

Vítor Oliveira

# **AN INTEGRATED APPROACH TO URBAN FORM**

Project developed with Cláudia Monteiro , Jenni Partanen and Jeremy Whitehand (Scientific Adviser).  
Founded by the ‘International Seminar on Urban Form’.

Morpho: a methodology for assessing urban form

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Revised version received 15 September 2012

**Abstract.** A methodology is proposed for assessing the physical form of urban areas. Turned morpho, it deals with fundamental elements of urban form: streets, plots and buildings. It includes seven assessment criteria: one for each of the elements individually, one for each relation between parts of elements; and finally, one linking form and function. The application of this methodology provides a quantitative assessment of the 'morphological basis' of an urban area, identifying its strengths and weaknesses. It is argued that morpho can make an important contribution to urban research and practice.

**Keywords:** assessment methodology, urban form, streets, plots, buildings

In recent decades there has been a significant growth in the amount of research on the physical form of urban areas. This is particularly evident in the increasing number of publications on both urban morphology specifically and more generally on the built environment. Journals that have commenced publication in the last 4 decades include *Built Environment* (established in 1974), *Environment and Planning B* (1974), *Urban Design International* (1996), *Journal of Urban Design* (1996), *Urban Morphology* (1997), *Journal of Urbanism* (2008) and *Journal of Space Syntax* (2010). This growth is also expressed in the establishment of international research networks such as the International Seminar on Urban Form (including its three national/regional groups – Nordic, Italian, and Portuguese – and the Urban Morphology Research Group) and the International Space Syntax Symposium.

A major challenge for urban morphology is to convey effectively its findings to a wider readership. Perhaps a wider appreciation of the potential of urban morphological theories, concepts and methods in research and action on urban areas needs to involve some

simplification. However, this does not have to mean a loss in the fundamental contents of the discipline. Two examples of such simplification illustrate this.

Angular segment analysis is a method recently introduced in the space syntax community (Hillier, 2009; Turner, 2007). It focuses on road-centre lines, a particular type of information that, unlike the axial lines that are central to the former space syntax mainstream method, is easily available in many countries for use with Geographic Information Systems (GIS). This step forward makes space syntax less consuming of resources and potentially more attractive, both to academics outside urban morphology and to practitioners.

The second example is the framework proposed and applied by Kropf in the 1990s (Kropf, 1996). Based on the work of Cozen and Caugiga – particularly the concepts of 'plain unit' and *tessuto urbano* – Kropf proposes a framework for identifying and describing, in hierarchical terms, the main elements of urban form. After a process of simplification of the existing theoretical and methodological background to make it more

A comparative study of urban form

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**Abstract.** This paper compares four different approaches to urban morphology: historic-geographical, process, typological, space syntax, and spatial analytical. It explores, in particular, the use of four fundamental concepts proposed in these approaches: morphological region, typological process, spatial configuration, and cell. The four concepts are applied in a traditional gateway area of the city of Porto, Portugal. The area includes considerable variety of urban form. The main purpose is to understand how to combine and co-ordinate these approaches so as to improve the description, explanation and prescription of urban form.

**Keywords:** urban form, Concesian school, Muratorian school, space syntax, spatial analysis

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Research projects are frequently designed with insufficient thought being given to how their findings may be related to those of other studies. Problems of comparison are made more difficult by the fact that research is

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In addressing the need to develop comparative studies of urban form, some projects have focused on the utilization of one morphological approach, or one concept or method, in different types of urban area in different parts of the world. Whitehead (2009) describes the utilization of the method of morphological regionalization for identifying and mapping urban landscape units in different geographical contexts. Cozen (2009) offers

PNUM  
WORKSHOP  
2015

Diferentes  
Abordagens  
no Estudo da  
Forma Urbana

Faculdade de Engenharia da  
Universidade do Porto

30 Junho - 4 Julho 2015

Apoio:  
PNUM - Guia Europeia de Morfologia Urbana  
(EUP - International Seminar on Urban Form  
ISUF 2015 Roma - City as Organism)  
CTTA - Centro de Investigação da Território  
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A(s) melhor(es) prestação(ões) no workshop será(ão) recompensada(s) com uma viagem a Roma para participar no ISUF2015, a realizar-se entre 22 a 26 de Setembro de 2015.

**Comissão Organizadora**  
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Escola Superior Católica, Escola Superior Técnica do Porto  
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Figure. Exploring different approaches in the study of urban form

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## Morpho: a methodology for assessing urban form

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Figure. Exploring different approaches in the study of urban form



Figure. Different plots in *Rua do Lindo Vale* and *Rua da Alegria*.



Are there significant advantages of establishing some shared principles for guiding urban transformation?

How should these rules be defined?



Figure. The city of Porto.

How to deal with such a complex object as the city?

Should the rules be defined and applied to the city as a whole?

Or, should we assume that the city is constituted by different parts and that each of these parts should have different rules for urban transformation?

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7. Discussion
8. A co-ordinating framework
9. Conclusion

## 2. Rua de Costa Cabral, Porto

This part of Rua de Costa Cabral is 1400 m long and has an average width of 11 m. The twelve street blocks have an average area of 24 800 m<sup>2</sup> (the largest block comprises 61 400 m<sup>2</sup> and the smallest block 3 800 m<sup>2</sup>), including 671 plots and 730 buildings.

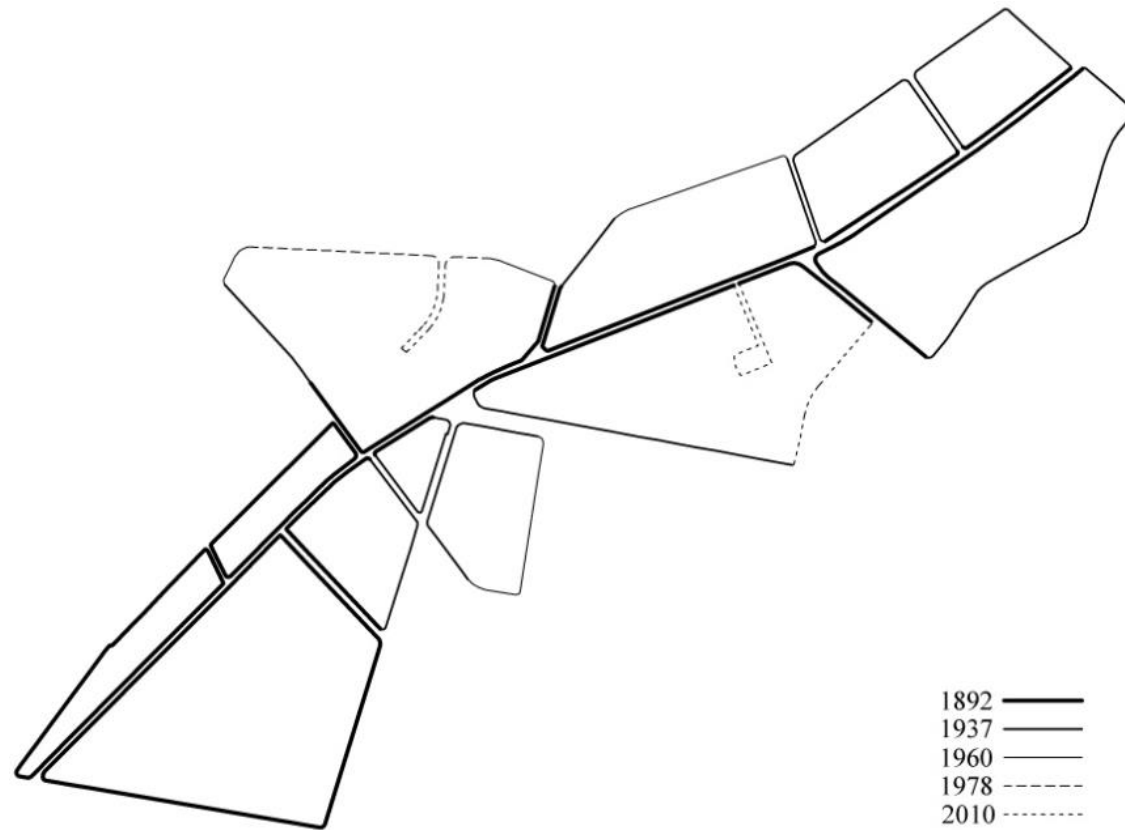


Figure. Rua de Costa Cabral, streets (source: Oliveira *et al.*, 2015).





