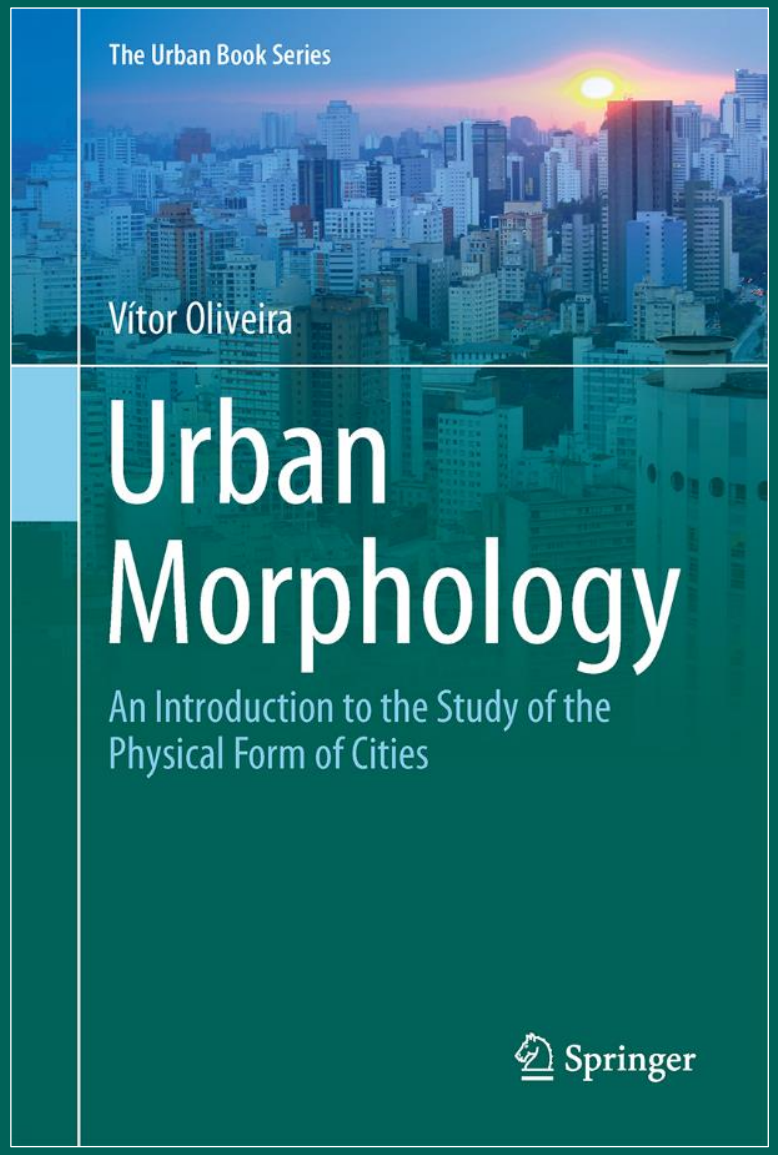
VITOR OLIVEIRA

URBAN MORPHOLOGY

MORFOLOGIA URBANA

AN INTRODUCTION TO THE STUDY OF THE PHYSICAL FORM OF CITIES

UMA INTRODUÇÃO AO ESTUDO DA FORMA FÍSICA DAS CIDADES



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MORPHO

1. Introduction
2. Different scales
3. Different urban landscapes
4. Different periods of formation
5. Physical form of cities and urban life
6. Scientific research and professional practice
7. Exercise

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1. Introdução
2. Diferentes escalas
3. Diferentes paisagens urbanas
4. Diferentes períodos de formação
5. Forma física das cidades e vida urbana
6. Investigação cientifica e prática profissional
7. Exercício

INTRODUCTION

INTRODUÇÃO

WHY URBAN MORPHOLOGY?

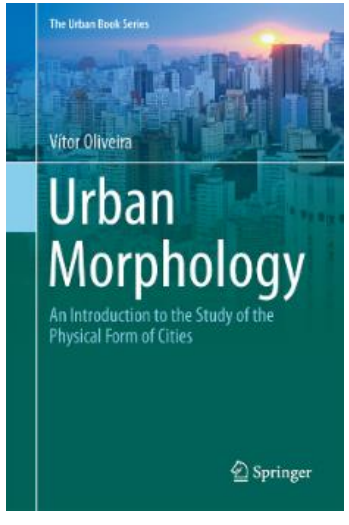
Because urban form matters, it has an influence on urban life.
Urban morphology can offer a scientific description of urban form (an object of great complexity), explaining the processes and agents that shape it over time; it can also offer evidence for practice on that form.

PORQUÊ O INTERESSE PELA MORFOLOGIA URBANA?

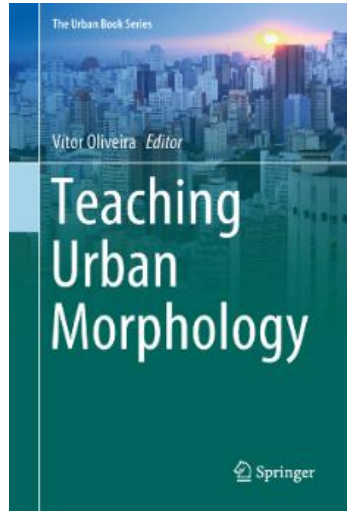
Porque a forma urbana influencia a vida urbana.
A morfologia urbana fornece uma descrição cientifica da forma urbana (um 'objeto de grande complexidade), explicando os processos e os agentes que transformam essa forma ao longo do tempo; podendo também fornecer evidência de suporte à pratica profissional.

