Public Space Dimensioning

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ABSTRACT. The present article aims to be a contribute for the development of a new methodological approach for public space dimensioning, including quantitative regulations and design guidelines. It starts from the point of view that the current way of designing public spaces is deeply marked by fragmented and individualized visions (and practices), that are unable to meet the extensive functional conflicts that today's public space has to bear. Objectively, and based on a functional approach, it is proposed to develop a novel model for sizing the public space according to its expected usage loads. Despite the embryonic nature of the proposed model, the results show: the inadequacy of existing norms, because the territory matters!; and the potential to apply the developed model in several urban scenarios. The proposed model, for now only prospective, requires deepening and evaluation, thus pointing to future investigations.

KEYWORDS. public space, usage load, local scale, urban design, spatial planning.

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1. Introduction

"The form of the city and of its public spaces cannot be a matter of personal experiment. (...) If we speak of public space, we speak of its quality, of its type, of its measurements, of its proportions. If order and measure are proper to every divine creation, it must therefore also be true for every human creation. Without measure and without form, terrestrial things cannot exist; they exist only as sickness, disorder, uproar. A body either too big or too small is a monster or a dwarf." (KRIER, 1977. 69-152)

It is important to notice that the driving force that has leaded us to this paper explains clearly the nature and the purpose of the investigation that supports all the work that is behind it. The paper is a piece of a major investigation process that tried to find and compare costs and benefits of different urban forms.

In particular, behind this work, there are two different motivation factors:

The first one refers to the huge value of the study object. The Public Space is undoubtedly an essential element for the reinforcement of the territory structure as well as one of the key factors for the qualification of the city;

The second starts from the recognition that the current way of projecting public space is, for three different reasons, markedly inadequate and unsatisfactory:

- It is characterized by the misalignment of the programmatic dimension (which is aggravated by the overlapping and density of functions that occur in the public space);

- The project attitude overestimates the aesthetic dimension of the process (with implications at an economic level and mostly with implications at a functional level);

- And in the Portuguese case the normative framework that supports public space projects is insufficient and it neglects the territorial dimension and context.

Consequently, the main objective of this investigation process is to find a novel method to determine and dimension small-scale public spaces. It will try to evidence that the project of public spaces should be profoundly dependent and relative to the density, frequency and nature of the functions that foreseeable will occur in a certain space. The purpose is to use a functional approach to demonstrate objectively the importance of determining the size of public spaces according to expected usage loads (in way that fulfils expectations, needs and demands of each user).

Aware that the goal is ambitious, it is important to identify from the beginning the limits of the work undertaken - so there are two different kinds of limitations:

The first, are more than limitations, methodological options:

- The permanent attitude of systematization sometimes threats the conceptual scope proper of investigations that have the public space has the object of study;

- The paper only analyses the local scale - understand local scale has a territorial and social unit similar to the "neighbourhood".

The other one are a couple of specific limitations proper of the emergent phase of the current investigation:

- The qualitative approach is rather fragile;

- The model developed is materialized by hypotheses that still need to be validated.

Methodologically the paper is organized in two different sections. In the first the objective is to compile a reference of functions, typologies and recommendations for projecting public spaces, and present the other strong concept of the paper, usage load. The second aims at building and testing a model that materializes the argumentative purpose of the paper: that the dimensions and project of public spaces are to be determined according to their expected usage loads..

2. Public space

There are several disciplines that have in public space their more recurrent object of study. Our approach is only concerned with his physic dimension.

In a general way, the definition of public space that underlies the present work refers to public space as exterior space, with no buildings, free and open (in profound opposition to interior spaces that need buildings).

The work developed by Kohn (KOHN, 2008.) is an important contribute to clarify the concept and consequently to have a best definition of the object of study of this investigation. The author analyses the "publicity" level of different spaces based on three axes:

- Property (where the most public is State property);

- Accessibility (where maximum accessibility is measured by the equity of access to a space by everyone at every moments);

- Intersubjectivity (which is define by the ability of a certain space to promote social interaction between people and groups with different interests).

