

A METHODOLOGY FOR IDENTIFYING AND CHARACTERIZING LOCAL SCALE TERRITORIAL UNITS, WITHIN THE EXTENDED CITY ¹

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Abstract

Planning the territory presupposes an in-depth knowledge of it and, accordingly, gathering and systematizing information. Such gathering demands territorial delimitation referents. The latter are often administrative boundaries, but these do not always match the reality. In other cases, the territory is subdivided in a geo-referenced grid but available data or the attributes under scrutiny do not always fit such a blind geometry.

Determining physical boundaries for data gathering units is a relevant and preliminary issue in any spatial planning process, especially if the territories in question lack homogeneity and/or if the approaches in use demand great detail. This communication intends to summarily present a *Methodology for identifying and characterizing local scale territorial units within the Extended City* designed during the ongoing research project *Costs and Benefits of Urban Dispersion on a Local Scale*.

The designed methodology conjugates four complementary types of analysis, the first two containing some innovative aspects:

- Digital Method;
- Empirical Knowledge on Cartography;
- Use of Statistical Data;
- Complementary Analyses.

Articulating the first three provides *Base Land Units (BLUs)* and *Urban Pieces'* limits and preliminary characterization. These concepts were created and adopted to express local scale realities; BLUs are essentially functional-experiential and Urban Pieces morpho-typological.

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Complementary Analyses take the delimited units' characterization further. There may be several types of such analyses depending on the objectives to achieve, which makes way for employing the Methodology in a vast range of situations.

The whole Methodology is based on the idea that delimitation and characterization tasks should take place in parallel. They should also relate to each other so that the delimited units express from the onset different realities without preventing that more in-depth knowledge on each of them is sought in subsequent phases.

1. Background

The shape of urbanization in the past few decades is quite different from the traditional ones, its traits being:

- Global webs of economic relations;
- Urban man's great mobility in everyday displacements;
- Spread of buildings and new developments throughout the territory.

These settlement patterns make the identification of experiential units and their limits significantly harder on every territorial scale, questioning the concepts of city or urban territory. However, to plan and manage such a territory it is mandatory to acquire in-depth knowledge of it, to systematically gather information, which requires territorial delimitation referents.

Administrative limits are often used for it, but they do not always match reality. In other cases, the territory is subdivided in a geo-referenced grid, but available data or the attributes under scrutiny do not always fit such a blind geometry. Determining physical boundaries for data gathering units is a relevant and preliminary issue in any spatial planning process, especially if the territories in question lack homogeneity and/or if the approaches in use demand great detail.

The focus of this paper is, precisely, the design of a methodology for identifying and characterizing *Local Scale Territorial Units* within the *Extended City*. Before describing the methodology itself, it is important to clarify what is the territorial scale it concerns and to present the attributes used in distinguishing different settlement forms.

2. Urban Territorial Units, on several scales

"Emerging urban territories have been classified as *generic, extensive, dispersed, diffuse, discontinuous, fragmented...* This limitless city is conceptualized by several authors, such as the *Global City*, the *Metàpole*, the *Edge City* or the *Città Diffusa*" (Font, 2004, pag. 12).

The vast majority of analyses focusing on these new urban territories use large concentrations, large cities as their referents. However, some of the phenomena identified – namely that of constructive and functional dispersion and fragmentation – are common to most growing cities, including small and mid-sized ones and even to some cities facing economic and demographic decline.

It is, after all, a widespread phenomenon resulting from financial, economic and cultural globalization, as well as the growth in mobility allowed by the private car. These dynamics of fragmentation and dispersion, present in many cities, large and small, render the delimitation of each city, the vaster ensemble it integrates and each of its constituent parts increasingly difficult.

Vaster ensemble the city integrates, *city* and *constituent part of the city* are terms that indicate the adoption of a hierarchical territorial scale usable in understanding and, perhaps, planning and managing urban territories.

2.1 Metropolitan Areas and Conurbations

The majority of contemporary theoreticians (the abovementioned and others) analyse these *vaster ensembles the city integrates* creating different terminologies:

- *Megalopolis*, a concept introduced by Jean Gottmann describing an extensive urbanized strip with over 30 million inhabitants in the north-eastern coast of the USA, encompassing several independent cities and their suburbs (Gottmann, 1961; Ascher, 1998, pag.192).
- *Megacity*, a term designating a territorial constellation detaining world-wide economic power constituted by an ensemble of discontinuous agglomerations, functionally linked in a vast territory. (Borja and Castells, 1997).
- *Metàpole* is a territory with a few hundred thousands of inhabitants, generically consisting of an ensemble of spaces in which inhabitants and economic activities are integrated in the everyday functioning of a metropolis (Ascher, 1998).