Figure. Rua de Costa Cabral, plots (source: Oliveira *et al.*, 2015).

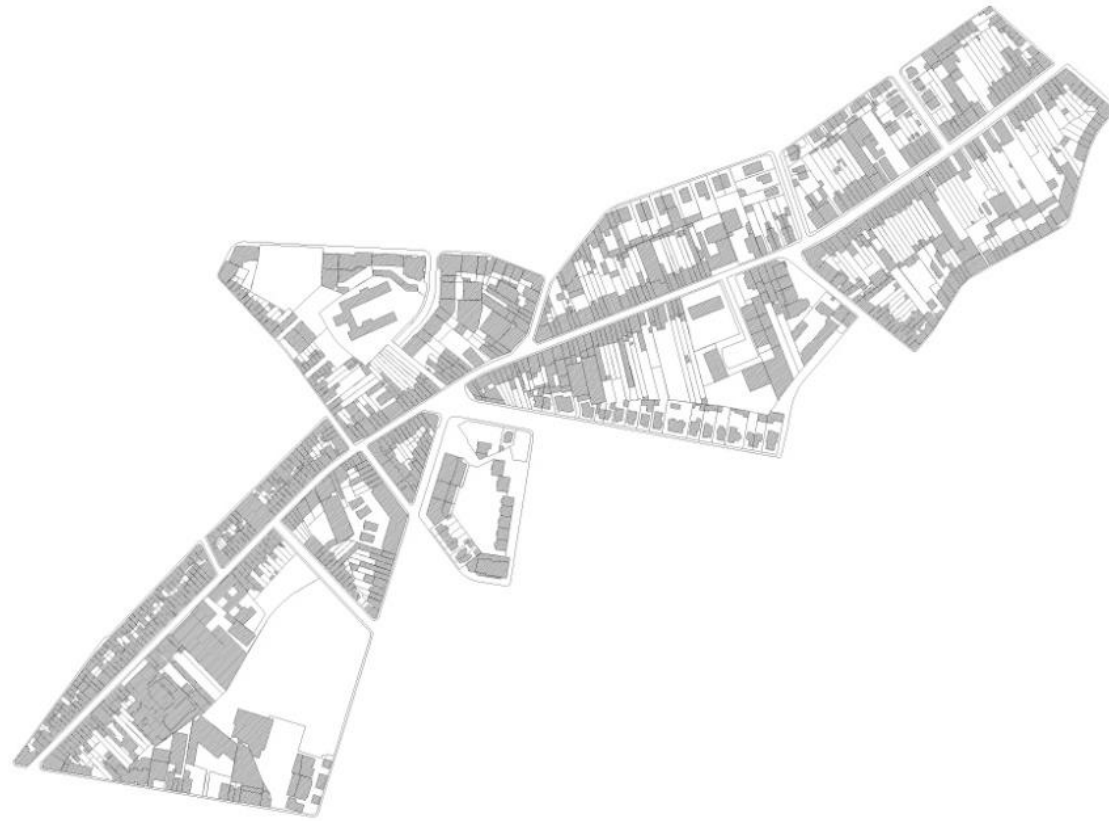


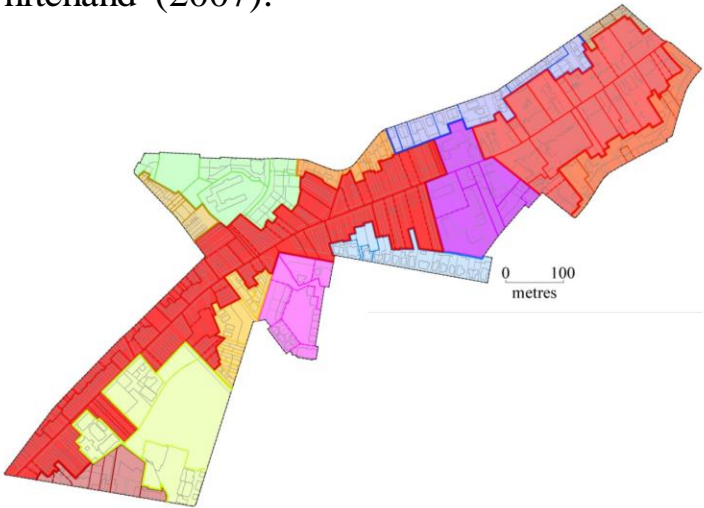
Figure. Rua de Costa Cabral, buildings (source: Oliveira *et al.*, 2015).

# 3. Morphological region (historico-geographical approach)

Table 1. The contribution of different morphological attributes to urban landscape characterization

Attribute	Persistence	Contribution to hierarchy (rank)
Ground Plan	High	Mainly high and intermediate
Building Fabric	Variable, but often considerable	Mainly intermediate and low
Land Utilization	Low	Mainly low and intermediate

Source: Adapted from Whitehand (2007).



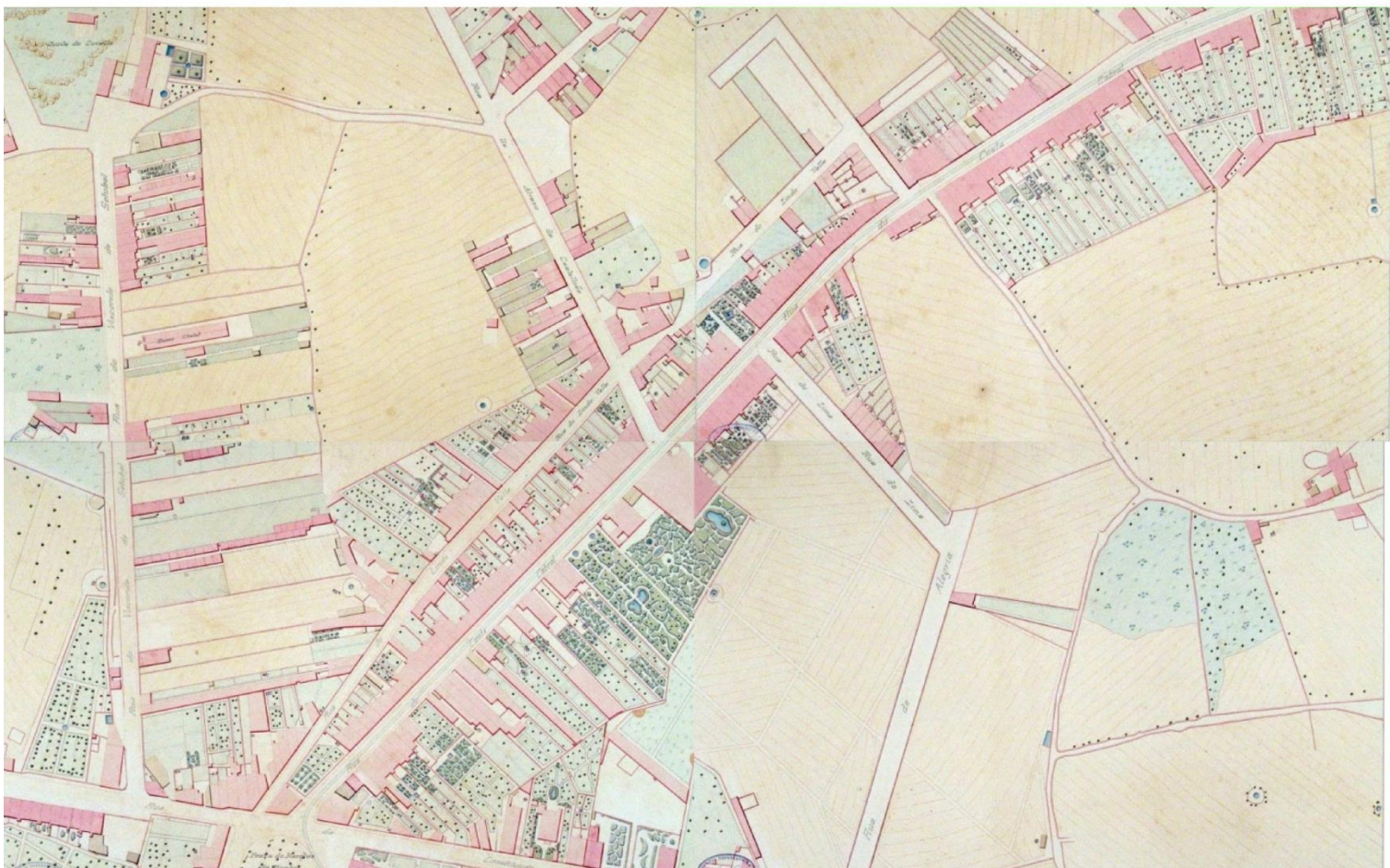


Figure. Part of the 1892 plan of Rua de Costa Cabral.