In resume, for the present work, public space refers to the set of exterior spaces that have free access and that are (preferable) State property.

2.1. Functions of the public space

The functions of the public space are naturally associated with the needs of his users. The public space responds to a wide range of requests and solicitations from users with completely different characteristics. Thus, it is interesting to note that the functions of public space are organized in relation to the demands of his potential users. Consequently, the amendment of the users or of their needs and demands requires the reconfiguration of the functions related to the public space. It is for this reason - because the users of public space and their needs change - that throughout history, there have been profound changes in patterns of occupation and the use of the existing public spaces.

As a result of a systematization exercise we have identified five major functions for the public space:

To circulate - the first one is related to the need of moving of his multiple users. The public space is the channel through which its users shift and move with different the rhythms, intensities and charges.

To stay - the second one is related to the need of providing conditions for the meeting and interaction of its many users. The public space represents, mainly at the local level, an engine of sociability, which has to satisfy desires of stay and conditions to promote social relations. Note also that this function is so broad that encloses the social function of public space, as well as parking and stopping of vehicles.

To access - at the local scale, and arising from the relationship with other elements that constitute the physical dimension of cities (lots and buildings), public space provides another function: access to buildings and lots.

To support - another dimension, that also enters in the field of competence of public space, but that goes beyond the logic hitherto established (very close and referenced to the users of public space), is related to the need of accommodation of various devices and equipments used for the operation of the various urban infrastructures.

Others - the analysis of urban spaces also highlights a number of "other" functions of public spaces that does not fall into any of the functions identified so far. In fact, the need to overcome topographic misalignments, the need to ensure some plasticity to the urban environment or the need to protect the performance of any of the other functions (local or general) of the public space (such as buffer zones associated with the implementation of territorial barriers), creates urban spaces with specific functions. These are spaces that meet one or more functions (with a residual character) even though, in addition, may perform other functions, like on foot moving/circulation.

In summary, it is curious to verify that these five functions of the public spaces can support the multiple stresses to which he is subjected. The following table (Table 1) tries to establish precisely the relations between users and functions of public spaces.

	PEOPLE	BICYCLES	CARS	COLLECTIVE TRANSPORTS	HEAVY DUTY VEHICLES	URBAN FURNITURE AND GREEN ELEMENTS	URBAN INFRASTR.
TO STAY	X	X	X	X	X		
TO CIRCULATE	X	X	X	X	X		
TO ACCESS	X	X	X		X		
TO SUPPORT						X	X
OTHERS						X	

Table 1

A closer analysis of the previous frame, allows us to recognize that most of the functions of public space occur simultaneously. Consequently, we can anticipate some symbiotic, indifferent, or conflicting situations, depending on the nature of the function, the type of public space and on the functional compatibility in question.

For example, this approach highlights the profound functional incompatibility between the motoring and all the other functions of the public space.

One of the objectives that this investigation persecutes is the construction of a technical reference, able to optimize symbiotic relationships and mitigate potential conflicts between different functions of the public space.

2.2. Typologies of the public space

It should be noted that the systematization/typification that was achieved at this point, illustrates the approach, effort and functional spirit that characterizes the present investigation.

As is shown in the table below (Table 2), we identified three major groups of types of public space that in turn are subdivided into seven sub-types of public space.

STREETS	SEGREGATED STREETS
	SHARED STREETS
FUNCTIONAL ENLARGEMENTS	SQUARES
	GREEN AREAS
	PARKING AREAS
OTHER SPACES	PROTECTION SPACES
	RESIDUAL SPACES

Table 2

2.3. Technical recommendations per functions and typologies

We intend to present a summary of the results of a set of recommendations for public space projects (from a wider research - carried out in a master's thesis (MOURA E SA, 2010.)). These recommendations are based on a functional approach.

Here, because more than conclusive results, it is intended to present the methodology adopted, we will focus only on the street (skeleton and stronger element of territory occupation) and in its two main functions: stay and circulation of people and cars.

