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# Mobility for Valencia City Centre – a Case Study

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## 1 ABSTRACT

Valencia (Spain) has one of the largest historical centres in Europe with a dimension of almost 2 km between its two most distant points. Two years ago, municipal government decided to change policy about traffic in city centre in order to reduce traffic car and promote non-motorized modes of transport and public transport, that is, a sustainable mobility. This paper show the main results of a final work of Master in Transport, Territory and Urbanism of Polytechnic University of Valencia. It objective is adjust a methodology to apply the superblocks model in a big historical city centre such as Valencia. The work focuses on a possible superblock in city centre of Valencia. The Spanish cadastre allows mapping the all uses in buildings measured in square meters of ceiling. Between them, especially those uses that produces travel attraction such as commercial uses, parking, residential, offices, entertainment … These data allows stablishing a different networks to different modal mobility. The design of networks is done using the concept of offer management. That is, the objective of networks is satisfy the needs of mobility but not the demand of traffic. Go walking and cycling are the priority modes of transport, after public transport to access to city centre from outside by underground, bus or taxi and finally traffic car to emergencies, services for disable or old people, loading and unloading and access parking. The methodology to design networks is applied in case study and produces an integrate mobility model to superblock selected as area of study.

Keywords: Valencia, mobility, case study, transportation, networks

## 2 INTRODUCTION

For many years, different traffic specialists have considered the traffic calming as a way to get more liveable cities as Lockwood I.M. (1997), Hass-Klau, C. (1992) or Appleyard, D. (1981). In Spain, Sanz A. (1996, 2008) between others introduced this concept. Currently, the sustainable mobility is one of the objectives of European Commission policy (2013a, 2013b) and many European cities have carried out or carry out actions for it[1] and many authors studies this topic as Książek (2015) or Grana et al. (2008).

In Spain, municipalities must develop their Sustainable Mobility Urban Plan or, in Spanish, Plan de Movilidad Urbana Sostenible (PMUS). In this context, the experiences of municipalities of Vitoria and Barcelona about this question are important.

On the other hand, the Agència d'Ecología Urbana of Barcelona[2] developed the theory of superblocks as a system to improve public spaces by decreasing motorcar spaces and increasing pedestrian areas or areas for not-motorized transport.

Figure 1 show the superblocks model applied to Barcelona. The idea is design urban areas with pedestrian priority. These areas have a size about 400x400 metres. Inside these areas, the mobility is mainly pedestrian. But is also possible other transport services by other transport modes: emergency cars, cars for disabled person, loading and unloading zones or DUM (Distribution Urban Merchandise) areas, access to parking and bicycles ways.

This model allows to concentrate the traffic in streets around each superblock and increase pedestrian public spaces inside of each superblock. In other words, the model allows calming traffic inside of each superblock. In addition, if the city is organized by superblocks, the bus public transport network can be more efficient.

This theory was applied in the cities of Vitoria and Barcelona between among others. Particularly in its Mobility Urban Plans. Vitoria has a Plan de Movilidad Sostenible y Espacio Público (Sustainable Mobility

[1] http://www.eltis.org/
[2] http://www.bcnecologia.net/en


ISBN 978-3-9504173-2-6 (CD), 978-3-9504173-3-3 (print)
Editors: Manfred SCHRENK, Vasily V. POPOVICH, Peter ZEILE, Pietro ELISEI, Clemens BEYER

Plan and Public Espace)[3] approved in 2007 to apply in period 2008-2023. On the other hand, Barcelona has approved its Sustainable Urban Mobility Plan[4] to period 2013-2018. Both plans uses the theory of superblocks to improve public spaces and mobility and apply the European policy in this matter.[5]