## Existing town plans

1892 *Planta Topográfica da Cidade do Porto* - Telles Ferreira

1903 *Planta da Cidade do Porto* - STCMP

1932 *Planta Topográfica da Cidade do Porto* - STCMP

1937 *Planta Topográfica da Cidade do Porto* - STCMP

1948 *Carta Militar de Portugal* - IGE

1960 *Planta Topográfica da Cidade do Porto* - STCMP

1978 *Levantamento Aerofotogramétrico* - DGPU

1992 *Cartografia Digital* - STCMP

1997 *Carta Militar de Portugal* - IGE

2010 *Planta da Situação Existente* - STCMP

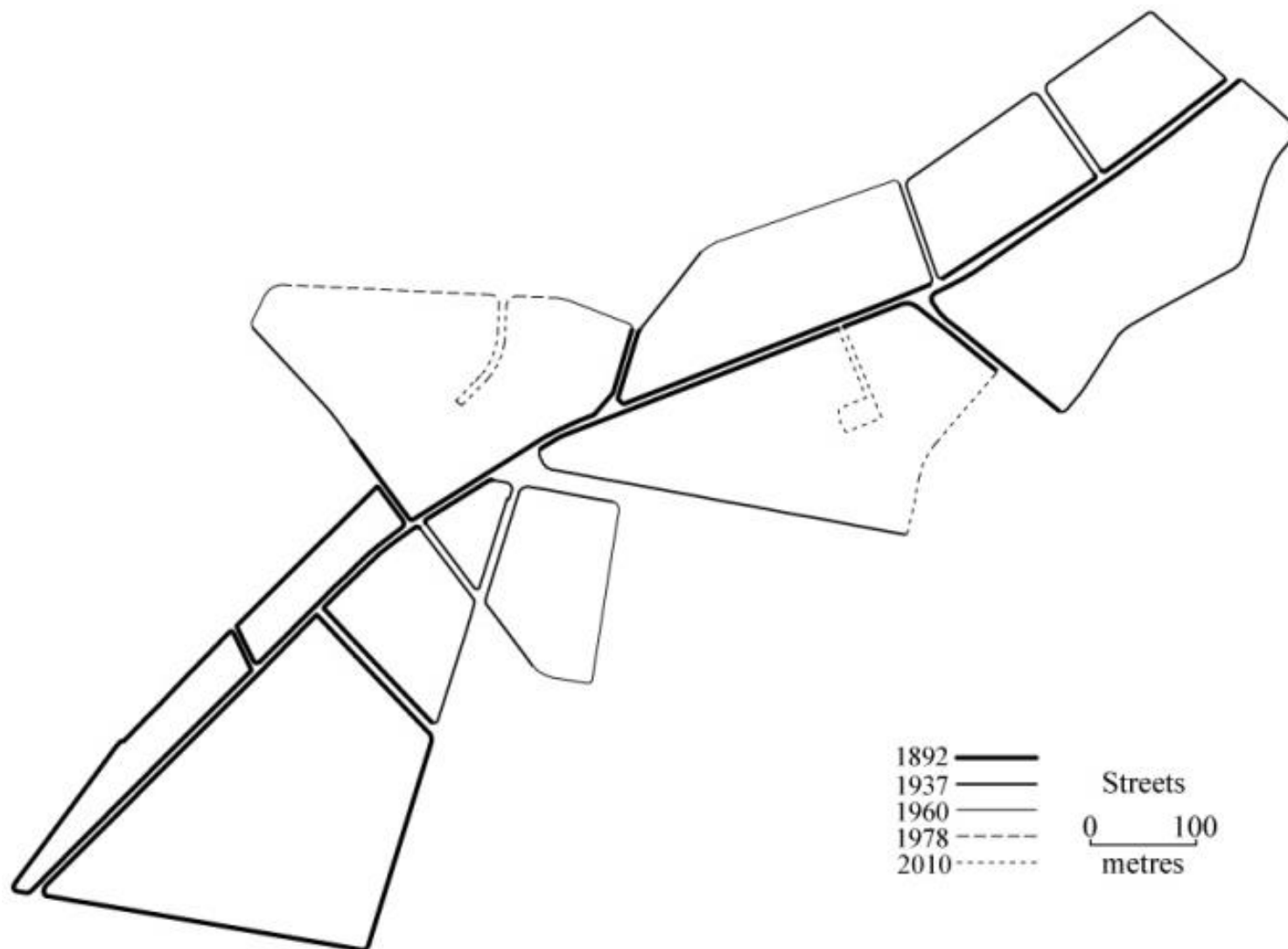


Figure. Rua de Costa Cabral – streets; displaying the year of construction of each street according to the main city plans (fonte: Oliveira *et al.*, 2015)

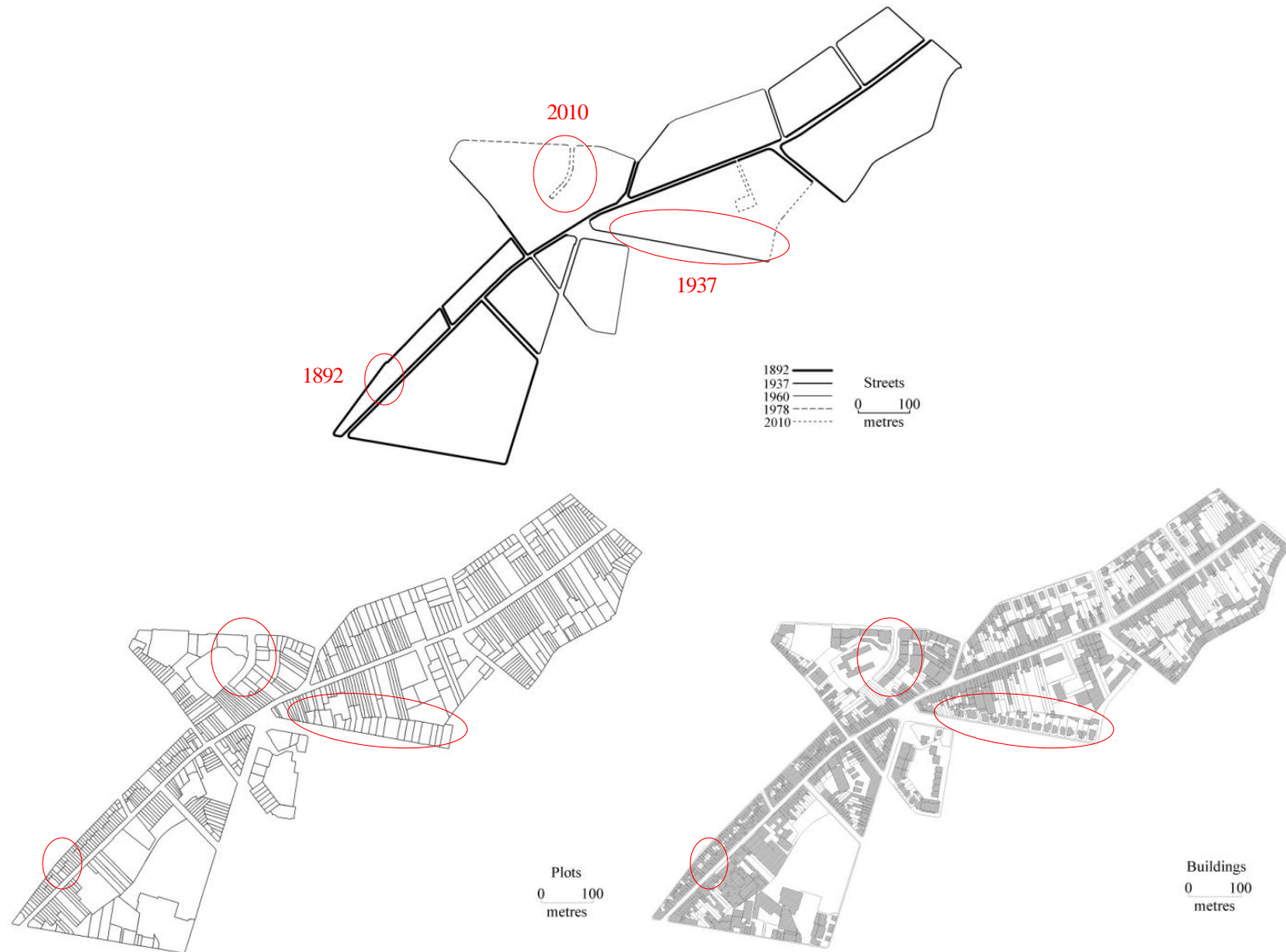


Figure. Identifying the different morphological regions.