RECENT MORPHOLOGICAL RESEARCH

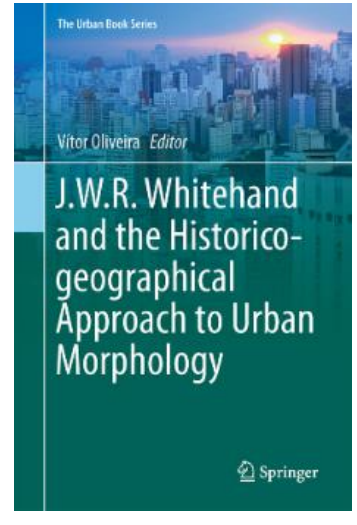
INVESTIGAÇÃO RECENTE EM MORFOLOGIA URBANA



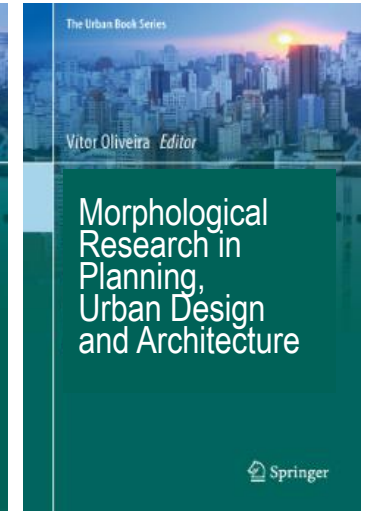
2016



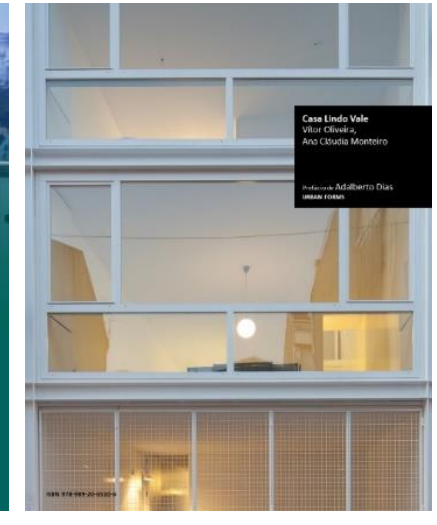
2018



2019



2021



2016

RESEARCH ON MORPHO METHODOLOGY

INVESTIGAÇÃO SOBRE A METODOLOGIA MORPHO

Oliveira V (2020) **The ground plan as a unifying concept**, *Journal of Urban Research and Development* 1, 45-59.

Oliveira V, Medeiros V, Corgo J (2020) **The urban form of Portuguese cities**, *Urban Morphology* 24, 145-66.

Francisco A, Oliveira V (2020) **Explorying the relations between urban form and social fabric,** *Revista de Morfologia Urbana* 8.

Oliveira V, Medeiros V (2016) **Morpho: combining morphological measures**, *Environment and Planning B* 43, 805-25.

Oliveira V (2013) **Morpho, a methodology for assessing urban form**, *Urban Morphology* 17, 149-61.

Oliveira V, Silva M (2013) **Morpho: urban morphological research and planning practice**, *Revista de Morfologia Urbana* 1, 31-44.

HOW TO ADRESS SUCH A COMPLEX OBJECT?

COMO ABORDAR UM ‘OBJECTO’ TÃO COMPLEXO?

Greene Street, New York (Vítor Oliveira)

The alignment of buildings along the street

The relation between buildings and street at the ground floor

The width of the street

The dimension of street-blocks

The frontage of street-blocks

The geometry of the street

The position of buildings within the plots

The age of the street

The relation between the height of buildings and the width of the street

Selecting characteristics for describing the physical form of cities

The area of plots

The buildings facades

The density of plots per street block

The plot frontages

The step-back of buildings

The age of buildings

The spatial relation between the street and the surrounding cities and the city

The land and building utilization

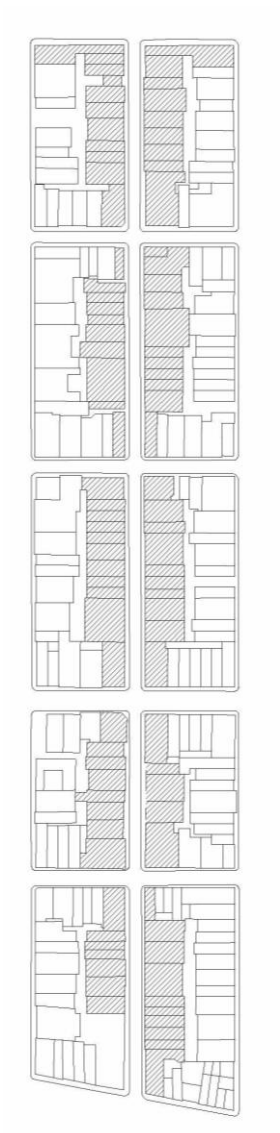
The interior arrangement of buildings

The open/exterior space of the plots

The architectural style

The height of buildings

Greene Street, New York (Vítor Oliveira)



Greene Street, New York

A focus on the most permanent elements of urban form – those that represent a higher investment, in the past, and that are more difficult to change, in present and future.

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Um enfoque nos edifícios mais permanentes da forma urbana – os que representam um maior investimento passado e que são mais difíceis de transformar no presente e no futuro.

DIFFERENT SCALES

DIFERENTES ESCALAS

METROPOLITAN SCALE . ESCALA METROPOLITANA

What should be the most important elements and characteristics to address at the metropolitan scale?
The focus should be on the main stocks and flows of the metropolis.
Streets and plots (or buildings) should constitute the elements of inquiry for this first layer of analysis.
The main variations of the physical form of the metropolitan territory would be justified by variations in the density of streets (nodes and segments) and in the density of plots (or buildings).