These concepts basically highlight different dimensions of one single reality, which, depending on their territorial expression, may be grouped in two types of urban aggregations:

- *Metropolitan area* – a solidary urban ensemble, large population-wise,² referenced to a central city and integrating other cities connected to the main one via hierarchical relations.

Conurbation: a non-hierarchical assemblage of cities presenting intense and complementary relations among themselves and cooperating, in certain sectors, when relating to the exterior. In OECD's report *Competitive Cities in the Global Economy* a similar concept is put forward: "collections of historically distinct and both administratively and politically independent cities located in close proximity, well connected though infrastructure, commuting and business linkages and clustered together as a single economic functional area (Kloosterman and Lambregts, 2001). One of the important characteristics of these polycentric regions is that they usually have no dominant central city (...)" (OECD, 2006, pag. 32).

2.2 Extended Cities

Notwithstanding the existence of these new urban territories, big in scope and size, the old *city* concept has not vanished from current jargon, sometimes referring to the continuous city, others only to its oldest and most central area, others in a broader sense, including its nearest peripheries (compact or dispersed).

Assuming a concept of *Extend City* matching this last vision:

- The *Extended City* may be defined as "each compact/continuous city with its closest surroundings, possibly integrating other agglomerations, urban fragments and dispersed development and the agricultural and forested areas it interpenetrates. In this definition, the phrase *closest surroundings* holds some discretion that is only worth clarifying when applying the concept to a specific context." (Carvalho, Pais, *et al*, 2008, pag. 111).

The concept does not pretend to add yet another denomination to current urban territories, but to precise the territorial scale our work refers to.

² According to the *Competitive Cities in the Global Economy* report, published by the OECD in 2006, Metropolitan Areas should have at least 1.5 million inhabitants.

In fact, not even at the city scale can one find a continuous built-up fabric anymore; fragments and dispersed buildings intertwined with lasting agricultural and forested areas occur in today's cities as well. It is, then, a different city from the traditional one; to highlight such differences, we name it *Extended City*.

Many of these cities, even if small or mid-sized, grow extensively beyond administrative borders, spreading throughout the territory. Some of them constitute relatively isolated entities, polarizing agricultural areas. Others polarize smaller rural settlements, approaching the Metropolitan Area concept, minus the demographic dimension. Others, still, integrate conurbations or metropolitan areas.

The Extended City scale thus corresponds to the old *city* concept, but highlighting a new territorial reality.

2.3 *Local Scale Territorial Units*

2.3.1 In every Extended City, one may identify parts, sub-parts, sub-sub-parts, depending on the territorial scale one wishes to adopt.

In this Project, *Local Scale* corresponds to the Base Land Unit's (BLU) scale. BLU is an expression we created, corresponding to a concept that integrates and almost coincides with other well known ones, namely that of the *neighbourhood*, in its everyday meaning, and that of the *neighbourhood unit*.

The latter stems from American sociological studies concerned with weakening social rapports among neighbours. Clarence Perry formulated it in the 1920's and the majority of modernist planners, those of the Garden City and those of the Athens Charter (Mumford, 198, pag. 541-542) adopted it. It aims at strengthening neighbourly relations, along with effective and rational public (or collective) service, namely in what concerns facilities.

BLUs' scale/territorial scope is thus conceptually linked to a demographic dimension suitable for good basic facilities service, often named local facilities. Adopting conclusions drawn by a recent study on the matter (Carvalho and Marinho, 2009), the reference, preferable population may be that of 3.000 users (residents or employed in the area), admitting an interval between 1.000 and 5.000 with natural consequences on the facilities to consider.

The BLU concept differs from the *neighbourhood unit* for introducing non-segregationist cautions (Carvalho, 2003, pag. 191) and taking on a broader meaning, as it does not necessarily refer to an exclusively residential area – it may also encompass central or industrial ones, techno-centres, a dispersed settlement area, or even an agricultural and/or forested area within the Extended City.

The concept is mostly based on functional and experiential characteristics and, consequently, a single BLU may encompass very distinct settlement patterns from a morpho-typological standpoint.