# Morphological regions

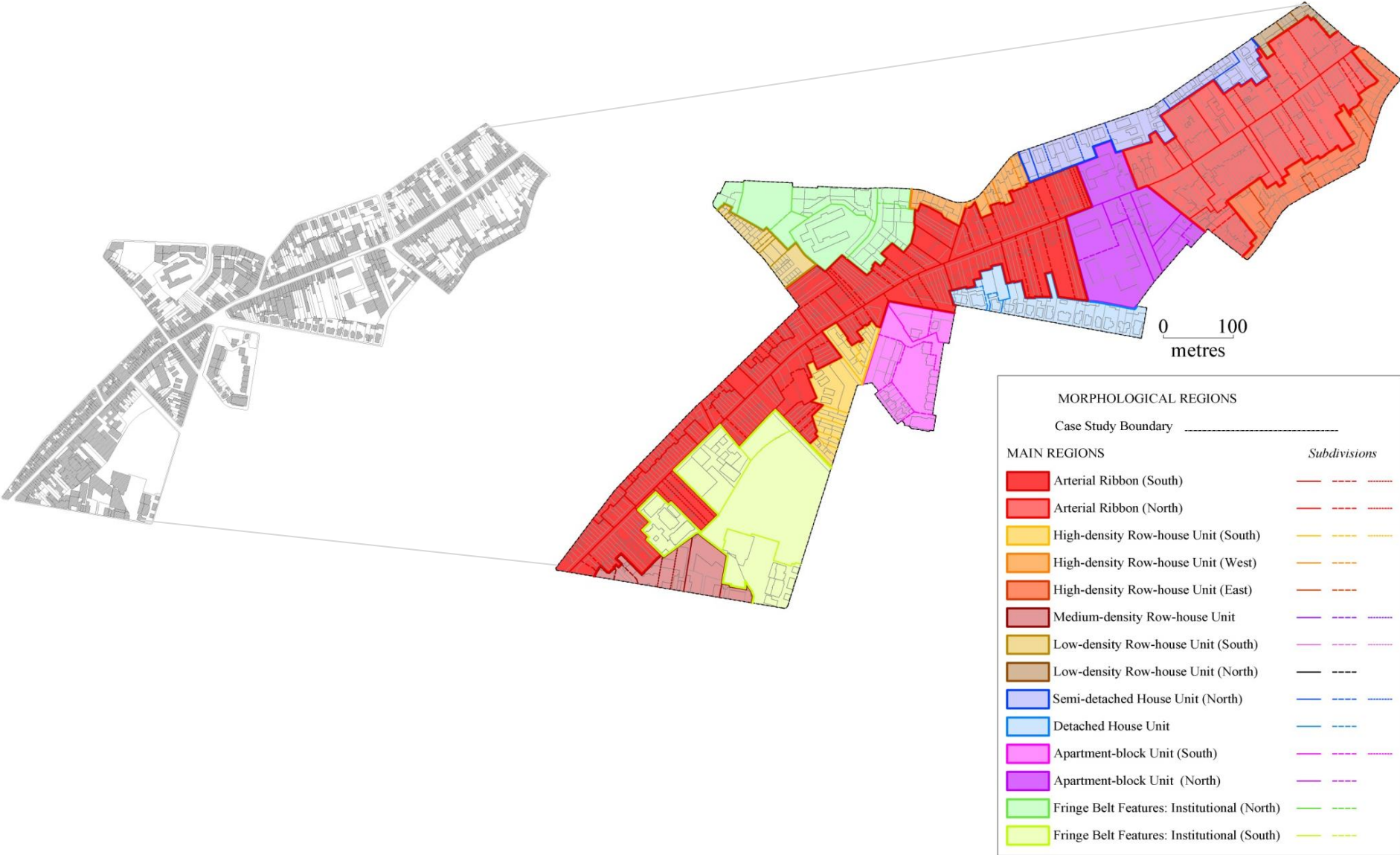


Figure. Morphological regions of Costa Cabral (source: Oliveira *et al.*, 2015).





Figure. First-order morphological regions of Costa Cabral (source: Oliveira *et al.*, 2015).

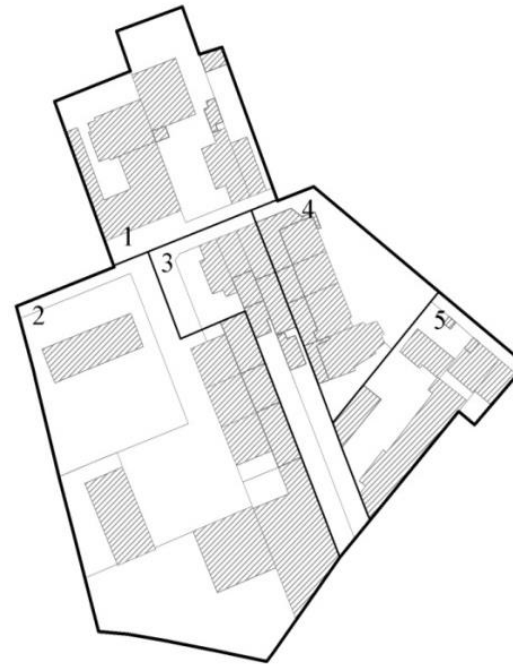
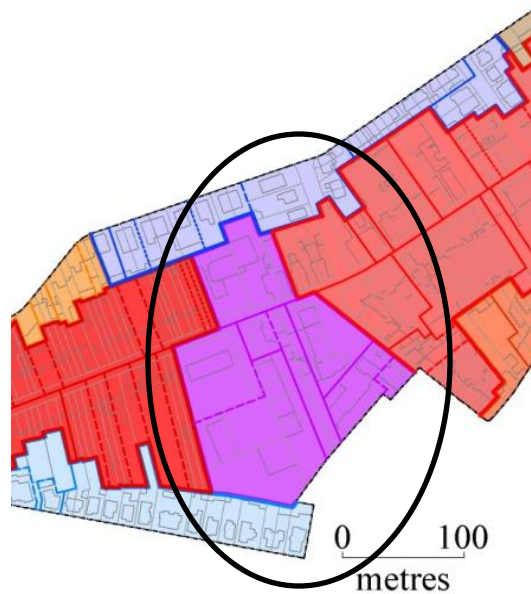


Figure. Second-order morphological regions in the Apartment-block Unit (North)  
(source: Oliveira *et al.*, 2015).



Figure. Second and third-order morphological regions in the Apartment-block Unit (North)  
(source: Oliveira *et al.*, 2015).