Table 3 presents recommendations for the constituent elements of the street that have a higher vocation to hold the functions in question: the carriageway, parking and sidewalks.

CARRIAGEWAY	**HIGH MOTORIZED TRAFFIC VOLUMES**	**MINIMUM – 6 M** **MAXIMUM – 6,5 M**		
	LOW MOTORIZED TRAFFIC VOLUMES	**MINIMUM – 4,8 OR 4,1 M** (RESPECTIVELY, WITH OR WITHOUT MOVEMENT OF HEAVY TRANSP.) **MAXIMUM – 5,5 (OR 6) M**		
	QUALITY CRITERION: LENGTH OF THE QUEUE OF CARS ≤ ¼ OF THE STREET FOR DIRECTION			
PARKING	**HIGH THROUGH TRAFFIC → MAX. DIMENSIONS**		**FIXED SEVERAL MAX. AND MIN. DIMENSIONS** (ARISING FROM SPECIFIC RULES)	
	LOW THROUGH TRAFFIC → MIN. DIMENSIONS			
	NOTE: LOW USAGE LOAD → SHARING THE SAME FUNCTIONAL SPACE			
SIDEWALK	**USAGE LOAD**	**HIGH**	**WITH TREES**	**MIN. – 3,5 M** **MAX. – 7,5 M**
			TREELESS	**MIN. – 2,3 M** **MAX. – 5,5 M**
		LOW		**MIN. – 1,9 M** **MAX. – 4,9 M**
	REFERENCE VALUE FOR PEDESTRIAN FUNCTIONS – 11,2 M² / PERSON (MINIMUM SERVICE AREA) **LOW USAGE LOAD→ EVALUATE THE IMPLEMENTATION OF SHARED STREETS**			

Table 3

For the design of the carriageway (number and width of roads that form it) were considered two different scenarios of traffic volume.

With regard to parking, the orientation of the places in the street should depend on the volume and speed of motorized traffic that occurs on the roadway (higher the slope, greater the entropy in the access to the places). So it should only be adopted parking at 90 degrees (perpendicular to the axis of the road) in low through traffic scenarios. In high trough traffic scenarios, it must necessarily be adopted parking at 0 degrees. Also the size of the places in the street should fluctuate according to the levels of demand and in relation to the expected impact on the carriageway that results from parking access.

For the design of sidewalks, it is proposed a combination of two criteria of different nature: one associated with the cross section; and another one related to the minimum area to consider for each user expected (considering cross-section and small enlargements). With regard to the criteria related to the cross section, it were set values that vary depending on the amount of use and the type of functional conflicts expected for a given street (Table 4).

SIDEWALK DIMENSIONS				
FIVE SPACES OF A SIDEWALK		MIN. (m)	MAX. (m)	CRITERIA
A	Protection space	0,4	0,6	1 Px standing
B	Trees	0,6	1,20	Trees alignment
C	Stay area	0,6	0,8	1 Px seated or standing
D	Central corridor	1,3	2,5	Min.= 2 Px circ.; Max.= 4 Px circ.
E	Access to buildings and lots	0,6	2,4	Min. = 1Px circ.; Max = 2Px w/ umb.
TOTAL		3,5	7,5	

Table 4

Note that the possibility of eliminating the space "A" (acceptable in reduced traffic environments or in cases where there is 90º parking) depends on the degree of intensity of the conflict between what goes on in the sidewalk and on the carriageway. he elimination of space "B" necessarily imply loss of quality (it is important to notice that an alternative solution can be adopted: alignment of trees in the parking line or even inside the lots). The space "C", seems to be the easiest to be eliminated (because its absence can be somewhat mitigated by the combination of the other sidewalk spaces). As a result we assure sidewalks between 1.9 (dimension that enables the crossing of two wheelchairs) and 7.5 meters.

3. Usage load

The usage load of a public space represents the type of function as well as its intensity and frequency of use. A more detailed analysis of what occurs in public space, allows easy identification of two fairly distinct types of usage loads:

- Marginal usage load: load that comes directly from the marginal occupation. Sets the impact of the marginal occupation (ex: functions associated with people who are in the public space because they inhabit or use the buildings that border the street).