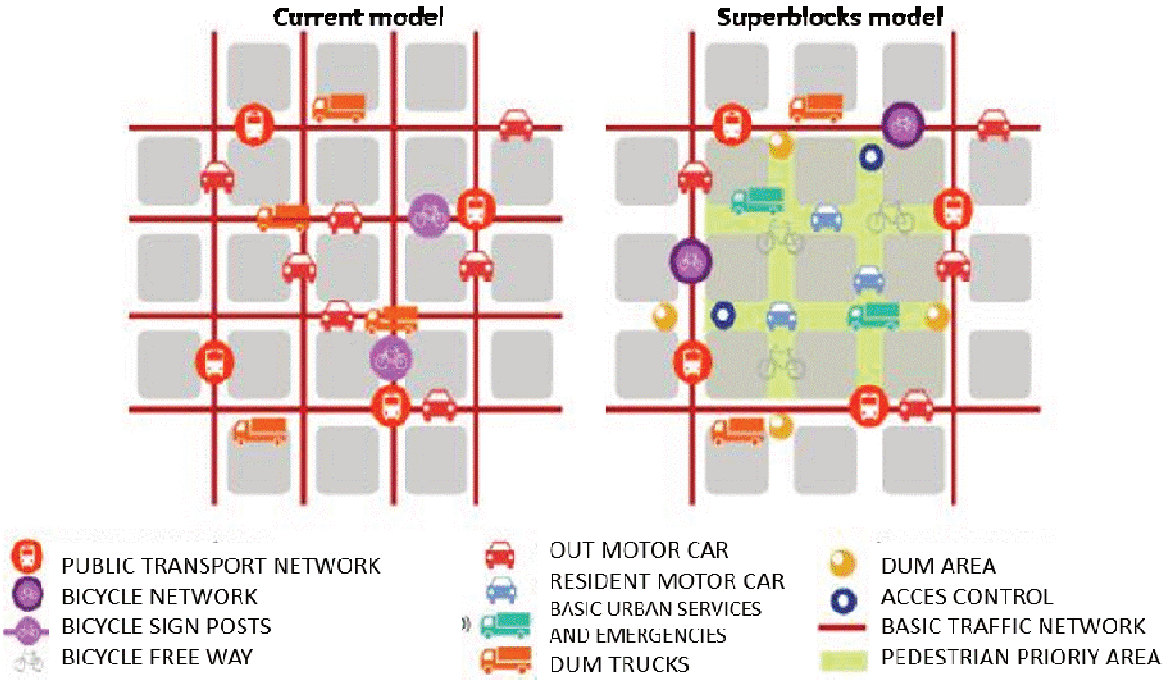


Figure 1. Superblocks model. Source: Agència d'Ecologia Urbana de Barcelona.

The city of Valencia is incorporated late to this trend but has carried out actions to promote non-motorized transport and improve public spaces (Gaja i Díaz, F. (2015); Broseta, M.T. (2015) and Pérez Igualada, J. (2015)).

València City has also its mobility plan[6] but this plan did not apply the theory of superblocks. Particularly it is difficult to apply this theory in city centre because of it is very large. The Valencia city centre with medieval origin has about 2 km for the longest distance by 1.5 km wide. Today Valencia city centre supports a lot of traffic.

In this situation, as a part of teaching objectives within the Master of Transport, Territory and Urbanism of Polytechnic University of València, was made a Final Work about Traffic management for sustainable mobility in Sant Francesc district. This paper show the proposal developed in this master's word about Sant Francesc district in Valencia centre. The study identify as a superblock the Sant Francesc district but really it is necessary a previous study to define the superblocks in city centre area that is very big.

## 3 OBJECTIVES

The objective of this paper is show a proposal of sustainable mobility model for Sant Francesc district in Valencia city centre. In order to achieve this objective, the following specific objectives will have to be met:

- To identify the zones in district that produce or attract traffic.
- To propose and evaluate possible alternatives for traffic management more sustainables that minimizes the use of private car vehicles.
- To generate new urban landscapes in public spaces.

3

http://www.vitoria-gasteiz.org/we001/was/we001Action.do?idioma=es&aplicacion=wb021&tabla=contenido&uid=1040577b_11ad7b633e2__7fc9

4 http://www.bcnecologia.net/en/projects/sustainable-urban-mobility-plan-barcelona-2013-2018

5 https://ec.europa.eu/transport/themes/urban/urban_mobility_en

6

http://www.ayto-valencia.es/ayuntamiento/trafico.nsf/vDocumentosTituloAux/13E8AC560711B1ADC1257C5B0041648A?OpenDocument&bdOrigen=ayuntamiento%2Ftrafico.nsf&idapoyo=&lang=1&nivel=6

Really these objectives are also oriented to a new landscapes low carbon, that is, new public spaces with a minimum carbon emission. Currently, transport modes as a walking, bicycle or public transport allows achieving its.

## 4 METHODOLOGY

The methodology is summarized in the following phases:

- Delimitation of the study area, according to the theory of superbloks, in order to establish pedestrian zones where the citizens are the main actor and main factor to design the public spaces.
- Description of mobility characteristics in the Valencia city center based in the analysis carried out in its Sustainable Urban Mobility Plan of Valencia.
- Identification of zones that generate or attract trips. Particularly residential uses, office buildings, commercial zones, parking, hotels, entertainment, health facilities, green zones or similar and public facilities. In Spain, the cadastre has a complete information of uses building to building for all buildings. So it is possible map all uses. The map of these uses allows design ways to access its by different transport systems.
- Alternative study of transport networks for different modes from the supply point of view to allows activities access.
- Public spaces design.

## 5 IDENTIFYING SUPERBLOCKS AND MOBILITY CHARACTERISTICS

The identification of superblocks in city centres is complex because, usually, European city centres have irregular forms with medieval origins. That is the case of València where the oldest streets are muslim origin. Figure 2 shows a possibility of superblocks for Valencia city centre but the proposal need further study.