# Morphological regions

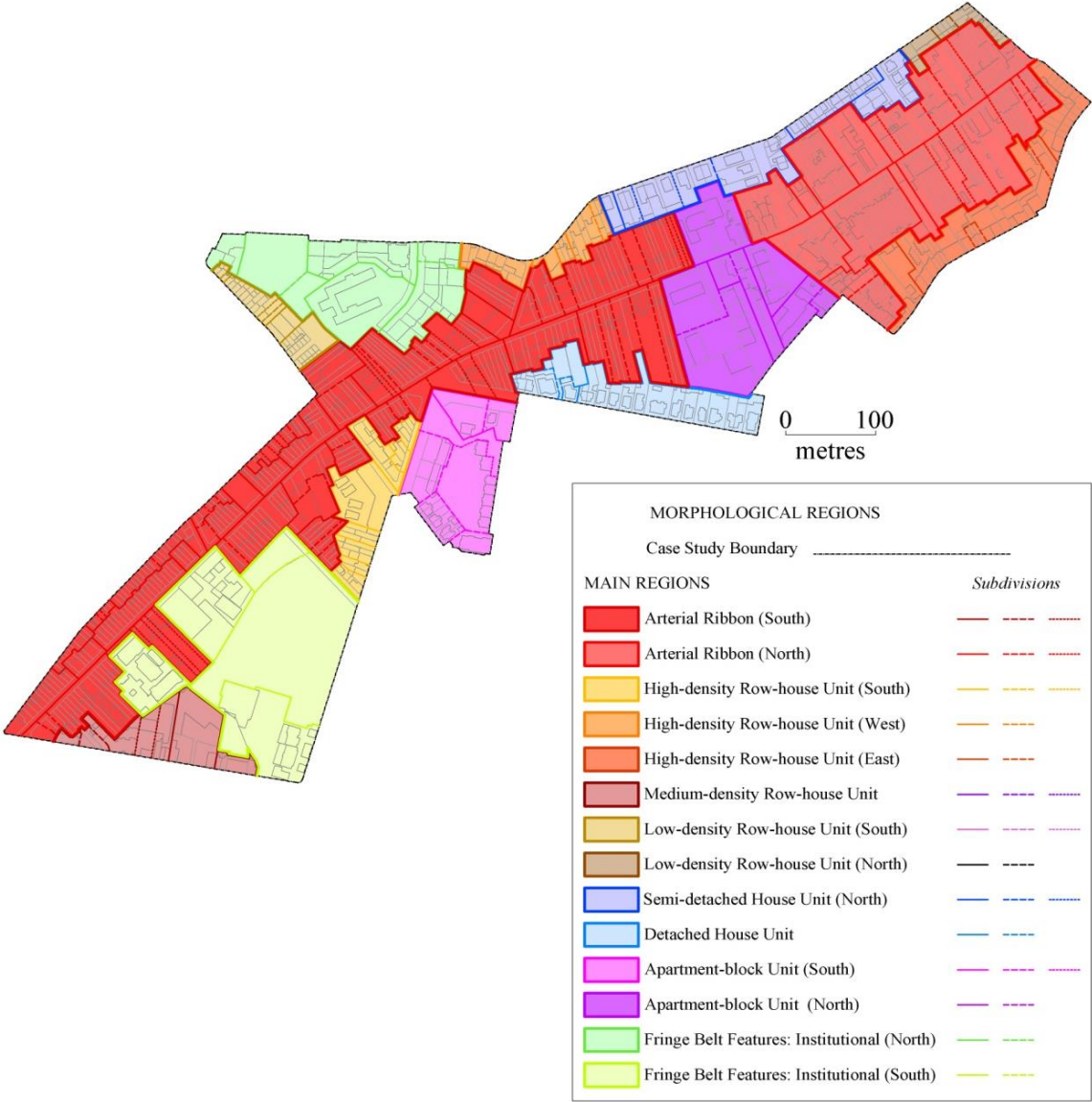


Figure. Morphological regions of Costa Cabral (source: Oliveira *et al.*, 2015).

## 4. Typological process (process typological approach)

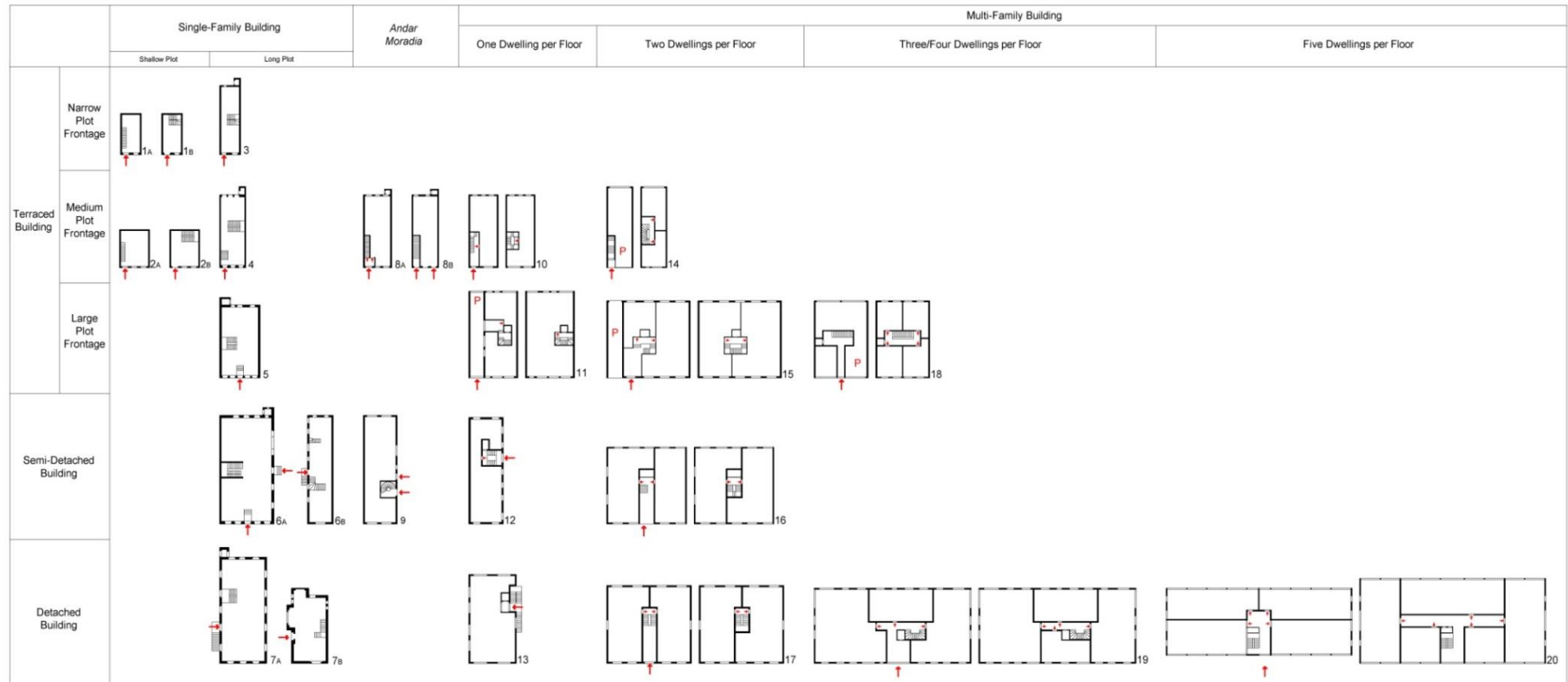


Figure. The typological process in Rua de Costa Cabral (source: Oliveira *et al.*, 2015).