- Through usage load: independent from the marginal usage load, it represents the quantification of the impact on the use of public space caused by traffic (soft or motorized) crossing. It represents an approximate quantification of the volume of users that intersect and cross a given public space.

The marginal usage load varies according to the building density, the land use and the urban form. On the other hand, the through usage load, depends on the location of the street in the city network, and on the accessibility level of the surrounding area. Table 5 provides a summary description of the adopted method for usage load calculation for each of the functions considered.

		PEOPLE		CARS	
		STAY	CIRCULATE	STAY	CIRCULATE
MARGINAL USAGE LOAD	HOUSING TERTIARY INDUSTRY	ESTIMATE OF THE Nº OF PEOPLE THAT ARE IN THE STREET (PEAK HOUR)		PARKING PLACES IN THE STREETS (REFERENCE VALUES, PER FUNCTIONAL UNIT)	ESTIMATE OF THE NUMBER OF CARS IN CIRCULATION IN THE STREET (PEAK HOUR) (MOTIVATED BY HIS MARGINAL OCCUPATION)
THROUGH USAGE LOAD	HIGH	HYPOTHESIS: TWICE THE PEOPLE OF THE MARGINAL USAGE LOAD ASSOCIATED WITH AN AVERAGE URBAN OCCUPATION.		ESTIMATE OF THE % OF CARS THAT PARK, WHEN CROSSING A STREET	HYPOTHESIS ON THE NUMBER OF CARS THAT "CROSSES" THE STREET AT THE TIP MOMENT
	LOW	HYPOTHESIS: HALF THE PEOPLE OF THE MARGINAL USAGE LOAD ASSOCIATED WITH AN AVERAGE URBAN OCCUPATION.			

Table 5

The analysis of the previous table shows that most of the estimates of the usage load (at the peak hour (and consequently at the peak moment) of a given street), are based on hypotheses that need further validation and verification. Nonetheless, this approach produces results (Table 6) that allow us to test and experiment a novel method for public space dimensioning based on the expected usage load – which is the major goal of the present article.

MARGINAL USAGE LOAD (REFERENCE VALUES FOR THE PEAK MOMENT OF THE STREET USE)				
FUNCTIONS		HOUSING	TERTIARY	INDUSTRY
PEOPLE	Stay	0,1 p. / dwelling (130 m²)	0,8 p. / t. unit (130 m²)	1 p. / i. unit (400 m²)
	Circulate	0,1 p. / dwelling (130 m²)	0,8 p. / t. unit (130 m²)	1 p. / i. unit (400 m²)
CARS	Stay	0,5 place / dwelling (130 m²)	4 places / t. unit (130 m²)	5 places. / i. unit (400 m²)
	Circulate	0,05 cars / dwelling (130 m²)	0,4 cars / t. unit (130 m²)	0,5 cars / i. unit (400 m²)

INTENSE TROUGH USAGE LOAD (REFERENCE VALUES FOR THE PEAK MOMENT OF THE STREET USE)					
FUNCTIONS		HOUSING	TERTIARY	INDUSTRY	TOTAL
PEOPLE	Stay	0,2 p. / dwelling	1,6 p. / t. unit	2 p. / i. unit	Reference values are twice the values related to the marginal usage load of an average urban occupation.
	Circulate	0,2 p. / dwelling	1,6 p. / t. unit	2 p. / i. unit	
CARS	Stay	-	-	-	8 places
	Circulate	-	-	-	10 cars
WEAK TROUGH USAGE LOAD (REFERENCE VALUES FOR THE PEAK MOMENT OF THE STREET USE)					
PEOPLE	Stay	0,05 p. / dwelling	0,4 p. / t. unit	0,5 p. / i. unit	Reference values are half the values related to the marginal usage load of an average urban occupation.
	Circulate	0,05 p. / dwelling	0,4 p. / t. unit	0,5 p. / i. unit	
CARS	Stay	-	-	-	2 places
	Circulate	-	-	-	3 cars

Table 6

4. Model for public space dimensioning

As it was previously explained, this early phase of the research (the first trials) focus exclusively on the street. More specifically, in a 200 meters long street (length that seems to be a good balance, a tolerable approximation, for the distance between two intersections in an urban dispersed environment and the sum of two blocks in a consolidated environment). Moreover it is important to bear in mind that at this stage we will only consider the functions: "circulation" and "staying" of people and cars.

