation of a new regional commercial centre in this rapidly growing area is also recommended

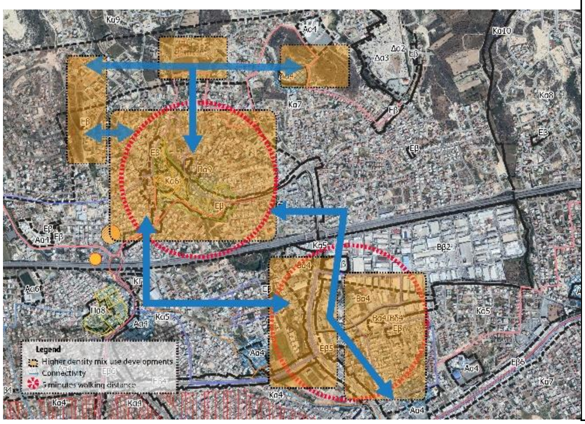
Kato Polemidia



The regeneration of the Veregaria area is a key opportunity for the regeneration and development of this area. The site will include student housing, educational facilities and open spaces that will be connected to the Garyllis Linear Park.

In order to capitalise on the creative drive of the university students, the area can be branded as a Creative District. Providing incentives for co-working spaces for both professionals and students to put their ideas in action.

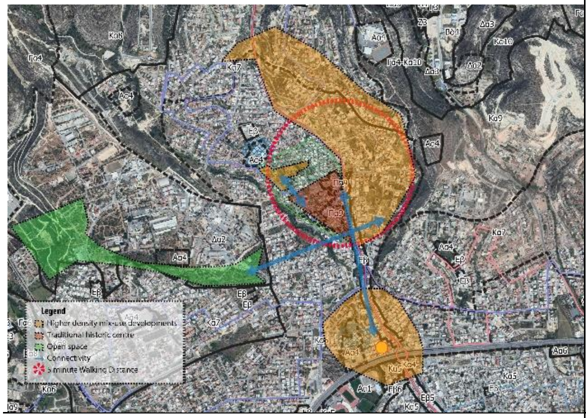
Agios Athanasios and Germasogia



Agios Athanasios has a strong commercial character and can act as an important employment hub. The area can be densified through the delivery of mix-use buildings, reducing the distance between employment and residential.

Pockets of empty land at the northern part of the area can be targeted for densification purposes due to their proximity to the existing employment hubs

Agia Phyla



The regeneration scheme of the traditional centre of Agia Phyla will add to the existing development momentum in the area. Complemented with incentives for the reclamation of the presently abandoned residential units within the traditional urban centre and new mix-use projects located east of the centre can cater for new residents.

Enhancing the already vibrant and self-sufficient character of the area

Agios Tychonas

Agios Tychonas' traditional settlement, strategic location and high-end tourism services must be taken advantage of and act as magnet in order to densify the area. It is key to build upon the tourism image of the area and further improve the existing facilities of the area.

Transforming Agios Tychonas into a prime gateway to the beach and the other urban centres of Limassol, as well as Nicosia and Larnaca

ANNEX XI – Monitoring and Evaluation Plan

1. List of M&E indicators

Outcome Indicators				
Objective	**Indicator**	**Timescale**	**Baseline**	**Target 2030**
Economic Efficiency Core Indicators (6 Indicators)				
1.1 Improvement of the efficiency and cost-effectiveness of the private & public transport network	1.1.1 Average travel time (min) by car	Yearly	14.2	Calculated for preferred Scenario
	1.1.2 PT operating cost	Yearly	2.39	2.20
	1.1.3 Capital investment costs of PT services	Yearly	Very Low	25million accumulated over 10 years
	1.2.4 PT punctuality	Analysis for indicator based on monthly data	obtain from Operator	95% target
1.2 Reduction in Congestion	1.2.1 veh-hours over the network	Yearly	Chapter 4.4 – Del4.1	71%
	1.2.2 veh-km over the network	Yearly	Chapter 4.4 – Del4.1	77%
	1.2.3 Delays and improvement of LoS	Yearly	Chapter 4.4 – Del4.1	-20%delays/+10%LoS
Environment Core Indicators (9 Indicators)				
2.1 Reduction in transport generated emissions and noise pollution	2.1.1 Carbon Dioxide emissions	Indicator based on average daily emissions for each calendar month	587,853	24% decrease (compared to 2005)
	2.1.2 Carbon Monoxide Emissions	Indicator based on average daily emissions for each calendar month	1,943,451	40% decrease
	2.1.3 Nitrogen Oxide Emissions	Indicator based on average daily emissions for each calendar month	2,207,477	40% decrease
	2.1.4 Particulate Matter	Indicator based on average daily emissions for each calendar month	51,837	50% decrease
2.2 Reduction in traffic generated noise	2.2.1 Noise	Indicator based on the average % of households exposed each day during a calendar month	Chapter 3.1 – DEL5.1	20% decrease
2.3 Reduction of old technology private vehicles	2.3.1 No of Electric and hybrid vehicles	Yearly analysis of National Registry	Very few	10% of the National Registry
	2.3.2No of electric charging stations	Yearly	V6	150
2.4 Increase in Vehicle Sharing	2.4.1 Shared Cars	Yearly	0	5% of car trips
	2.4.2 Shared Bikes	Yearly	Very Low	2% of bike trips
Accessibility and Social Inclusion Indicators (16 indicators)				
3.1 Improvement the Level of Accessibility (LoA) for Public & Private Transport	3.1.1 The LoA for Public Transport	Yearly	Accessibility Analysis (Chapter 3.3 – DEL 5,1)	Accessibility Analysis for preferred scenario
	3.1.2 The LoA for Private Transport	Yearly	Accessibility Analysis	Accessibility Analysis for preferred scenario
3.2 Improvement of Public Transport services both in time and space	3.2.1 Public Transport share (including PT on demand)	2025 and 2030	1.8%	10%
	3.2.2 Adapted new public transport services	Yearly	0	50% of feeder lines