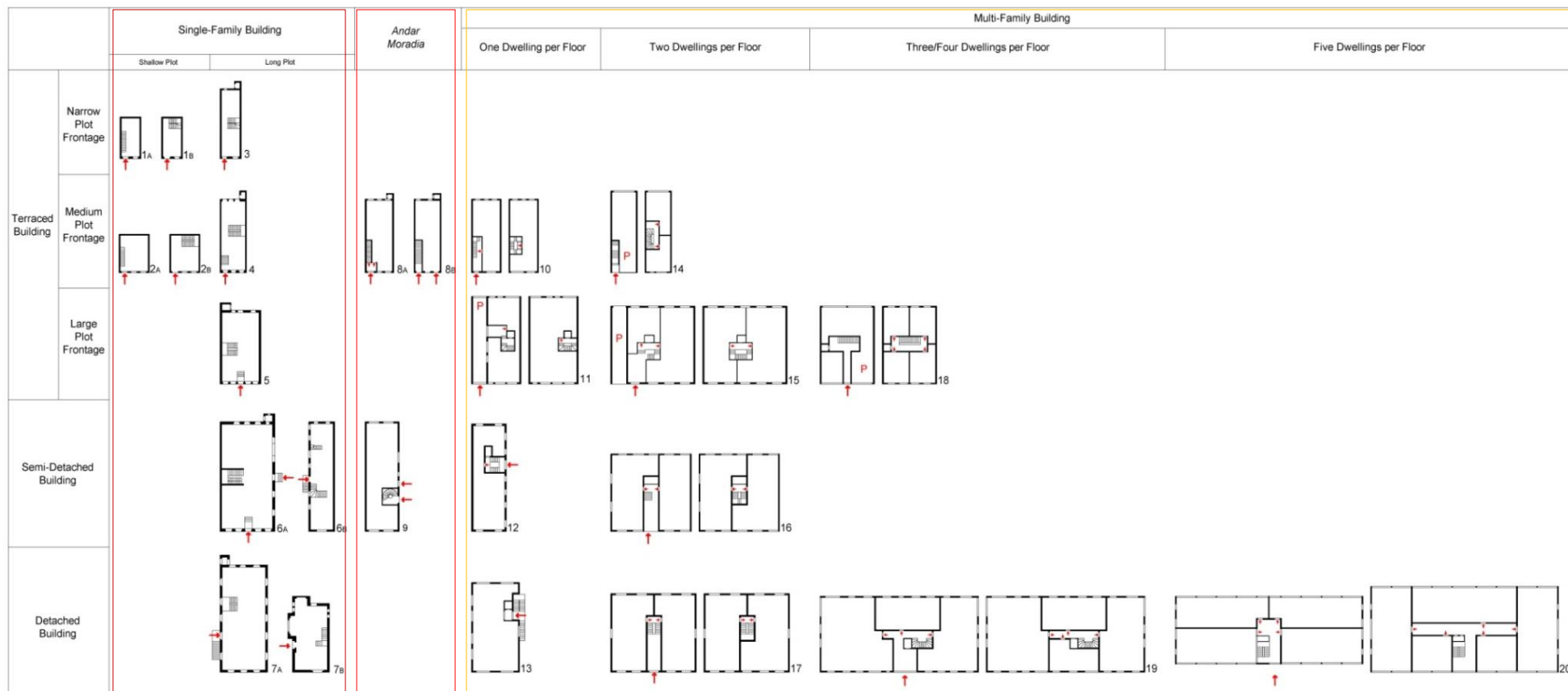


Figura. O processo tipológico da Rua de Costa Cabral (fonte: Oliveira *et al.*, 2015).

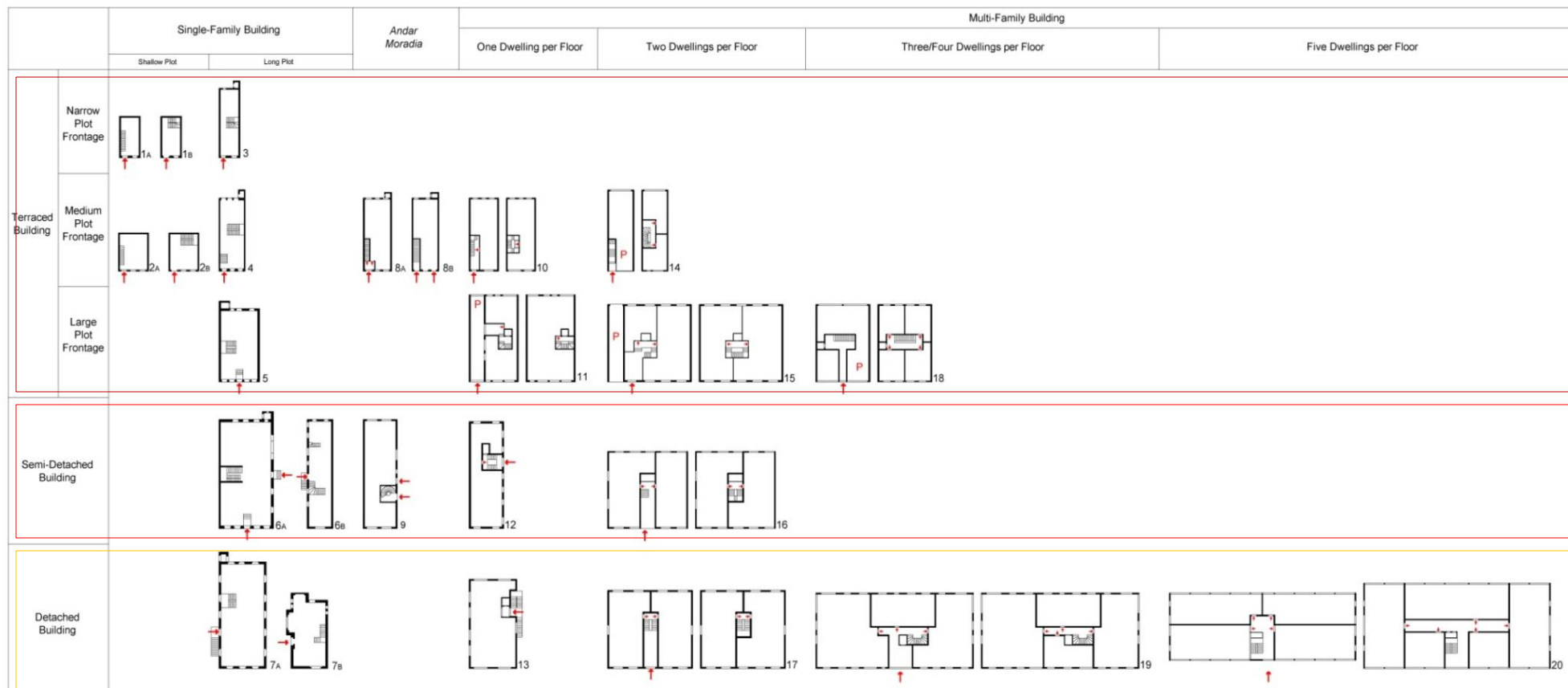


Figura. O processo tipológico da Rua de Costa Cabral (fonte: Oliveira *et al.*, 2015).



Figure. Examples of building types in Rua Costa Cabral (source: Oliveira *et al.*, 2015).



## 5. Spatial configuration (space syntax)

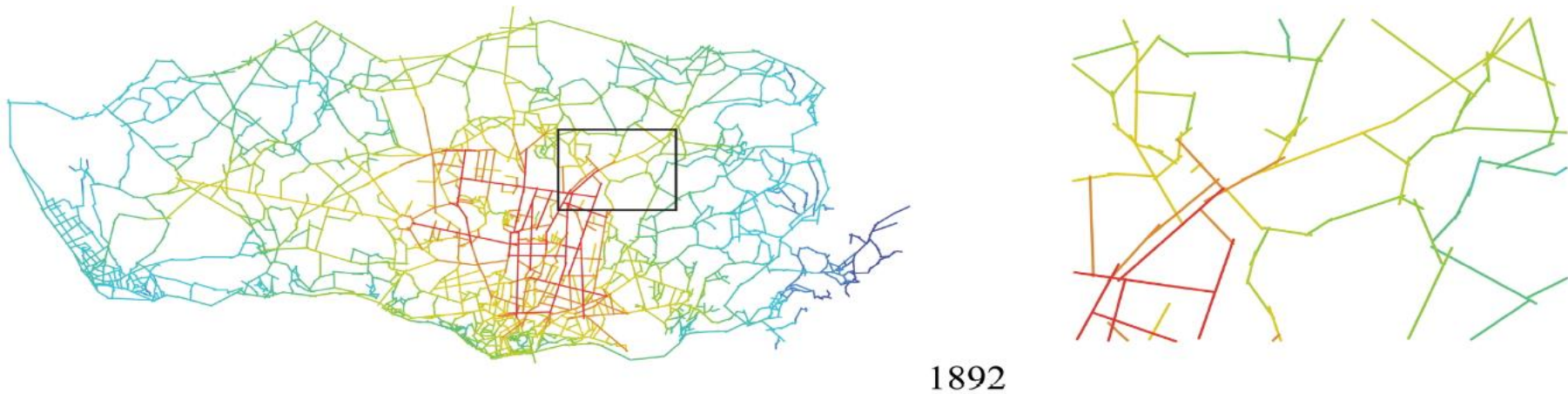


Figure. Global Integration in 1892 (source: Oliveira *et al.*, 2015).