Methodologically, the first step for street dimensioning is the calculation of its marginal and through usage load (based on the reference values presented in 3). Crossing the values estimated for usage load with the technical criteria for the public space functions, it is possible to establish sizing per function (criteria related to the usage load - A). On the other hand, and following the technical criteria for each of the considered functions, it is possible to have a set of technical criteria for the cross section of the "street" (B). Combining A and B it is finally possible to determine the "right" (in a functional approach) size for the street. The next diagram (Figure 1) represents precisely the methodology path adopted.

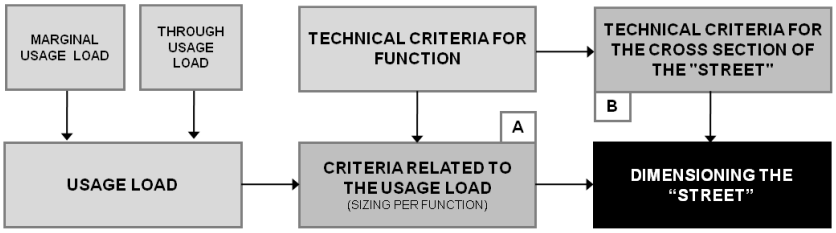


Figure 1

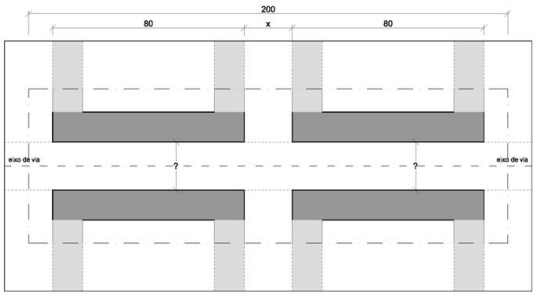
4.1. Presentation of a result: the case of a street of a classic urban form

The proposed model has been tested in two distinct scenarios of through usage load (high and low) and in four different urban forms. However, in the present article, because the method is the paper concern, it will only be presented (with detail) the case of the classic urban form street. Table 7 shows all the trials that were performed and afterwards, it is presented the sequence of the trial that was taken into account in the present article.

STREETS	HIGH THROUGH USAGE LOAD	LOW THROUGH USAGE LOAD
CLASSIC URBAN FORM	X	X
MODERNIST URBAN FORM	X	X
GARDEN CITY	X	X
DISPERSED URBAN FORM	X	X

Table 7

CLASSIC STREET - THREE FLOORS WITH 15% OF TERTIARY USE



USAGE LOAD AT THE PEAK HOUR

MARGINAL OCCUPATION	HOUSING UNITS	79
	TERTIARY UNITS	14
	INDUSTRY UNITS	0

FUNCTIONS		MARGINAL + HIGH THROUGH USAGE LOAD	MARGINAL + LOW THROUGH USAGE LOAD
PEOPLE	TO STAY	114	57
	TO CIRCULATE		
CARS	TO STAY	104	98
	TO CIRCULATE	20	13

PEDESTRIAN FUNCTIONS

NUMBER OF PEOPLE In the street section at the peak hour	114 Persons
AREA DEDICATED TO PEDESTRIAN FUNCTIONS Service area = 11,2 m²/person	A_p = 114 x 11,2 ≈ 1.280 m²
TEST OF A POSSIBLE SOLUTION OF URBAN DESIGN	• Sidewalk – single area dedicated to pedestrian functions • Sidewalk extension = sidewalks – crosses = 360 m