Outcome Indicators				
Objective	**Indicator**	**Timescale**	**Baseline**	**Target 2030**
	3.2.3 Buses with Disable access	Quarterly	Very low	100% of all active bus vehicle
	3.2.4 Park and Ride places	Yearly	0	5
	3.2.5 Bus lanes	Yearly	0	39,5km (equivalent length of bus lanes)
	3.2.6 Bus stops with telematics	Quarterly	3% of the total number of bus stops	80% of the total number of bus stops
	3.2.7 Bus shelters	Quarterly	Very low	100% of the total number of bus stops
3.3 Increase of options to use sustainable modes of transport	3.3.1 Pedestrian share	2025, 2030 (H-Hs survey)	5,7%	10%
		Quarterly (counters)	First count after installation	10% growth/year
	3.3.2 Cyclists share	2025,2030 (H-H survey)	0.7	4%
		Quarterly (counters)	First count after installation	10% growth/year
	3.3.3 Pedestrian streets	Yearly	1.5 km	24 km
	3.3.4 Continuity/ integration pedestrian ways	Yearly	17 km	21 km
	3.3.5 Continuity/ integration cycling	Yearly	15 km	215 km
	3.3.6 Bicycle sharing stations	Yearly	22	40
	3.3.7 Bicycle parking spaces	Yearly	24	72
Quality of Life indicators (5 indicators)				
4.1 Enhancement of the attractiveness & quality of the urban environment & urban design for a balanced allocation of road network to private and active modes of transport	4.1.1 Environmental zones	Quarterly	1	10
	4.1.2 Calming areas	Quarterly	Very low	7 km
	4.1.3 Home zones	Quarterly	Very low	10 km
	4			7
	4.1.4 Greening urban arterials	Quarterly	About 7 km (pedestrian Way about 7 km cycleway	14 km pedestrian Way / 21,5km cycleway
Safety Indicators (7 indicators)				
5.1 Reduction of road accidents (black spots) in central area	5.1.1 Fatal road accident casualties - CBD	Quarterly	Analysis required to establish baseline	50% reduction
	5.1.2 Road accidents with injuries - CBD	Quarterly	Analysis required to establish baseline	50% Reduction
5.2 Reduction of road accidents (black spots) in the whole study area	5.2.1 Fatal road accident casualties – Study Area	Quarterly	35	50% Reduction
	5.2.2 Road accidents with injuries – Study Area	Quarterly	716	50% Reduction
5.3 Reduction of accidents involving vulnerable people (primary school pupils, pedestrians, cyclists, disabled)	5.3.1. Schools with Safe buffers	Quarterly	0	25
	5.3.2 Safe pedestrians' & cyclists' crossing	Quarterly	Very Low	80
	5.3.3 Accessible points of interest for disabled people	Quarterly	0	30