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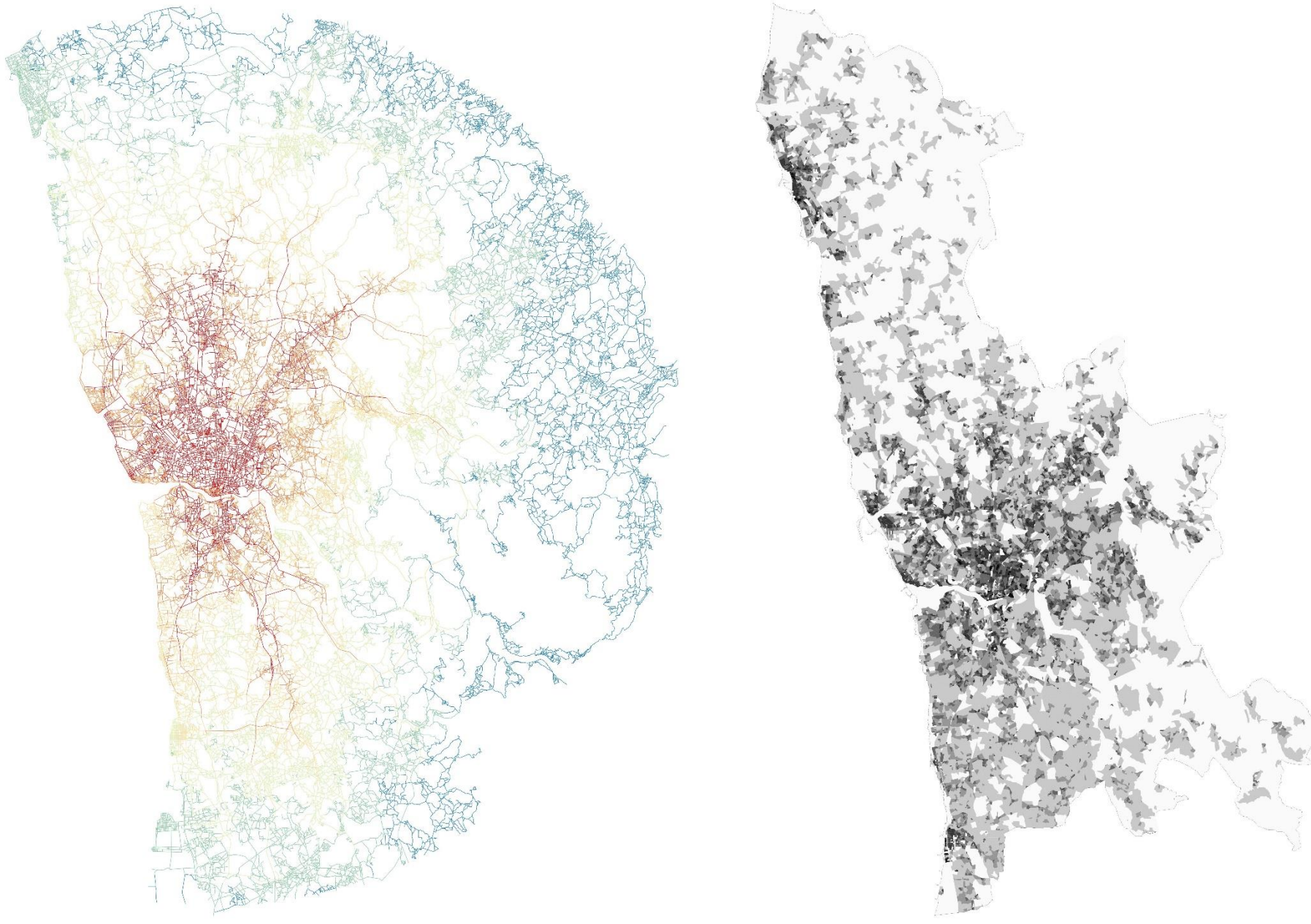
Quais devem ser os elementos e as características mais importantes a serem abordados à escala metropolitana?
O foco devem ser os principais *stocks* e fluxos da metrópole.
Ruas e parcelas (ou edifícios) devem constituir os elementos de investigação neste primeiro *layer* de análise.
As principais variações da forma física do território metropolitano são justificadas por variações na densidade de ruas (nós e segmentos) e na densidade de parcelas (ou edifícios).

Table. The town-plan and the different scales of analysis

	Town-plan				Building fabric	Land utilization
	Streets	**Street-blocks**	**Plots (or buildings)**	**Block-plans of buildings**		
Metropolitan	Accessibility of streets, density of nodes	-	Density of plots (or buildings)	-	-	-
City	Accessibility of streets, density of nodes	Density of street-blocks	Density of plots (or buildings)	Coincidence plot / building frontages (density)	-	-
Neighbourhood	Accessibility of streets, density of nodes	Density of street-blocks	Density of plots (or buildings), width of plot frontages	Coincidence plot / building frontages (density)	Relation building height / plot width	Land and building utilization



Porto Metropolitan Area: accessibility of streets (Serra and Pinho, 2013) and density of buildings

Área Metropolitana do Porto: acessibilidade das ruas (Serra e Pinho, 2013) e densidade de edifícios.

Table. Different scales: metropolitan, city and neighbourhood

	Integration of streets (r25,000)			**Size of street-blocks (%)**			**Density of Buildings (%)**			**Coincidence building/plot front.**	
	Max	Ave	Min	Sma	Med	Lar	Hig	Med	Low	C+MC	NC+MNC
Porto metropolitan area	8135.8	4136.6	172.5	31,1	21,4	47,5	20,0	22,8	57,2	-	-
Porto city	8135,8	6235.2	3858.5	47,8	23,5	28,7	38,1	24,7	37,2	48,3	51,7
Caxinas neighbourhood	2386.2	2096.9	1715.9	55,3	36,8	7,9	81,6	7,9	10,5	73,7	26,3

Accessibility of streets: Max – Maximum, Ave – Average, Min – Minimum
Size of street-blocks: Sma – Small, Med – Medium, Lar – Large
Density of buildings: Hig – High, Med – Medium
Coincidence between building and plot frontages: C – Coincident, MC – Mostly Coincident, MNC – Mostly Non-Coincident, NC – Non-Coincident.

CITY SCALE . ESCALA DA CIDADE

The analysis should encompass streets, street-blocks, plots and buildings.
Density is the main characteristic under inquiry, in a direct or indirect way.
The new criteria (in relation to metropolitan scale):
i. density of street-blocks,
ii. the coincidence between building and plot frontages.

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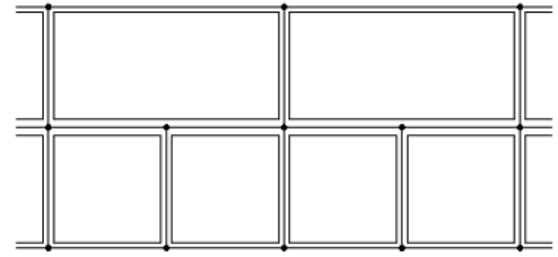
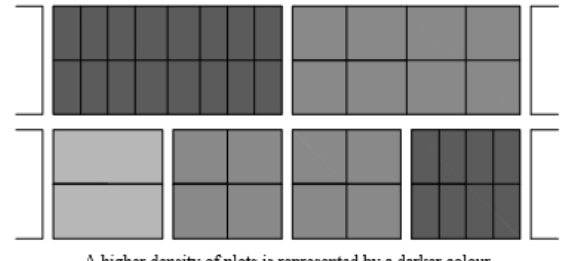
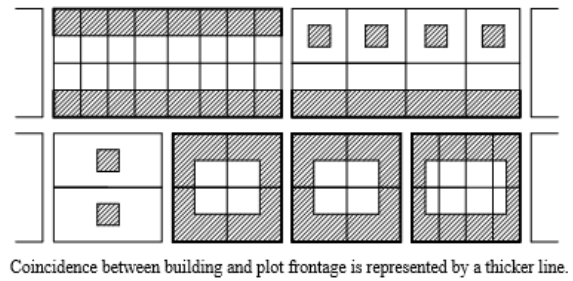
A análise deve abranger ruas, quarteirões, parcelas e edifícios.
A densidade é a principal característica a ser explorada, de modo direto ou indireto.
Os novos critérios (em relação à escala metropolitana):
i. densidade de quarteirões,
ii. coincidência entre fachada do edifício e frente da parcela.