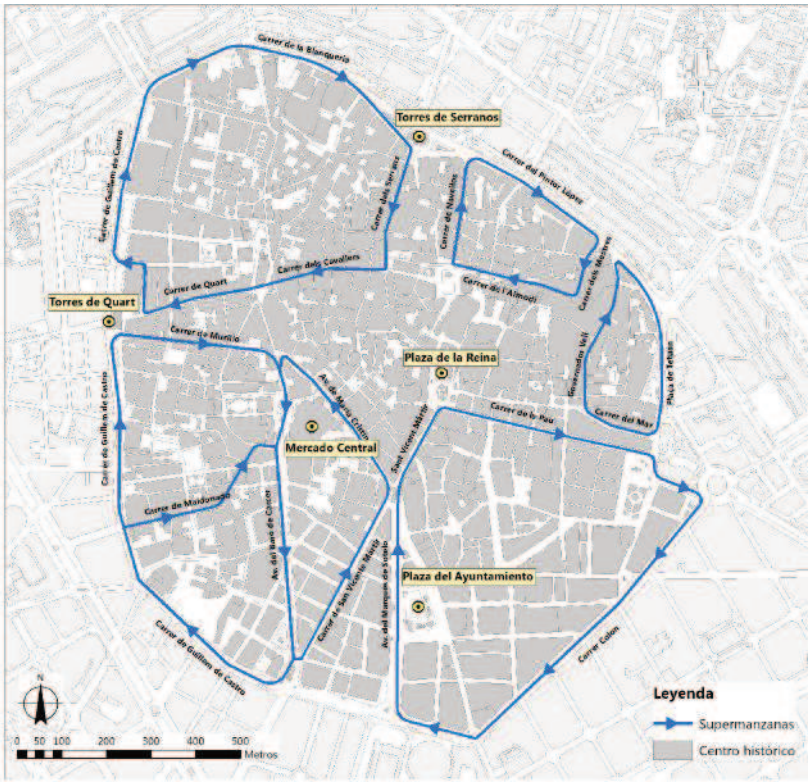


Figure 2. An example of superblocks for Valencia city centre.

However it exist a clear superblock, specifically the area of Sant Francesc on the south-est of the city centre or, simply, Sant Francesc district. This zone is the result of urban renewal project maede in the late nineteenth and early twentieth centuries and allows traffic for public transport or others. This work is focused in this area.


ISBN 978-3-9504173-2-6 (CD), 978-3-9504173-3-3 (print)
Editors: Manfred SCHRENK, Vasily V. POPOVICH, Peter ZEILE, Pietro ELISEI, Clemens BEYER

On the other hand, Valencia is a compact Mediterranean city. It exist urban sprawl phenomenon on metropolitan area but not in Valencia City. On 27 December 2013 the PMUS (Sustainable Urban Mobility Plan) of Valencia was approved. The mobility plan includes a detailed analysis of Valencia's traffic characteristics that has served as the basis for the present study. However, this plan does not use the theory of superblocks and does not propose its.

Table 1 shows the general characteristics of mobility in Valencia City. Note you that the number of trips by not-motorized modes is high. In fact, this is a general characteristic of Mediterranean cities. Historically, because of climate, Mediterranean cities are compact and people like using public spaces.

In this situation, historical city centre of Valencia is a very important area of social and economic activity and, in consequense, is also a very important area that attracts trips.

| **Indicator** | **Value** | |
|---|---|---|
| Total trips | 1.575.973 | |
| Not-motorized trips (pedestrian and bicycle) | 834.289 | 52,9 % |
| Motorized trips | 741.684 | 47,1 % |
| Average mobility by person (trips by person) | 1,98 | |
| Average mobility by person, not-motorized (trips by person) | 1,04 | |
| Average mobility by person, motorized (trips by person) | 0,94 | |

Table 1. Basic characteristics of mobility in Valencia City. Source: PMUS of Valencia.

## 6 GENERATING AND ATTRACTING TRIPS

The cadastre in Spain is an updated database with all information about urban uses in all cities. The use in each building is measured in square meters of ceiling. Table 2 shows the uses considerated in this study and its ceiling square meters in study area of Sant Francesc district according to database of Spanish cadastre:

| Uses | Ceiling $m^2$ |
|---|---|
| Residential | 416,011 |
| Offices | 176,042 |
| Commercial | 292,717 |
| Parking | 135,159 |
| Hotels | 54,258 |
| Entertainment | 28,211 |
| Healt facilities | 4,362 |
| Green zones or similar | 7,693 |
| Public facilities | 12,273 |

Table 2. Uses that generate or attract trips in Sant Francesc district.

The exactly location of this uses are mapping in one map for each use. Figure 3 shows, as an example, the location map of commercial uses. These maps serve to identify the needs to acces by car for services. Remember that the final objective is mainly produce a pedestrian area inside the superblocks but it exist some services that need motorized transport modes: access to private parkings of residents, emergency cars (fire trucks, ambulances, police cars), loading and unloading especially to commerce, access to facilities and offices, access of disable people and acces to public parking. The idea is offer the possibility of these services but not to satisfy the external potential demand by car traffic mode. The maps produced allows identifying where are the needs of access services.