DIMENSIONING THE SIDEWALK (m)

CRITERIA	SPACES OF A SIDEWALK				
	A PROTECTION	B TREES	C STAY	D CENTRAL C.	E ACCESS TO B.
B. CROSS-SECTION	0,6 (MAX. VALUE)	1,2 (MAX. VALUE)	MIN. – 2,5 MAX. – 5,7		
A. USAGE LOAD	-	-	1.280 / 360 = **3,6**		
SOLUTION TO ADOPT	$L_{TOTAL\ OF\ THE\ SIDEWALK}$ = 0,6 + 1,2 + 3,6 = **5,4**				

PARKING (TO STAY + CARS)

NUMBER OF PARKING PLACES Parking places to guarantee	104 lugares de estacionamento
AVAILABLE SPACE ALONG THE STREET Potential number of parking places	Available space = 270 meters [(80 x 4) x 0,85] **Angle parking** (90 degrees) - 270 / 2,5 = 108 lug. (> 104) - (O.K.) Notes: - Parking on both sides of the street. - Only 90-degrees parking spaces does not require the implementation of parking areas in the nearby. - This option can compromise the desirable flow of motorized traffic.

CAR CIRCULATION	
WIDTH OF THE CARRIAGEWAY Maximum value proposed for heavy trough traffic scenario	**6,5 meters**
MAXIMUM NUMBER OF CARS CIRCULATING In the street section at the peak hour	20 cars
TRAFFIC QUEUE LENGTH Evaluation of the conditions of traffic circulation/congestion	20 cars X 5m = 100 meters (≤ 100 meters) - (O.K.)

FINAL STREET SOLUTION: PLAN AND CROSS SECTION

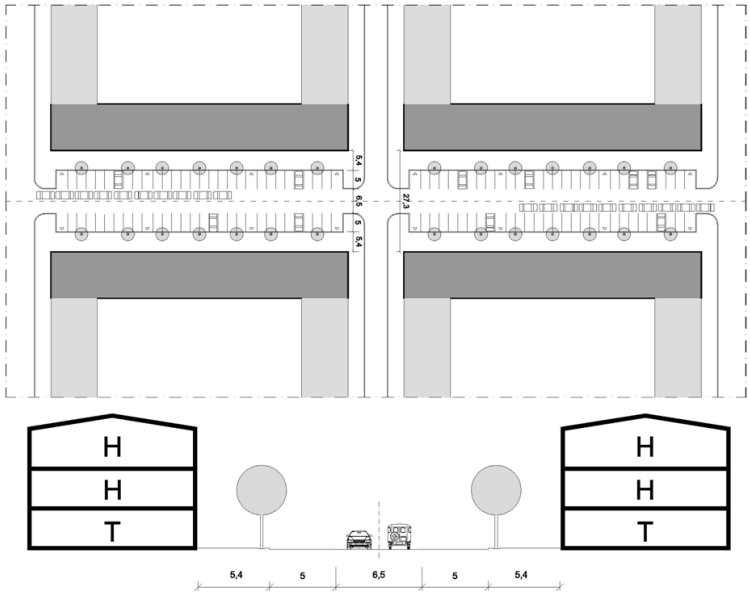


Figure 2

The next table (Table 8) is a summary of all tests that were carried out and turns clear the diversity of solutions that a model of this nature can promote.

SUMMARY OF KEY FINDINGS FROM TESTS								
COMPONENTS OF THE STREET	CLASSIC		MODERNIST		GARDEN		DISPERSED	
	HIGH THROUGH U. LOAD	LOW THROUGH U. LOAD	HIGH THROUGH U. LOAD	LOW THROUGH U. LOAD	HIGH THROUGH U. LOAD	LOW THROUGH U. LOAD	HIGH THROUGH U. LOAD	LOW THROUGH U. LOAD
SIDEWALK	5,4 m	3,5 m	4,3 m [b]	3,5 m [b]	1,8 m + E [c]	Shared [d]	1,9 m	Shared [d]
PARKING	Street (90º) [a] (2,5 x 5)	Street 90º (2,3 x 4,5)	Parking area	Parking area	Street (0º) (6 x 2,3)	Street (0º)	Street (0º) (6 x 2,3) (1 Side)	Street (0º)
CARRIAGEWAY	6,5 m	6 m	6,5 m	6 m	6 m	Gymkhana track	6 m	Gymkhana track
CROSS-SECTION (METERS)	**27,3**	**22,0**	**15,1**	**13,0**	**14,2**	**7,8**	**12,1**	**6,7**