Criteria	Measurement	Illustration
1. Spatial accessibility of streets	It measures the integration and choice potential of each segment of street	
2. Dimension of street blocks	It measures the area of each street block	 A higher density of blocks (smaller area) is represented by a darker colour.
3. Density of plots	It measures the number of plots and divides it by the area of the respective street block	 A higher density of plots is represented by a darker colour.
4. Coincidence between building and plot frontages	It measures the number of plots where building and plot frontage is coincident	 Coincidence between building and plot frontage is represented by a thicker line.

City of Porto: accessibility of streets (Serra and Pinho, 2013) and density of buildings

Cidade do Porto: acessibilidade das ruas (Serra e Pinho, 2013) e densidade de edifícios.

Table. Different scales: metropolitan, city and neighbourhood

	Integration of streets (r25,000)			**Size of street-blocks (%)**			**Density of Buildings (%)**			**Coincidence building/plot front.**	
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Accessibility of streets: Max – Maximum, Ave – Average, Min – Minimum
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NEIGHBOURHOOD SCALE

The analysis of ground plan is complemented with an inquiry to the main elements of building fabric and land use.

ESCALA DO BAIRRO/FREGUESIA

A análise do ‘plano de cidade’ é complementada com um inquérito aos principais elementos da tecido edificado e dos usos do solos.

Caxinas, a neighbourhood with a high density of buildings (Google Earth)
Caxinas, uma área com uma grande densidade de edificios

Caxinas morphological description

The relief has no significant variations.
The **spatial accessibility of the street system** is very high, at neighbourhood and urban scales.
The area has 53 **street intersections**; 24 of these are 4-ways nodes (balance between accessibility and privacy).
The area is made of 38 **street-blocks**: more than half is 'small', three are 'large' street-blocks.
4/5 of these street-blocks has a high **density of plots**; only four have a low density of plots.
In many occasions plot width is less than 5m.
Building and plot frontages are coincident, or mostly coincident, in ¾ of the street-blocks.

Most of the 1.500 buildings have 1 or 2-**storeys**. ¼ has 3 or 4 storeys, and only a small minority has 5 or more.
Most streets have between 7,5 and 15m **width**.
While 85% of the buildings have exclusively a residential use, only six of the 38 street-blocks are exclusively residential and 2 street-blocks remain empty.

The two most vibrant streets of Caxinas are the seafront and the first parallel street – Dr. Carlos Pinto Ferreira.
The latter is 1.000m long.
The west and the east sides of the street are made of, respectively, 108 and 130 buildings, opening their doors directly into the street – including single-family houses, multi-family houses, restaurants and coffee shops, supermarkets and fruit shops, hairdressers, banks, to name the most important.
This means that on average, and one each side of the street, there is one new building each 8m.
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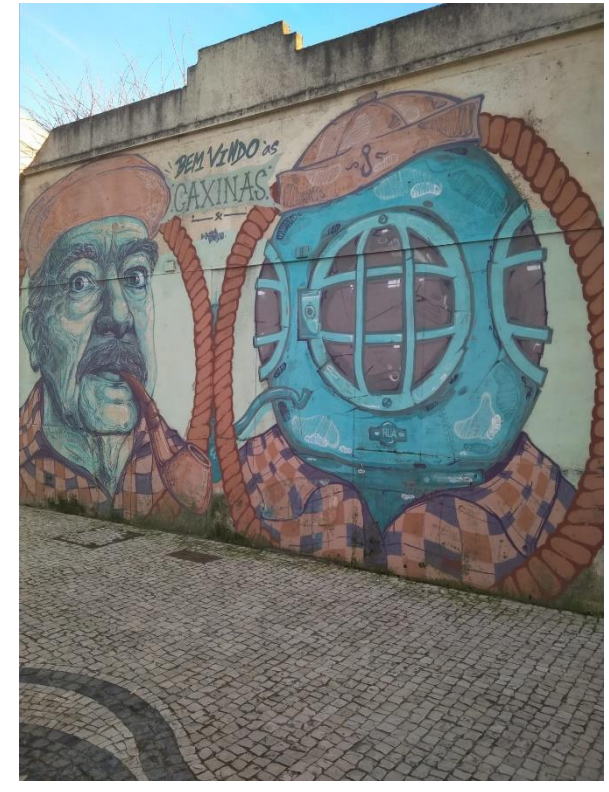

Caxinas (Vítor Oliveira)

DIFFERENT URBAN LANDSCAPES

DIFERENTES PAISAGENS URBANAS

Because of its focus on the most structural aspects of urban form, Morpho can be applied in the description of very different urban landscapes, from ‘planned’ to ‘unplanned’.

Devido ao seu enfoque nos aspectos mais estruturais da forma urbana, a Morpho pode ser aplicada na descrição de paisagens urbanas muito diferentes, das ‘planeadas’ às ‘não planeadas’.

Rua do Almada, Porto, and Gens, Gondomar - aerial views, approximately at the same scale (Google Earth)

Different landscapes: ‘planned’ and ‘unplanned’

	Integration of streets (r25,000)			Size of street-blocks (%)			Density of Buildings (%)			Coincidence building/plot front.	
	Max	Ave	Min	Sma	Med	Lar	Hig	Med	Low	C+MC	NC+MNC
Rua do Almada (Porto)	7113.7	6469.9	5856.4	40,0	30,0	30,0	40,0	40,0	30,0	100,0	0,0
Gens (Gondomar)	4185.3	3146.3	2528.5	40,0	13,3	46,7	26,7	26,7	46,6	0,0	100,0

Rua do Almada

The street is 800 m long and 10 m wide.
It links two squares, Loios in the south and República in the north (República located 50m higher than the former).

The street is part of the integration core of the **street-system** at the neighbourhood, city and metropolitan scales.
The street has six intersections, four 4-ways nodes and two 3-ways nodes, reflecting the adaptation to the rugged relief.
Almada is made of ten street blocks and 344 buildings.
Street-blocks are mainly small or medium, and have medium-to high-density of **buildings** per hectare.
Building and plot frontages are coincident in all plots.