By superposition of all maps it is possible to produce a map of activities or a map where the urban activities listed are concentrated. Figure 4 shows this map. The map shows the zones with the highest activities are.

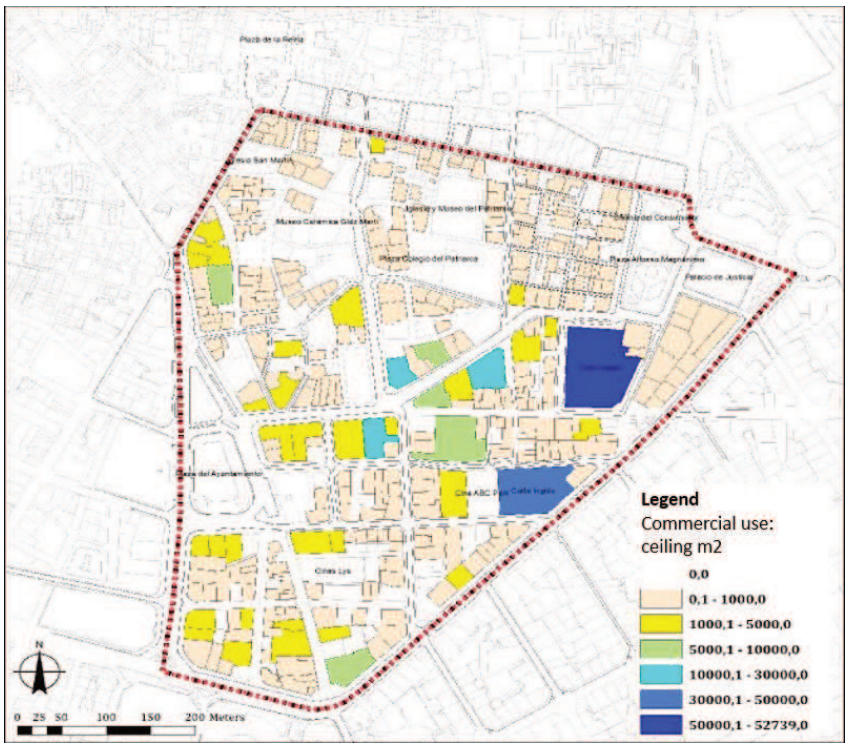


Figure 3. Location of commercial uses in Sant Francesc district (Valencia).

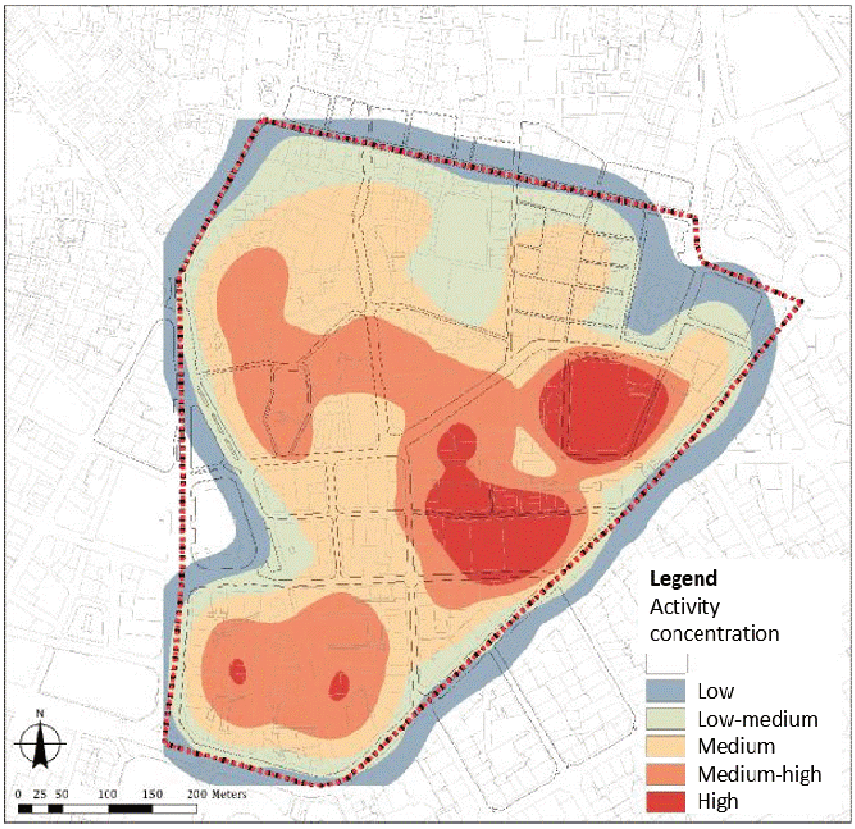


Figure 4. Activity concentration in Sant Francesc district (Valencia).