(a) Although the high through traffic volumes (and the consequent risk of congestion), we opted for angle parking (90º).

(b) It should be noted that in this case (modernist form) the pedestrian load is divided by between two spaces: the sidewalk (along the street) and the spaces between buildings.

(c) This sidewalk is comprised by a corridor of 1,8 meters and occasional enlargements (E), interspersed with parking, with 2.3 meters wide.

(d) Adoption of shared street (unitary solution - functional sharing across the street) that requires traffic calming measures (we suggest the introduction of a gymkhana track, by taking advantage of the informal setting of the parking lots.

Table 8

5. Conclusions

The current framework, marked by the absence of rules capable of responding to the severe overlapping of functions that occur in public space, sets a broad range of standard solutions, supported by mono-functional approaches (specific, for example, of the traffic engineering) that completely neglects the context and the role that the occupation of the territory has in the definition of the functional program to be adopted for a particular public space. Moreover, this type of traditional approaches, which inspires the legal and normative framework that acts on the public space projects in Portugal, deals with the territory without distinction, legitimizing the formalization of spaces whose usage load (i.e., the density of occurrences for a particular public space) hardly justifies the huge costs of his construction and maintenance.

Against this background, the present article wants to stand as an effective contribute for the develop of a novel model (and its translation in rules and design guidelines) for sizing the public space according to its expected usage loads. This challenge reflects a project attitude that seeks rationality, a cost/benefit perspective resting on the notion of 'enough', i.e., satisfying the functional needs, expectations and demands of all public space users (with major concern with the soft modes), avoiding "wastes" of "too much" space.

In order to do so, it is proposed that each public space should be dimensioned accordingly to its expected usage load, comprising marginal usage load, the one deriving from marginal occupation (i.e., the uses in the buildings surrounding a given public space), and through usage load, which varies with the trough traffic volumes.

The intense overlapping of functions in public space gives way to several conflicts, whose resolution implies the definition of spatially compatible speed differentials.

The territorial context should also influence the level of functional segregation (or sharing) in a given public space, as it generates quite diverse occurrences.

The application of the model that was carried out and shortly presented in this article comes to show that this methodology (despite embryonic) evidences:

- The inadequacy of existing regulations: because the sizing of public space should respond to different needs and functional requirements (territorially differentiated);

- And the applicability of the model in different scenarios: urban growth; urban renewal/requalification; and production/revision of the legal and regulatory framework that supports the dimensioning of public spaces.

As clues for further investigation, this article suggests the following steps:

- validation and refinement/improvement of the model: the reference values that were used, were built based on assumptions that need support (use of counts and inquiries); test the matured model in more scenarios (develop the model beyond the street).

- Test the production and creation of regulations for the sizing of public spaces.

6. Legends

Table 1 – Public space functions.

Table 2 – Typologies of public spaces.

Table 3 – Technical recommendations per functions and typologies.

Table 4 – Sidewalk spaces and dimensions.

Table 5 – Usage load: method of calculation.

Table 6 – Usage load: reference values for the peak moment of the street use.

Table 7 – Tested streets and through scenarios.

Table 8 – Summary of key findings for all the tests that were carried out.

Figure 1 –Proposed methodology for dimensioning public spaces.

Figure 2 – Dimensioning test – the classic street.

7. Bibliography

ADLER, David, *Metric handbook: planning and design data*, Oxford, Ed. Architectural Press, 1999.