2/3 of the buildings in Almada are three or four storeys high. The largest street-block of this set includes 121 buildings.
58 of these face the Almada street.
In a significant part of these buildings, frontage is about 5m and depth ranges between 20 and 90m.
Over more than two centuries, buildings were conserved recurring to small maintenance works.
Yet, eight buildings erected in the last decades of the 20th century can be found in these 58 plots.
However, even in this set of eight buildings, seven were built in the original plots of the 18th century, and only one building was erected on a plot resulting from plot amalgamation (of two different plots).
…

Gens

Small settlement in the parish of Foz do Sousa, Gondomar. While the settlement size has been considerably small until the 1950s, the major stage of development took place in the 1970s and 1980s.
The relief has a significant variation, between 70m in the south-west limit and 130m in the east limit.

The **streets** are segregated, particularly at the city scale.
The only exception, when analysed at the neighbourhood scale, is the triangle formed by Castanheira and Central de Gens streets.
The street system is made of more than forty 3-ways nodes and only three 4-ways nodes – high discontinuity of streets being now overlapped by motorways and their accesses.
Street width varies between 5 and 10m.
Fifteen **street-blocks** have been identified; almost half of it being large street-blocks.
About half of these street-blocks have low density of **plots**. While **building and plot frontages** are non-coincident or mostly non-coincident is all street-blocks, there is some coincidence in the two streets of higher integration.
Almost all 400 buildings have one to two storeys high (and 5% have three to four storeys).
Gens is a residential area; almost all its buildings are exclusively residential.
…

Rua do Almada (Vitor Oliveira)

DIFFERENT PERIODS OF FORMATION

DIFERENTES PERIODOS DE FORMAÇÃO

Historical areas are different from new urban areas.
The strengths, weaknesses, opportunities and threats of each one are singular.
Yet, in physical terms, historical and new areas are made of the same elements – streets, street-blocks, plots and buildings.

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As áreas históricas são diferentes das áreas de formação recente.
Os pontos fortes e fracos, as oportunidades e as ameaças de cada uma são singulares.
No entanto, em termos físicos, áreas históricas e as novas são constituidas pelos mesmos elementos - ruas, quarteirões, parcelas e edifícios.

Historical area in Porto and new area in south Vila do Conde – aerial views, approximately at the same scale (Google Earth)

	Integration of streets (r25,000)			Size of street-blocks (%)			Density of Buildings (%)			Coincidence building/plot front.	
	Max	Ave	Min	Sma	Med	Lar	Hig	Med	Low	C+MC	NC+MNC
Porto historical kernel	7373.6	5928.8	4664.2	83,8	13,7	2,5	67,5	18,8	13,7	100,0	0,0
South Vila do Conde	2405.9	2175.5	1870.3	38,5	46,1	15,4	7,7	30,8	61,5	30,8	69,2

Porto historical area

Relief of this area, in a valley structure, has significant variations, ranging from the water level to 90m in the northeast part.

The integration of these historical **streets** in the whole street system is high at the three scales of analysis, being slightly higher at the metropolitan and city scales than at the neighbourhood scale.

The 'walled area' is made of 80 street-blocks and around 1,400 buildings.

More than 4/5 of the **street-blocks** are 'small'.

2/3 of the street-blocks have high density of **plots**; less than 1/5 has low density of plots – mainly made of open spaces and institutions.

Building and plot frontages are coincident, or mostly coincident, in all street-blocks.

More than half of the 1.400 buildings is three or four storeys; 30% is one or two storeys, and 16% has five or more storeys. Street width is quite variable.

Building height is usually higher than street width, creating the usual 'canyon' section of medieval cities.

Mixture of uses exists in more than ¾ of the street-blocks; 14% is exclusively residential and 9% is exclusively non-residential.

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New area in South Vila do Conde

The natural setting for this urban landscape is exceptional, being at the river mouth of the Ave; relief is almost flat. Despite the close distance to Caxinas (a place of high integration), the **streets** that make this area are poorly integrated in the whole street system in all three scales of analysis, particularly at the metropolitan scale.

The area is made of 26 street intersections, including only two 4-ways nodes, revealing a fragmented street layout.

The area is made of thirteen **street-blocks**.

More than 4/5 of these street-blocks are small- or medium-size.

Almost 2/3 of these street-blocks have low density of **plots**.

In more than 2/3 of the street-blocks **buildings setback** from the street.

More than half of these buildings are three or four storeys high; 30% have five or more storeys and 15% are one or two storeys.

Street width is usually large, varying from 12 to 25m.

Accordingly, street width is larger than building height, creating an 'open' section.

In addition to the low number of plots, there is also a low number of promoters creating a monotonous landscape.

The area is almost exclusively residential.

Only two of the 121 buildings have mixture of uses.

…

Historical area (Vitor Oliveira)

PHYSICAL FORM OF CITIES AND URBAN LIFE

FORMA FÍSICA DAS CIDADES E VIDA URBANA

The hypothesis is that
urban landscapes which are physically dense, accessible and continuous
are also socially and economically diverse, and environmentally sustainable.

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A hipótese é que
paisagens urbanas fisicamente densas, acessíveis e contínuas
são também social e economicamente diversas e ambientalmente sustentáveis.

Case Study and Samples

Caso de estudo e amostras

1. *Praça da Ribeira*
Medieval (3,6 % of the four tissues in Porto)

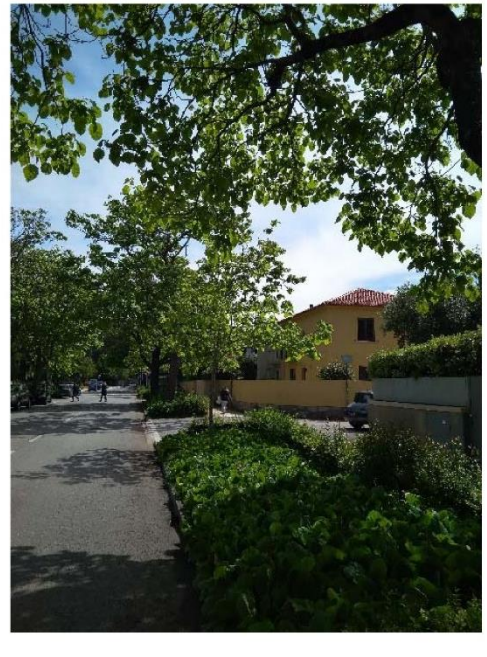
2. *Largo Soares dos Reis*
19th century (44,6 %)