## 7 ALTERNATIVE ANALYSIS

Based on the above information, it is possible to begin the study of proposal. The analysis is sequential in two phases. On first phase is designed the proposal for the different transport network modes. On second phase is checked if the street sections allows the planning networks. If all transport networks do not fit in the section of a street, it will be necessary to find an alternative route for one or more of the networks. So on and on until the final solution.


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First phase is also sequential. First it is developed a drawn proposal of traffic networks: network of motorized cars to access activities, network of public bus transport, bicycle network and pedestrian network. All networks have stop spaces for taxi, public bus, loading and unloading, motorbike and bicycles. The parking cars are not planning in streets, only in buildings or underground and the motorized network is planned to access its.

The motorized networks inside the superblock are planned only as a closed loop. So the motorized vehicles only can travel by a circular movement. This avoids the flow of passing traffic and allows only trips with origin or destination inside the superblock.

In our study, this phase finished after three iterations. In the first place, the access routes for cars services were designed to produce the car network.

During this analysis was incorporated as an objective the pedestrianization of the Town Hall Square due the city council made this goal public. Because of that, it was necessary to modify the superblock and incorporate another distribution street on the west. Figure 5 shows the car network in the final proposal of this phase.

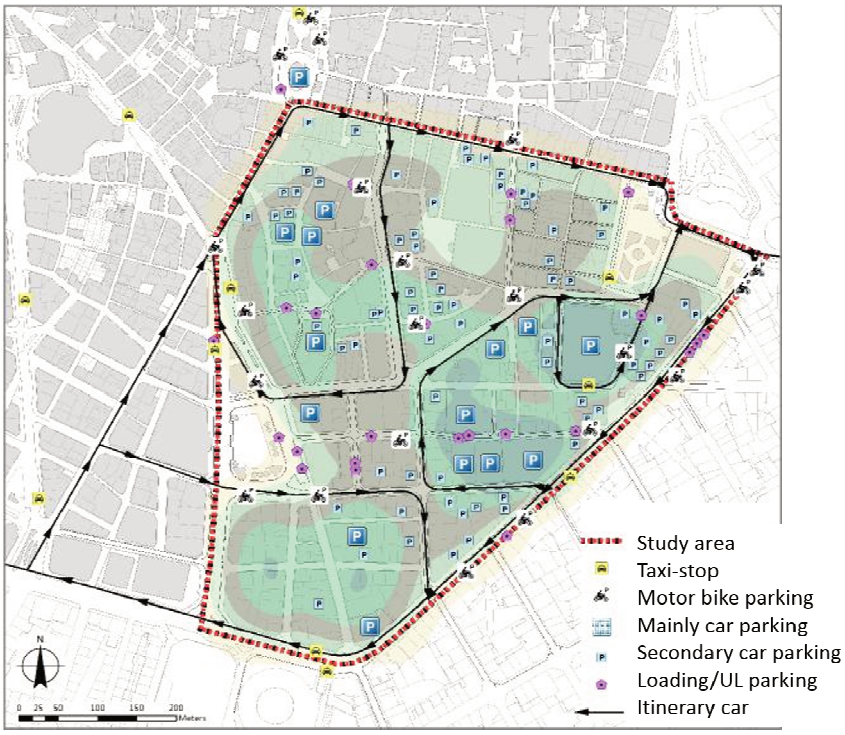


Figure 5. Car network on alternative after first analisys phase.

It was also carried out with all the networks of the different modes of transport provided with stop spaces: public bus, bicycle and pedestrian network. Overlapping all networks by GIS, as shown in Figure 6, you get the map of all transport routes. In this way, it is possible draw a complete map with all the itineraries for each mode of transport.

But this proposal is only theoretical because we still have to check if there is enough space in each street for the networks planned.

## 8 CHECKING STREET SECTIONS

For checking if different transport networks fit in the streets, a standard width was set for each network:

- 2.5 meters for bike path
- 3.0 meters for bus line
- 3.0 meters for car line
- 2.0 meters for line parking in street

According to these criteria was tested all streets and rethinking the paths of the networks. After this analysis, all the transport networks was redraw to adapt the transport networks to real possibilities of space in streets. In all case, all networks must be continuous and coherent.