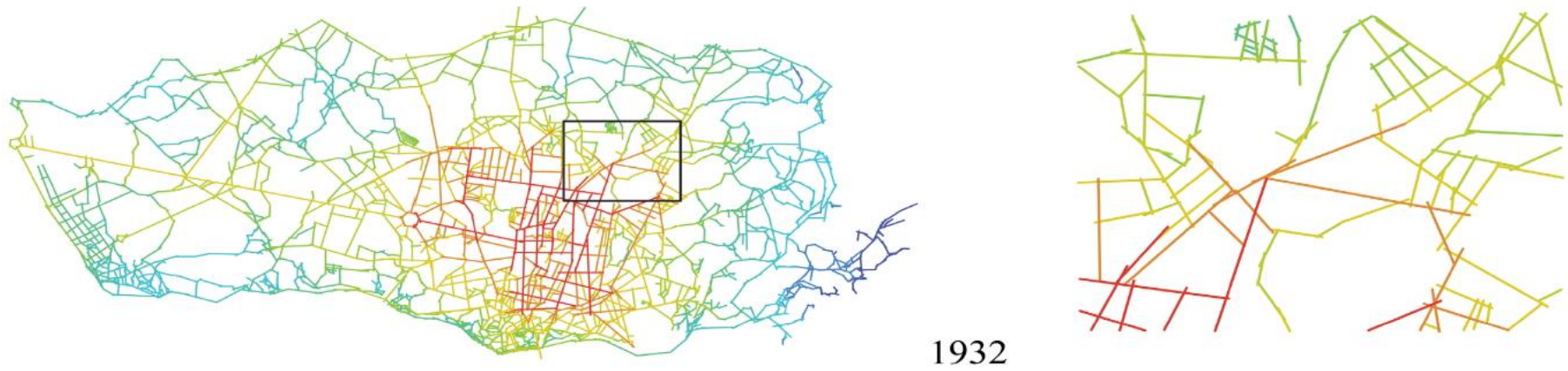


Figure. Global Integration in 1932 (source: Oliveira *et al.*, 2015).



1948



Figure. Global Integration in 1948 (source: Oliveira *et al.*, 2015).

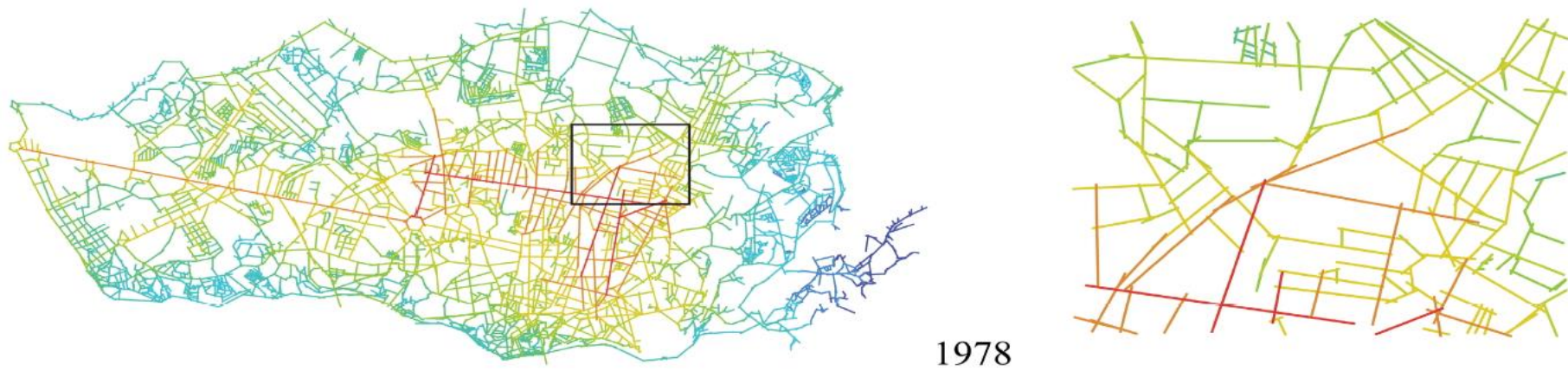


Figure. Global Integration in 1978 (source: Oliveira *et al.*, 2015).

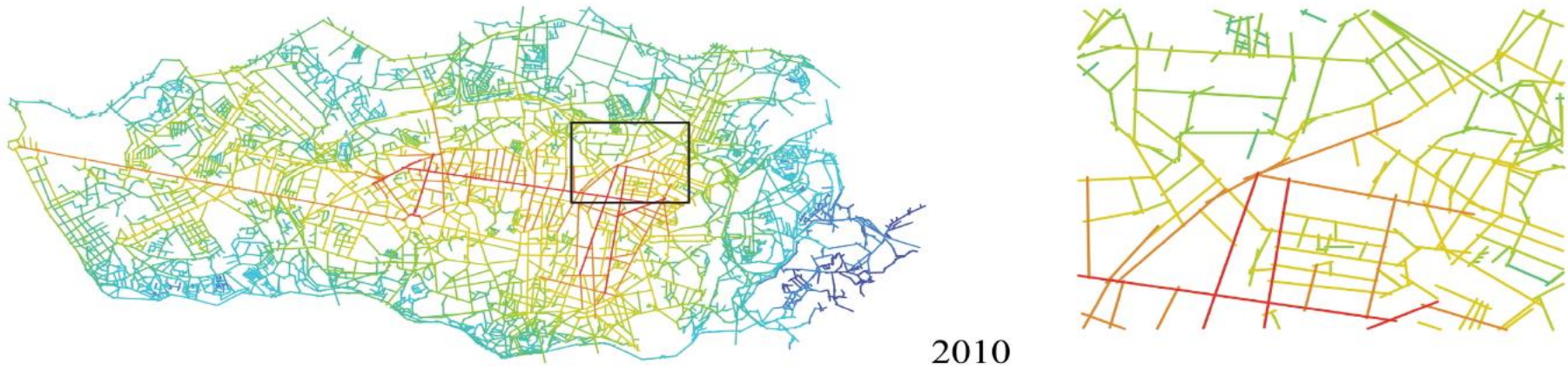


Figure. Global Integration in 2010 (source: Oliveira *et al.*, 2015).



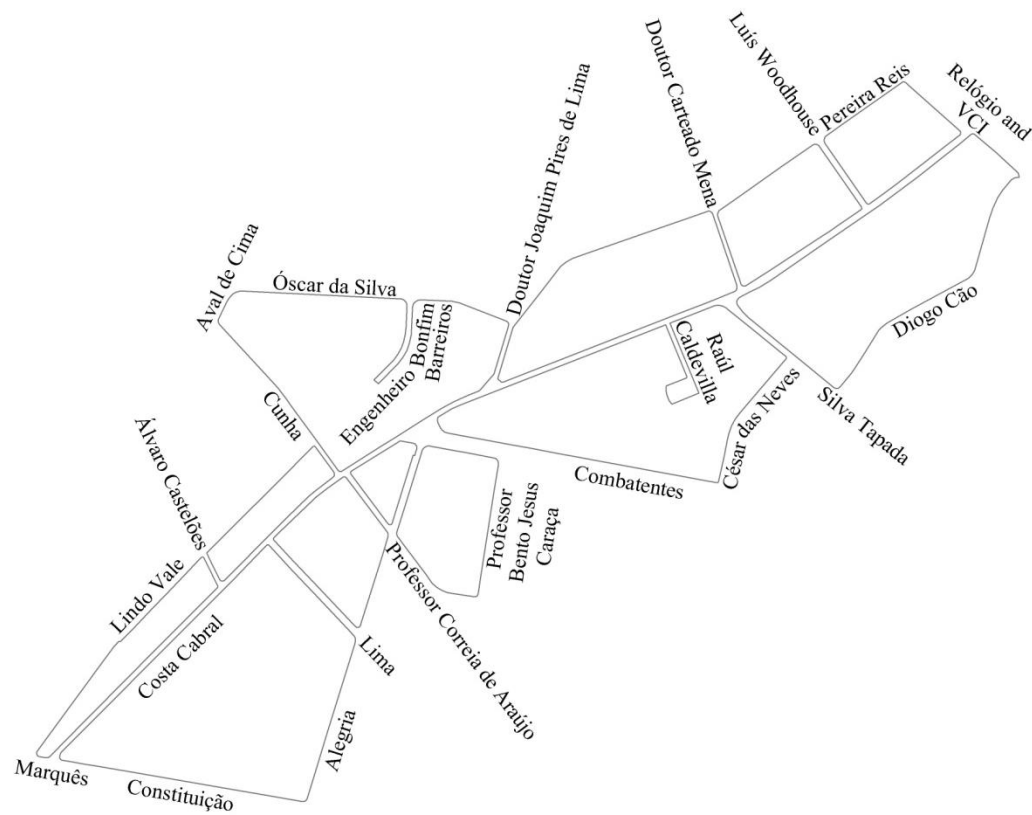


Figure. Identification of the streets; Global Integration in 2010  
(source: Oliveira *et al.*, 2015).