ALVES, F. M. Brandão, *Avaliação da Qualidade do Espaço Público Urbano. Proposta Metodológica*, Lisboa, Fundação Calouste Gulbenkian / Fundação para a Ciência e Tecnologia, 2003.

KOHN, Margaret, *Homo spectator: Public space in the age of the spectacle*, Philosophy & Social Criticism, vol 34, nº 5, 467–486, 2008.

KRIER, Léon, *The City Within the City*, Tokyo, A + U, Special Issue, November, p. 69-152, 1977.

LOBO, M. C., PARDAL, S., CORREIA, P., *Normas Urbanísticas, Volume II - Desenho Urbano, Perímetros Urbanos e Apreciação de Planos*, Lisboa, DGOT/UTL, 1991.

MARSHALL, Stephen, *Streets & Patterns*, London, Spon Press, 2005.

NEUFERT, Ernst, *Arte de Projectar em Arquitectura,* 9.ª Edição (tradução da 21ª edição alemã), São Paulo, Gustavo Gili, 1991.

NOBLE, John; SMITH, Andrew, *Residential roads and footpaths: layout considerations*, 2nd edition, Design bulletin 32, London, Department of the Environment / Department of Transport, HMSO, 1992.

PIRES DA COSTA, A.; SECO, A.; ANTUNES, A., *Hierarquização Viária e de Cruzamentos*, Textos didácticos FEUP / FCTUC, 1999.

SARANDESES, J. M., MOLINA, M. A. H., MURO, M. M., *Espacios Públicos Urbanos - Trazado, Urbanización y Maintenimiento*. Madrid, ITU, MOPU, 1990.

8. Biography

Frederico Moura e Sá. He graduated in Civil Engineering by the University of Porto (FEUP), with a Major in Urban and Regional Planning. He has a Master Degree in Urban and Regional Planning by the University of Aveiro (dissertation: Public Spaces on a Local Scale). Currently he is a PhD student in PDA of FAUP. He began his professional career in 2003 as collaborator of the Urban Planning Division of FEUP and as a researcher of CITTA. He was involved in several projects, including: the study for the rehabilitation of Porto's downtown; the elaboration of a land use plan and of a sustainable mobility plan for the city of Chaves; the development of a strategic plan for the light-rail system of Porto, as well as the evaluation of its overall impact; among others. He is an Assistant at the University of Aveiro since 2008, and researcher of GOVCOPP (Centre for Studies in Governance, Competitiveness and Public Policies). At the moment, he is involved in several projects: "costs and benefits of urban dispersion on a local scale" (just finished), devoting himself mainly to issues of local public infrastructure; requalification of Aveiro's main Avenue (Dr. Lourenço Peixinho); among others. His areas of interest are Infrastructure, Public Space, Urban Design, Urban and Mobility Planning.

Jorge Carvalho. He holds a degree in Civil Engineering from IST, the Technical University of Lisbon. Has a postgraduate diploma in Urban and Regional Planning and a PhD in Applied Environmental Science by the University of Aveiro. His professional activity has focused on urban planning, articulating plans and urban development projects with the corresponding implementation, including the definition of sectoral policies for urban management and organization of municipal services. He coordinated the Research Project "Costs and Benefits of Urban Dispersion on a Local Scale", financed by the Portuguese Foundation for Science and Technology (FCT). He worked in the Municipality of Évora, where he was responsible for the Office of Illegal Urban Areas Recovery and then Director of the Department of Urban Administration (since its foundation in 1980, until1989). He has collaborated with many municipalities, with far greater incidence in Sesimbra, Évora, Coimbra, Póvoa de Varzim and Oliveira de Azemeis. He is Professor at the University of Aveiro since 1991, where he teaches courses in urban planning and municipal administration. His teaching and recent research activities express the thought processes developed over the years in practice. He is the author of several publications in these areas, the most important are: "Ordenar a Cidade" (2003), Quarteto, Coimbra, "Perequação, Taxas e Cedências" (2003), Almedina, Coimbra (with Fernanda Paula Oliveira); "Formas Urbanas" (2003), Minerva, Coimbra.