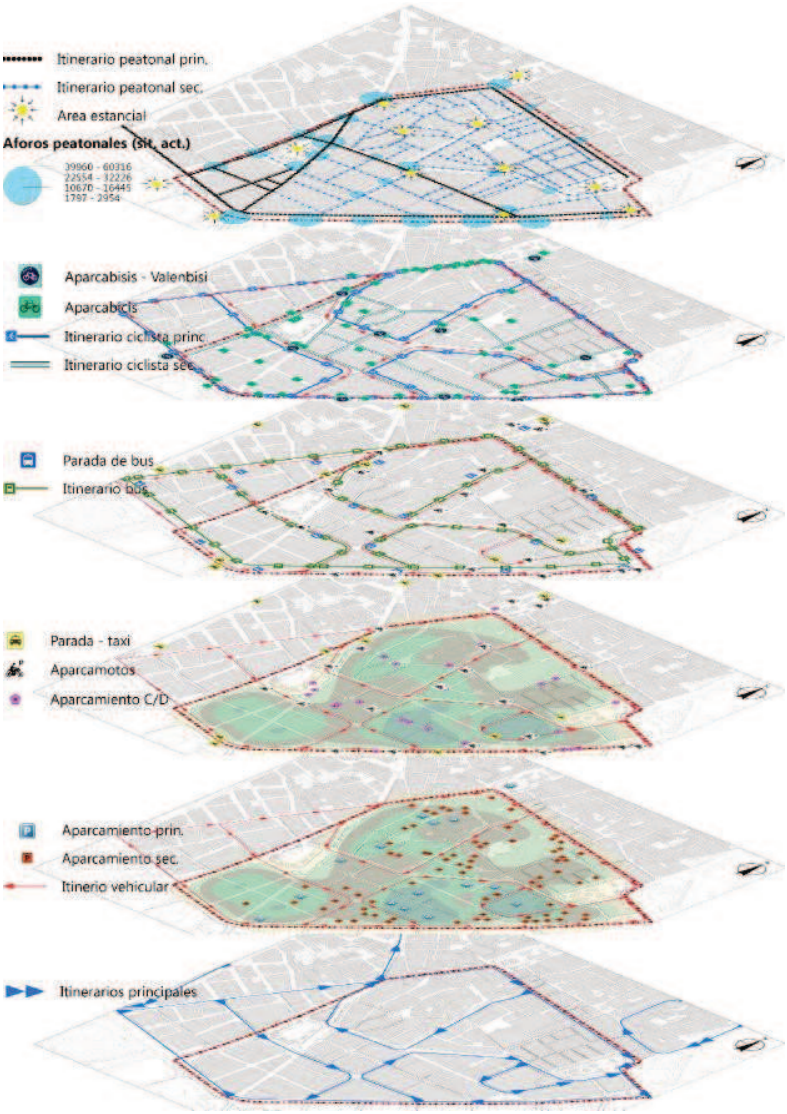


Figure 6. Overlapping network traffic of different modes (pedestrian, bicycle, public bus, car) in Sant Francesc district (Valencia) with parking and stop zones.

Figure 7 shows the final proposal for car network. The proposal has a basic network with a mainly closed loop and two secondary closed loop. This network allows connect all the area by car but only basic network, the street of round abour the whole historical centre, is designed to traffic flow. Secondary loops allows the access inside the superblock and, in other streets, cars can move by pedestrian areas (especially emergency cars or loading/unloading) or access ways to parking in buildings. Loading and unloading is limited in Valencia centre to certain times.

On the other hand, currently it exist some pedestrian streets in Valencia centre. When a street is changed to pedestrian street, according to Valencia experience, different urban activities was located it, for example, restaurants, pubs, shops ... In this case is very difficult to return the street with a design for motorized vehicles. These situations condition new designs of the zone.

The motor bike traffic present a special interest. In Spain, average car occupation is about 1.3 persons by car. On the contrary, although the number of passengers on a motorbike is about 1 per vehicle, three motorbikes occupy the space of a one car. That is, in practice, the use of the motorbike doubles the number of passengers in the same space. For this reason is important planning motorbike parking. Motorbikes use the same network of cars but need specific spaces to parking.


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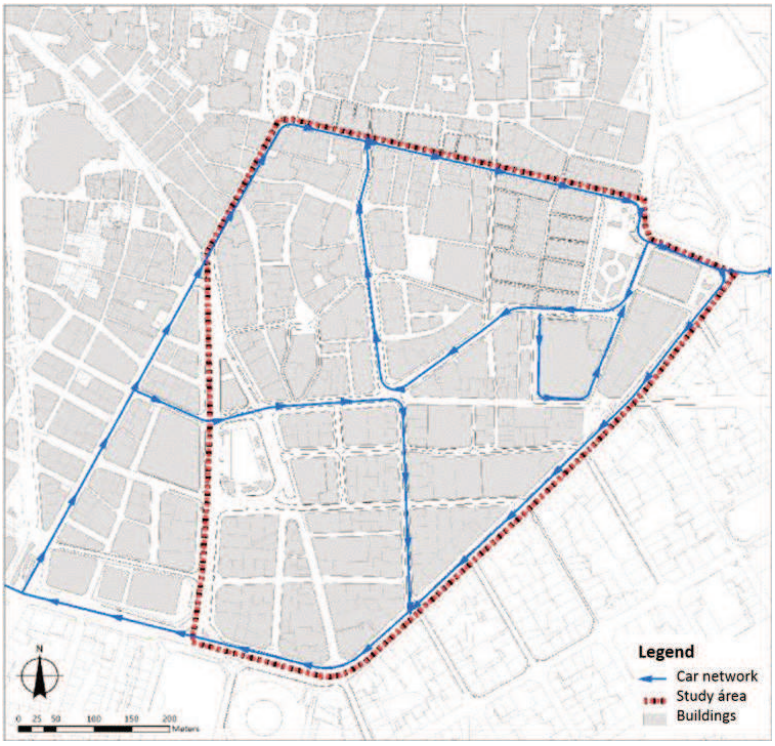


Figure 7. Final proposal car network in Sant Francesc district (Valencia).