Table A-XI 1: List of M&E indicators

2. Programme of M&E Activities

<table>
<tr><th>No</th><th>Action</th><th>Indicative Timing</th></tr>
<tr><td>1</td><td>M&E Plan approved as part of the Limassol SUMP</td><td>3^{rd} Qtr. 2019</td></tr>
<tr><td>2</td><td>Person appointed as the Limassol SUMP M&E Manager (MEM)</td><td>4^{th} Qtr. 2019</td></tr>
<tr><td>3</td><td>Action Plan and Budget Approved for Limassol SUMP</td><td>4^{th} Qtr. 2019</td></tr>
<tr><td>4</td><td>MEM coordinates the completion of the Self-Assessment Tool</td><td>4^{th} Qtr. 2019</td></tr>
<tr><td>5</td><td>MEM completes Process Evaluation Schedule from timings in Action Plan</td><td>4^{th} Qtr. 2019</td></tr>
<tr><td>6</td><td>MEM establishes M&E Team with representatives from Limassol District (DEC), Municipalities (MEC) and Communities (DEC)</td><td>4^{th} Qtr. 2019</td></tr>
<tr><td>7</td><td>Development of SUMP Management Information System developed</td><td>4^{th} Qtr. 2019 - 1^{st} Qtr. 2020</td></tr>
<tr><td>8</td><td>M&E Team quarterly meetings</td><td>1^{st} Qtr. 2020 - 4^{th} Qtr. 2030</td></tr>
<tr><td>9</td><td>MEM provides M&E Reporting to Quarterly Project Steering Committee meetings.</td><td>1^{st} Qtr. 2020 - 4^{th} Qtr. 2030</td></tr>
<tr><td>10</td><td>MEM to develop Program for Process Evaluation (Attachment “C”) from timings in Project Action Plan. Each Bundled Measures to have a process evaluation 3 times during its life - during preparation, implementation and operation. Measure Evaluation Results Form (MER Form) required for half the measures.</td><td>1^{st} Qtr. 2020</td></tr>
<tr><td>11</td><td>MEM & M&E Team develop data management strategy (i.e. Policy, guidelines, governance, roles and responsibilities and process) on methodologies, collection, analysis, and reporting. To be approved by Project Steering Committee.</td><td>1^{st} Qtr. 2020</td></tr>
<tr><td>12</td><td>MEM to identify all Measure Leaders (MLs)</td><td>1^{st} Qtr. 2020</td></tr>
<tr><td>13</td><td>MEM to identify all Data Managers (DMs)</td><td>1^{st} Qtr. 2020</td></tr>
<tr><td>14</td><td>MEM to implement the Data Management Strategy. Collecting and analysing data from DM, ensuring quality control of data, transferring analysed data into indicators. Capturing indicators in Management Information System. It is expected that MEM will meet with DM on average once a year to set up and manage data requirements – which equates to 10 meetings a year for 10 years.</td><td>1^{st} Qtr. 2020 - 4^{th} Qtr. 2030</td></tr>
<tr><td>15</td><td>MEM implements Process Evaluation (PE) Programme of Bundled Measures. All data, results, findings recorded in Management Information System

Table – Indicative No of Process Evaluations Activities each Year
<table>
<tr><th></th><th>2020</th><th>2021</th><th>2022</th><th>2023</th><th>2024</th><th>2025</th><th>2026</th><th>2027</th><th>2028</th><th>2029</th><th>2030</th></tr>
<tr><td>PE Preparation</td><td>4</td><td>4</td><td>2</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>PE Implementation</td><td></td><td>2</td><td>4</td><td>4</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>PE Operation</td><td></td><td></td><td></td><td></td><td>2</td><td>2</td><td>2</td><td>2</td><td>2</td><td></td><td></td></tr>
<tr><td>“Measure” Forums</td><td>4</td><td>5</td><td>4</td><td>4</td><td>1</td><td>1</td><td>1</td><td>1</td><td>1</td><td></td><td></td></tr>
<tr><td>End of Project Interviews</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>3</td></tr>
<tr><td>MER Form</td><td>2</td><td>3</td><td>3</td><td>2</td><td>1</td><td>1</td><td>1</td><td>1</td><td>1</td><td></td><td></td></tr>
</table></td><td>2^{nd} Qtr. 2020 to 4^{th} Qtr. 2030</td></tr>
<tr><td>16</td><td>MEM provides Annual M&E Reporting to Steering Committee</td><td>1^{st} Qtr. each yr. 2021 - 2030</td></tr>
<tr><td>17</td><td>Coordinating Household Travel Survey, Noise Monitoring Site Survey, Parking Site Survey, Public Spaces Survey, Pedestrian and Cyclist Counts</td><td>1^{st} Qtr. 2025</td></tr>
<tr><td>18</td><td>MEM to coordinate Completion of Mid Term Evaluation</td><td>4^{th} Qtr. 2025</td></tr>
<tr><td>19</td><td>Coordinating Household Travel Survey, Noise Monitoring Site Survey, Parking Site Survey, Public Spaces Survey, Pedestrian and Cyclist Counts</td><td>1^{st} Qtr. 2025</td></tr>
<tr><td>20</td><td>MEM to coordinate Completion of End of Project Evaluation</td><td>4^{th} Qtr. 2040</td></tr>
</table>

Table A-XI 2: Programme of M&E Activities