3. *Av. Marechal Gomes da Costa*
First half of 20th century (23,1 %)

4. *Rua H. Lopes de Mendonça*
Second half of 20th century (28,7 %)

Medieval (3,6 %)

19th century (44,6 %)



1st half of 20th century (23,1 %)

2nd half of 20th century (28,7 %)

Table. Morphological analysis of the four samples

	Medieval	19th century	20th century: 1st half	20th century: 2nd half
Streets				
Number of streets	30	10	13	10
Intersection density: 4-ways nodes	14	17	12	1
Intersection density: 3-ways nodes	25	10	17	13
Normalized angular integration (average)	0,913	1,141	0,934	0,811
Street-blocks				
Number of street-blocks	34	16	18	2
Number of street-blocks per hectare	2,157	0,918	1,089	0,128
Plots				
Number of plots	464	350	245	47
Number of plots per hectare	29,44	22,95	14,82	3,01
Buildings (block-plans)				
% of blocks with C and MC frontages	91,18	100,00	0,00	0,00

Note: C – Coincident . MC – Mostly Coincident

Table. Economic diversity of the four samples

	Medieval		**19th century**		**20th century: 1st half**		**20th century: 2nd half**	
Classification of Economic Activities / CAE number of Companies (C) and Workers (W)	C	W	C	W	C	W	C	W
A. Agriculture, animal production, hunting, forest	1	3	0	0	0	0	0	0
B. Extractive industries	0	0	0	0	0	0	0	0
C. Manufacturing industries	5	18	10	89	0	0	1	2
D. Electricity, gas, steam, hot and cold water	0	0	0	0	0	0	0	0
E. Water collection, treatment and distribution	1	5	0	0	0	0	0	0
F. Construction	3	28	0	0	1	1	2	7
G. Wholesale and retail trade	24	68	34	158	2	3	13	149
H. Transports and storage	14	190	6	25	0	0	0	0
I. Accommodation, catering and similar activities	55	365	10	58	0	0	1	7
J. Communication and information activities	1	3	3	30	0	0	0	0
K. Insurance and financial activities	8	27	2	10	1	1	1	4
L. Real estate activities	0	0	4	9	1	1	7	12
M. Consulting, scientific, technical	14	54	7	40	9	18	10	47
N. Support services and administrative activities	6	30	4	437	1	5	0	0
O. Public administration and defence; social security	1	76	0	0	0	0	0	0
P. Education	4	35	3	63	0	0	1	2
Q. Social support and human health activities	7	234	2	26	5	13	19	39
R. Artistic, shows, sports and recreational activities	1	63	3	6	0	0	1	11
S. Other service activities	9	84	6	23	0	0	2	6
T. Activities of families employing domestic staff	0	0	0	0	0	0	0	0
U. Activities of international organizations	0	0	0	0	0	0	0	0
Diversity Index – Companies	0,825		0,834		0,753		0,808	
Diversity Index – Workers		0,847		0,752		0,717		0,680

Table. Synthesis

	Medieval	19th century	20th century: 1st half	20th century: 2nd half
Streets: intersection density, 4-ways n.	**14**	**17**	**12**	**1**
Streets: normalized angular integration	**0,913**	**1,141**	**0,934**	**0,811**
Street-blocks: number per hectare	**2,157**	**0,918**	**1,089**	**0,128**
Plots: number per hectare	**29,44**	**22,95**	**14,82**	**3,01**
Buildings/plots: % of blocks C and MC	**91,18**	**100,00**	**0,00**	**0,00**
Education: diversity index	**0,727**	**0,798**	**0,664**	**0,637**
Employment: diversity index	**0,627**	**0,581**	**0,469**	**0,418**
Dwelling size: diversity index	**0,590**	**0,642**	**0,546**	**0,557**
Econ. activities – companies: div. index	**0,825**	**0,834**	**0,753**	**0,808**
Econ. activities – workers: div. index	**0,847**	**0,752**	**0,717**	**0,680**
Land consumption: density of residents	**121,89**	**101,44**	**40,23**	**114,09**
Land consumption: density of workers	**81,41**	**63,87**	**2,54**	**18,32**
Land and energy cons.: mov. individuals	**547,68**	**388,80**	**34,08**	**66,72**

Note: The darker the background, the more positive is the combined result of each dimension – physical, social, economic and environmental.

RESEARCH AND PRACTICE
INVESTIGAÇÃO E PRÁTICA

It is argued that the elements applied in the description of different areas (in terms of scale, content and time formation), can be used in the prescription of their future transformation.
Over the last decades, planning has been mainly addressing land uses and some aspects of building fabric.
Although these are important aspects, it is argued that these should not be the focus of planning practice.
On the contrary, the focus should be on the most structural and persistent elements of urban form.

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Sustenta-se que os elementos utilizados na descrição de diferentes áreas (em termos de escala, conteúdo e formação), podem ser usados na prescrição da sua transformação futura.
Nas últimas décadas, o planeamento tem-se centrado nos usos do solo e em alguns aspectos do tecido edificado.
Embora esses aspectos sejam importantes, sustenta-se que não devem constituir o 'centro' da prática de planeamento.
Pelo contrário, o enfoque deve estar nos elementos mais estruturais e persistentes da forma urbana.

The way the **system of streets**, squares and gardens is organized, as well as the density of its elements and its intersections, allowing more or less spatial accessibility, and thus favouring or hindering the flows of movement, is a decisive factor in structuring a territory and promoting effective urban cohesion.

Each transformation of this system, given its high permanence in time, must be correctly evaluated.

In the assessment of a new transformation, spatial accessibility should not be dependent of the regularity or the orthogonality (as opposed to curvilinear) of the new streets, but on the way in which the new streets are proposed to be articulated with the existing system, reinforcing or weakening it.

In addition, street design must change the focus from vehicles to people.

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O modo como se organiza o **sistema de ruas**, praças e jardins, bem como a densidade dos seus elementos e das suas interseções, permitindo uma maior ou menos acessibilidade espacial, e assim favorecendo ou dificultando os fluxos de movimento, é um factor decisivo na estruturação de um território e na promoção de uma efetiva coesão urbana.

Cada transformação deste sistema, dada a sua elevada permanência no tempo, deve ser avaliada corretamente.