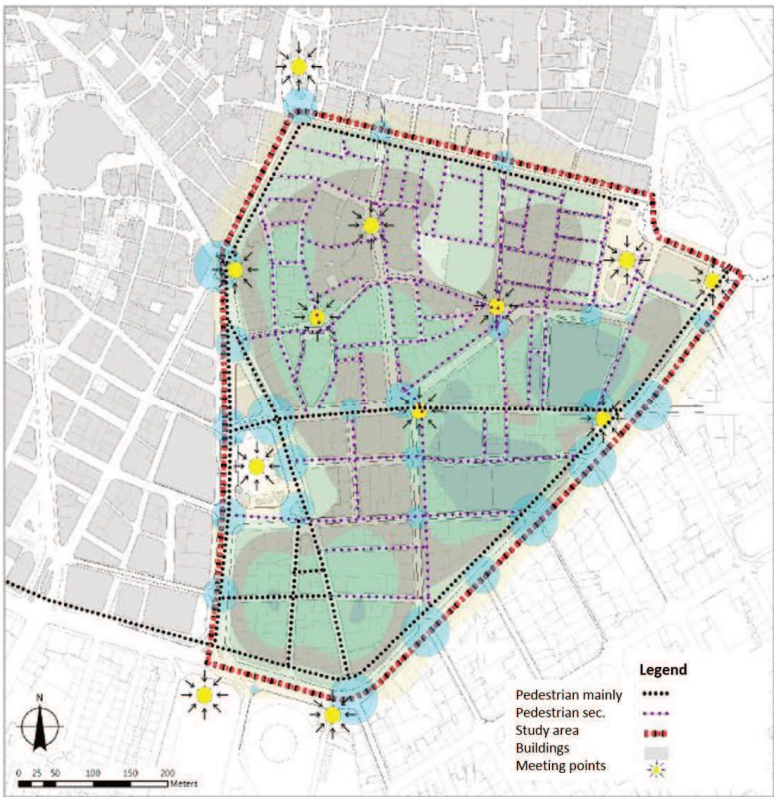


Figure 8. Final proposal pedestrian network in Sant Francesc (Valencia).

Figure 8 shows the final proposal for pedestrian network. With the proposal, most of the public space becomes pedestrian. The pedestrian network includes the meeting-points zones or public areas around the streets with a function of meeting people. This network includes symbolic public spaces as a Town Hall Square or commercial streets. Of course, the design of symbolic spaces, as a pedestrian zones, condition the design of networks.

By overlapping all network maps it is possible to obtain a complete map of urban public spaces with its functions as you can see in Figure 9.