# 6. The cell (cellular automata)

Cellular Automata (AC) operate within a grid based on elementary rules defining the state of the cell according to the state of the neighbours and their relation to the cell itself.

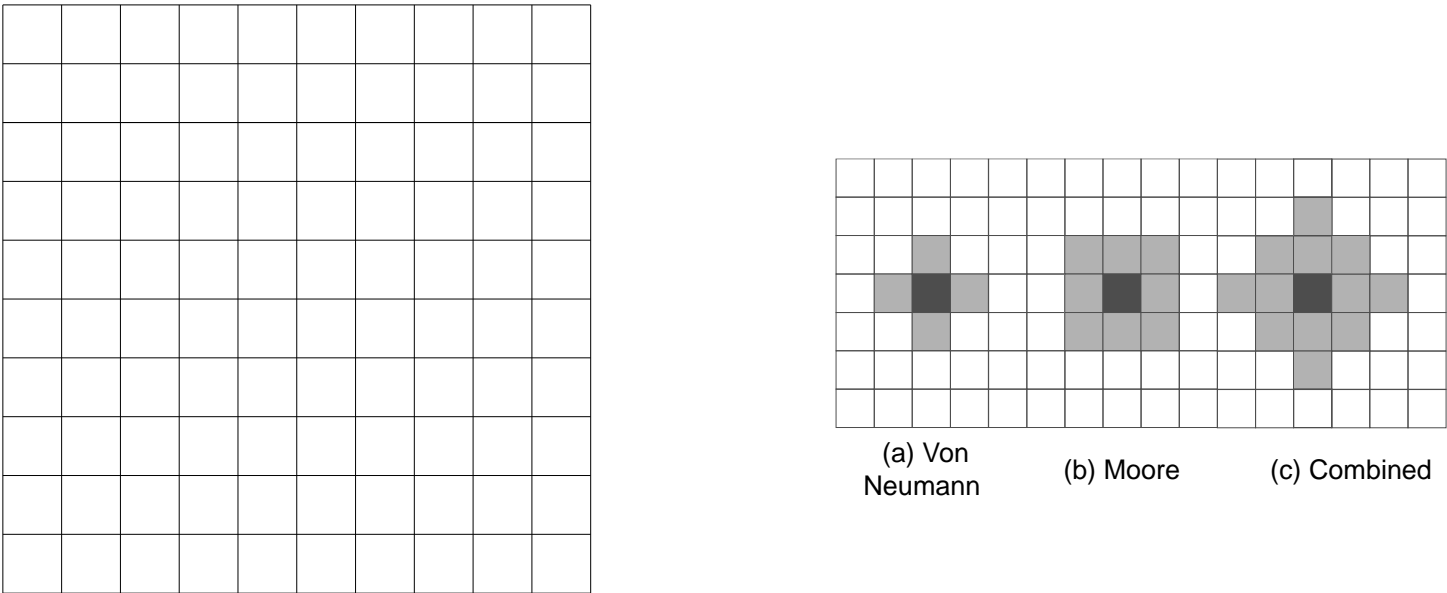


Figure. Cells and neighborhoods.



Figure. The cells of Rua de Costa Cabral.



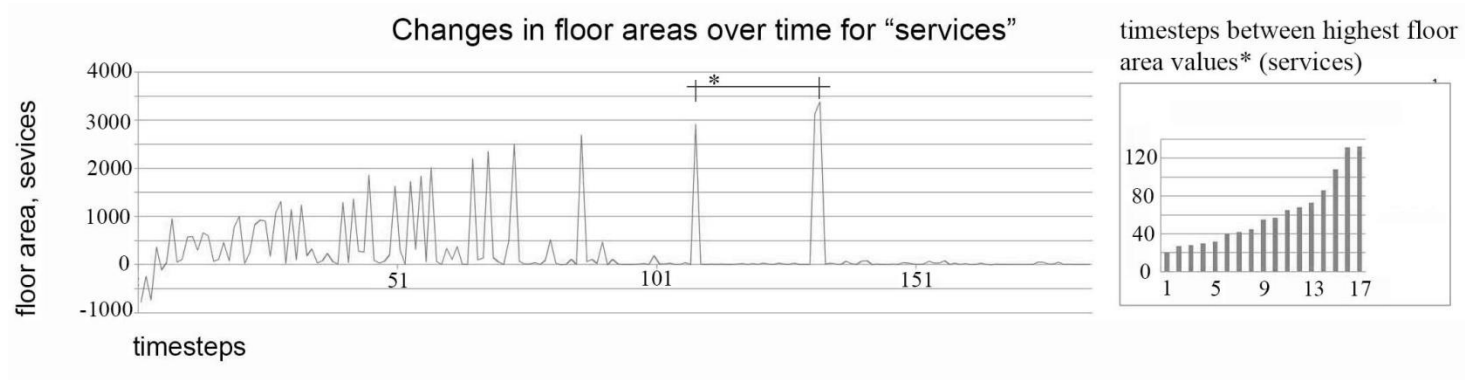


Figure. (a) static plots; (b) discontinuous, emerging phases of linear growth for services.

# 7. Discussion

	<i>Cell</i>	<i>Spatial Configuration</i>	<i>Typological Process</i>
<i>Morphological Region</i>	<b>Form:</b> ground plan (plots) and land utilization	<b>Form:</b> ground plan (streets)	<b>Form:</b> ground plan (buildings) and building fabric <b>Resolution:</b> small- to large-scale analysis <b>Time:</b> importance of history
<i>Typological Process</i>			
<i>Spatial Configuration</i>	<b>Resolution:</b> medium- to large-scale analysis <b>Time:</b> anticipation of future scenarios		

Figure. The main points of contact between the different concepts.

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## 8. A co-ordinating framework

The analysis of existing relations suggests that the concept of the **morphological region** may have the necessary characteristics to provide a **framework** to combine and co-ordinate the different concepts.

A **sequential application** of the four concepts is proposed:

- (i) morphological region,
- (ii) spatial configuration,
- (iii) typological process, and
- (iv) cell.

The application of the concept of the **Morphological Region (MR)** provides a number of results related to the historico-geographical structure of the landscape.

The results for each street are mainly concerned with its morphogenesis and the plots and buildings expressing it.

However, the application of **Spatial Configuration (SC)** reveals something that the **MR** does not: the ‘accessibility’ of each street within the urban system.

If the purpose of the application is not only description and explanation but also prescription, the two concepts both offer important outputs.

The **MR** facilitates the definition of rules for the future transformation of the main elements of urban form (streets, plots, buildings).

The **SC** allows the testing of different alternatives for transformation of the street system. The two concepts can be combined in formulating proposals for the development of that street system.

## 9. Conclusion

**Developing comparative studies of different approaches in urban morphology is a challenging task.**

The application of four approaches to a study area in Porto suggests the concept of the **Morphological Region as a co-ordinating framework.**

The main points of contact between the different approaches have been identified and a general methodological procedure has been outlined.

Yet, further work is needed to develop this line of investigation.

A number of questions arise:

First, would some other morphological concept be relevant for the purposes of comparison and co-ordination?

Secondly, would it be relevant to explore a different focus within some of the concepts?

Thirdly, how can this methodological process be developed, enabling a stronger interaction between concepts and developing the interactive capacity of the MR?

Fourthly, what are the most effective ways to present the results of such an integrated analysis and design?

## References

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