Na avaliação de uma nova transformação, a acessibilidade espacial não deve estar dependente da regularidade ou da ortogonalidade (em oposição a curvilínearidade) das novas ruas, mas sim do modo como as novas ruas se articulam com o sistema existente, reforçando-o ou enfraquecendo-o.

Para além disso, o desenho do sistema de ruas deve mudar o foco dos veículos para as pessoas.

The definition of a street system is always associated with the conformation of a **street-block system**.
In a way, the two systems correspond to the ‘full’ and ‘empty’ of the same object.
The first system guarantees urban flows, the second provides support for the construction of building stocks.
It is argued that urban stocks and flows should have high density.
The smaller these blocks are (within certain limits), and the smaller the ‘segments’ defining the blocks are, the higher the possibility of spatial interaction is.

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A definição de um sistema viário está sempre associada à conformação de um **sistema de quarteirões**.
De certo modo, os dois sistemas correspondem ao ‘cheio’ e ao ‘vazio’ de um mesmo objeto.
O primeiro sistema garante os fluxos urbanos, o segundo fornece o suporte para a construção do stock edificado.
Sustenta-se que os *stocks* e os fluxos urbanos devem ter uma elevada densidade.
Quanto menores forem esses quarteirões (dentro de certos limites), e quanto menores forem os 'segmentos' que definem os quarteirões, maior é a possibilidade de interação espacial.

In each street-block, a high density of **plots** potentially corresponds to a high presence of agents and, as such, to a high diversity of urban strategies.

The increase in plots size and the reduction in the number of agents has been one of the most significant changes that occurred in the 20th century in the physical form of cities, with consequent losses in different aspects of urban life.

In this sense, low density of plots per street-block should be avoided.

On the contrary, the definition of small- and medium-width of plot frontages along a street corresponds to an effective valuation of each linear meter of contact between public (street) and private space (plot).

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Em cada quarteirão, uma elevada densidade de **parcelas** corresponde, potencialmente, a uma elevada presença de agentes e, como tal, a uma grande diversidade de estratégias urbanas.

O aumento da dimensão das parcelas e a redução do número de agentes foi uma das mudanças mais significativas ocorridas no século XX na forma física das cidades, com consequentes perdas em diversos aspectos da vida urbana.

Nesse sentido, a baixa densidade de parcelas por quarteirão deverá ser evitada.

Pelo contrário, a definição de frentes de parcela de pequena e média largura ao longo de uma rua, corresponde a uma valorização efetiva de cada metro linear de contacto entre o espaço público (rua) e o espaço privado (parcela).

Each **building** to be erected on each of these plots will confirm its diversity potential.
It should also actively contribute to the formal definition of the street as an attractive place for different modes of transport, particularly the pedestrian mode.
In this sense, building and plot frontages should be as close as possible, or should be coincident.
Additionally, this particular position of the building on the plot is the most advantageous option in terms of the definition of background open-space.

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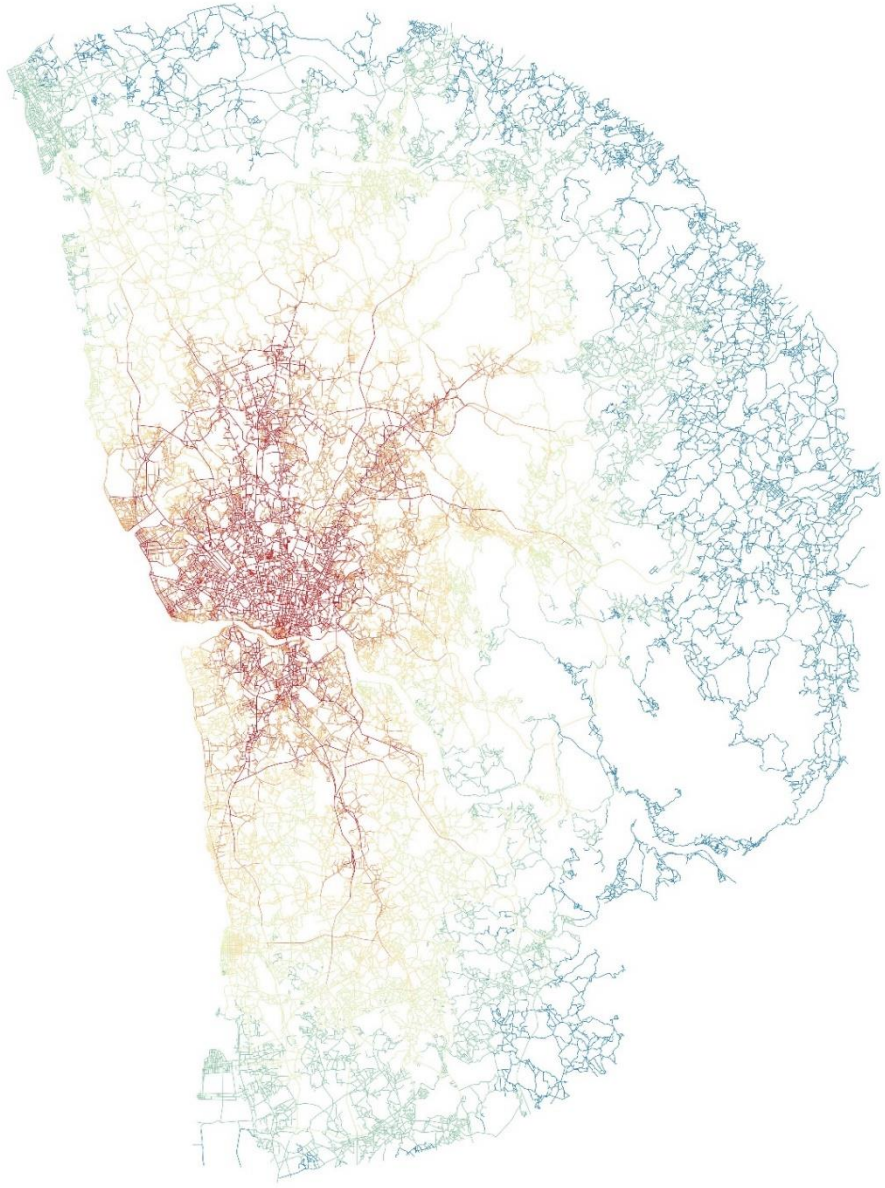
Cada **edifício** a ser construido em cada uma dessas parcelas confirmará seu potencial de diversidade.
Deverá também contribuir ativamente para a definição formal da rua como um lugar atrativo para diferentes modos de transporte, particularmente o modo pedonal.
Nesse sentido, as frentes do edifício e do lote devem ser o mais próximas possível, ou ser coincidentes.
Para além disso, esta posição particular do edifício no terreno é a opção mais vantajosa em termos de definição do espaço aberto da parcela.