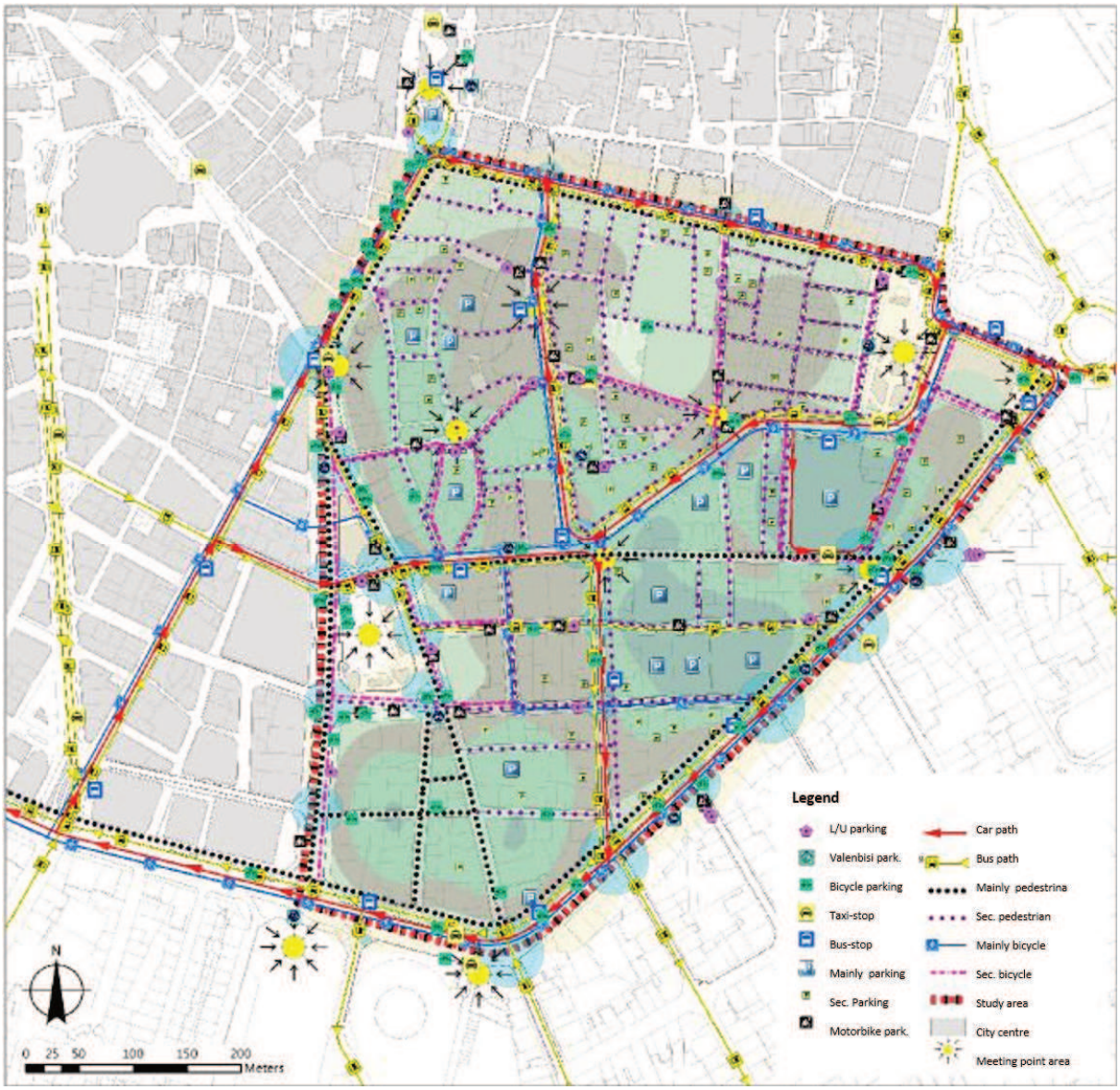


Figure 9. Final image of public spaces functions according to transport networks in Sant Francesc district (Valencia).

Finally, when the feasibility to locate the transport networks in the available space of the streets has been verified, then it will be possible to design the public spaces and the public street landscape. As a consequence, the pedestrian areas increase and the quality urban landscapes will also increase.

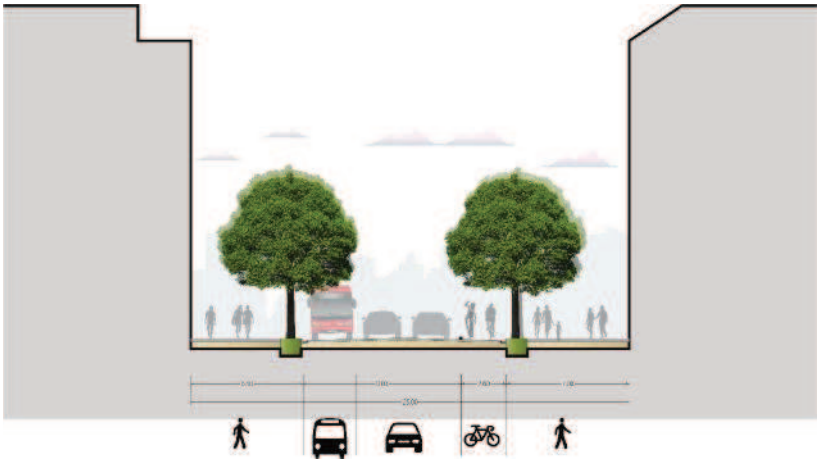

Figure 10. Proposed section for Colon Street (Valencia).

The study includes the standard section of all streets in superblock. Figure 9 shows, as an example, the section proposed for Colon Sreet, a stretch of round, that is currently one of the streets with the highest


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traffic intensity. In this case the section present an important increase of pavement for pedestrian. On the other hand, has been applied the general criteria according to which distributors streets haven't parking spaces to facilitate a fluid traffic. Note you that parking line in streets affect the space of two lanes: the lane of parking and the next lane to maneuver in order to park.

## 9 CONCLUSION

This study shows an example of application of theory of superblocks and traffic design based in traffic network offer to apply in city centre zone to calming traffic. The final objective is to promote non-motorized trips but maintaining the necessary basic services that must be performed by motor vehicles.

The Valencia city centre is very big to consider all it as a superblock. In consequence the study area is Sant Francesc district, a zone with more adequate dimensions. The study proves that is possible to significantly increase pedestrian public spaces while maintaining basic services through motorized transportation.

The action allows redesign the urban landscapes in city centre. Particularly the street sections to allow the different traffic network and zones of meeting points for people. The particular projects for these new urban landscapes would be developed in the future.

The applied methodology has proven to be useful for the reorganization of traffic in urban areas with the aim of promoting non-motorized traffic and generating new urban public spaces or low carbon urban landscapes.

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