EXERCISE

EXERCICIO

Streets - spatial accessibility

Ruas - acessibilidade espacial



Integration is high at the three scales of analysis, being slightly higher at the metropolitan and city scales.

A integração é elevada nas três escalas de análise, sendo ligeiramente maior nas escalas metropolitana e municipal.

Spatial accessibility of streets (Serra and Pinho, 2013)

Streets-blocks - density

Quarteirões - densidade

The ‘walled area’ is made of 80 street-blocks.
More than 4/5 of the street-blocks are ‘small’.

A anterior 'área muralhada' é composta por 80 quarteirões.
Mais de 4/5 dos quarteirões são ‘pequenos’.

	Size of street-blocks (%)		
	Small	Medium	Large
Porto historical kernel	83,8	13,7	2,5

Plots - density

Parcelas - densidade

2/3 of the street-blocks have high density of plots. Less than 1/5 has low density of plots – mainly made of open spaces and institutions.

2/3 dos quarteirões têm uma elevada densidade de parcelas. Menos de 1/5 tem baixa densidade de parcelas – sendo compostos essencialmente por espaços abertos e instituições.

	Density of plots (%)		
	High	Medium	Low
Porto historical kernel	67,5	18,8	13,7

Building and plot frontages - coincidence

Frentes de edifícios e de parcelas - coincidência

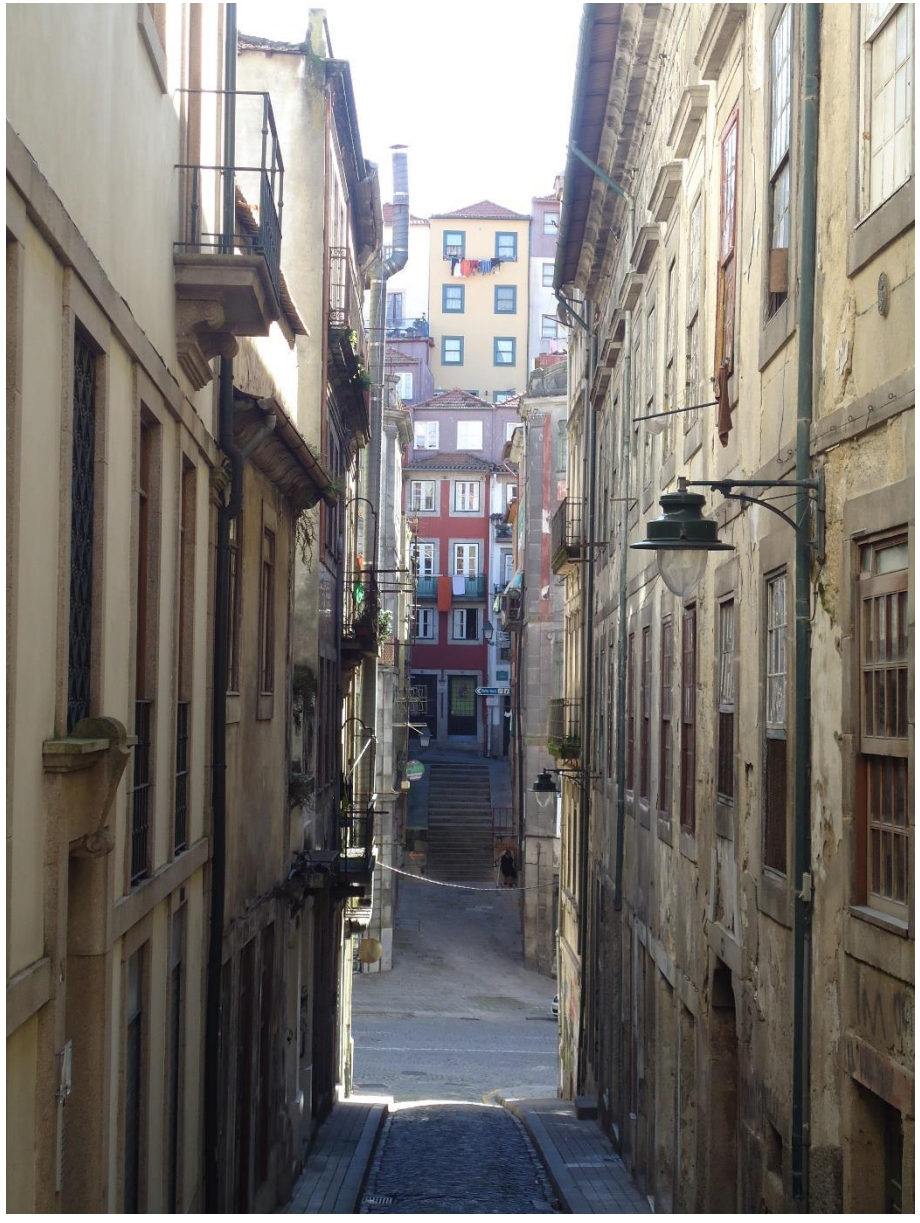
Building and plot frontages are coincident, or mostly coincident, in all street-blocks.

As frentes dos edifícios e das parcelas são coincidentes, ou maioritariament coincidentes, em todos os quarteirões.

	Coincidence b. building and plot frontage	
	C+MC	NC+MNC
Porto historical kernel	100,0	0,0

Building fabric

Tecido edificado



(Vítor Oliveira)

More than half of the 1.400 buildings is three or four storeys.
30% is one or two storeys, and 16% has five or more storeys.
Street width is quite variable.
Building height is usually higher than street width, creating the usual ‘canyon’ section of medieval cities.

Mais da metade dos 1.400 edifícios têm três ou quatro pisos.
30% tem um ou dois pisos, e 16% tem cinco ou mais pisos.
A largura das ruas é bastante variável.
A altura dos edifícios é geralmente maior do que a largura da rua, criando a perfil longitudinal *canyon* usual nas cidades medievais.

Land and building utilization

Uso do solo e do edificado

Mixture of uses exists in more than ¾ of the street-blocks.

14% of street-blocks is exclusively residential and 9% is exclusively non-residential.

A mistura de usos existe em mais de ¾ dos quarteirões.

14% dos quarteirões é exclusivamente residencial e 9% é exclusivamente não residencial.

(Vítor Oliveira)