2.3.2 Facing the need of identifying and delimiting different morpho-typological settings brought about by certain activities, such as a formal urban analysis or one of different real estate products, the concept of Urban Piece was created.

Piece, according to the Dictionary, means "any quantity of a whole, separate or not" (Dicionário Priberam da Língua Portuguesa, 2009). It therefore suits the concept which *Urban Piece* refers to, because it may be of variable size and may take part of the overall continuous city or constitute a more or less isolated fragment of the extended city.

Urban Piece is, then, the term used to identify a continuous territory with homogenous characteristics in terms of urban fabric (cadastre, public space and buildings), an attribute often associated to the uses it fosters and, sometimes, to its residents' socioeconomic characteristics.

Two relatively independent concepts were thus adopted to delimit and subsequently characterise local scale units:

- Base Land Unit, from an essentially experiential perspective,
- Urban Piece, corresponding to a morpho-typological reality.

3. Attributes for delimiting and characterizing Territorial Units

3.1 According to Chambers (in Soja, 2000, pag. 150) it is no longer possible to map today's metropolis for it no longer stands as a social, political, geographic or economic unity. Consequently, we no longer recognize its limits. City borders' permeability has confounded our ability to separate what is in and what is out, to distinguish what the city and what the countryside are, what the suburb is and what the centre is, natural from artificial.

The statement reflects how difficult it has become to identify borders between urban and non-urban territories or between the different parts of those areas identified as urban. But difficulty does not mean impossibility; it rather arises as a challenge requiring answers and methodologies adapted to this new reality to be sought.

Domingues and Silva, in a study on the urbanization of Portugal's Northern Coast, state that "the legitimate ambition of finding pertinent limits to the "new city" has been partly achieved through a contiguity method, i.e., through aggregating intersecting circles with 50m and 100m radius from each building. (...) Indicators from the 2001 Census have also been used, such as population variation and residents' totals. The main physical barriers were delimited and several polarity indicators were used." (Domingues and Silva, 2004, pag. 16).

Most authors attempt to characterize this new territorial reality by highlighting the importance of functional relations. Sassen, for instance, considers that the Global City model is based on economic activities' geographic dispersion and, simultaneously, on a system of aggregating those same activities. Through this, urban dispersion does not make cities obsolete because, even though they no longer concentrate urban functions within them, they remain their point of control (Sassen, 2000, pag.22). Ascher considers the Metàpole to basically consist of a residence and activities basin, composed by heterogeneous, not necessarily contiguous, spaces (Ascher, 1998, pag.16).

One should bear in mind, then, that notwithstanding current urban territories' fragmentation and dispersion, it is possible to differentiate the relational web which characterises them:

- Based on bigger or smaller constructive compactness and continuity (no longer based on a clear and dichotomous distinction between urban and rural areas, but resorting to a differentiating threshold built purposely to do so);
- And based on functional relations as well, be it daily or more sporadic, more or less dense, translating into urbanites' displacements between workplaces, homes and leisure/services and into relations between economic activities.

3.2 However, these are not the sole attributes which may be used to identify and delimit urban territories on several scales. The following list summarily puts forward a set of attributes suitable for it:

- Continuity between buildings, articulated with road networks;
- Physical fabric (public space, lots, buildings and biophysical site);

- Building compactness and density;
- Collective infrastructure networks (existence/non-existence and density);
- Barriers (hampering connectivity) and borders (permeable but perceptible);
- Existing functions (housing, services, industry...)
- Population (age, socioeconomic and cultural characteristics);
- Identity (History, geography, local experience);
- Size, associable to distances to local facilities and services;
- Mobility, namely the one concerning people's everyday displacements;

Figure 1. Usable attributes in delimiting Territorial Units on several scales

ATTRIBUTES	Metropolitan Area/ Conurbation	Extended City	City Part	Base Land Unit (BLU)	Urban Piece
Building continuity	0	•	0	0	0
Physical fabric	0	0	0	0	•
Building compactness and density	-	-	0	0	•
Collective infrastructure	0	0	0	0	0
Barriers and borders	•	•	•	•	0
Existing functions	0	0	•	•	0
Population characteristics	0	0	0	0	0
Identity / Experiential	0	0	0	•	0
Size (area and population)	-	-	0	•	-
People's Mobility	•	•	0	0	-


Determinant **Significant** **Possible** **Not applicable**

These attributes, used for delimiting territorial units, may also be useful for their characterization, if conjugated with others.

4. Methodology Formulation

4.1 Global Design

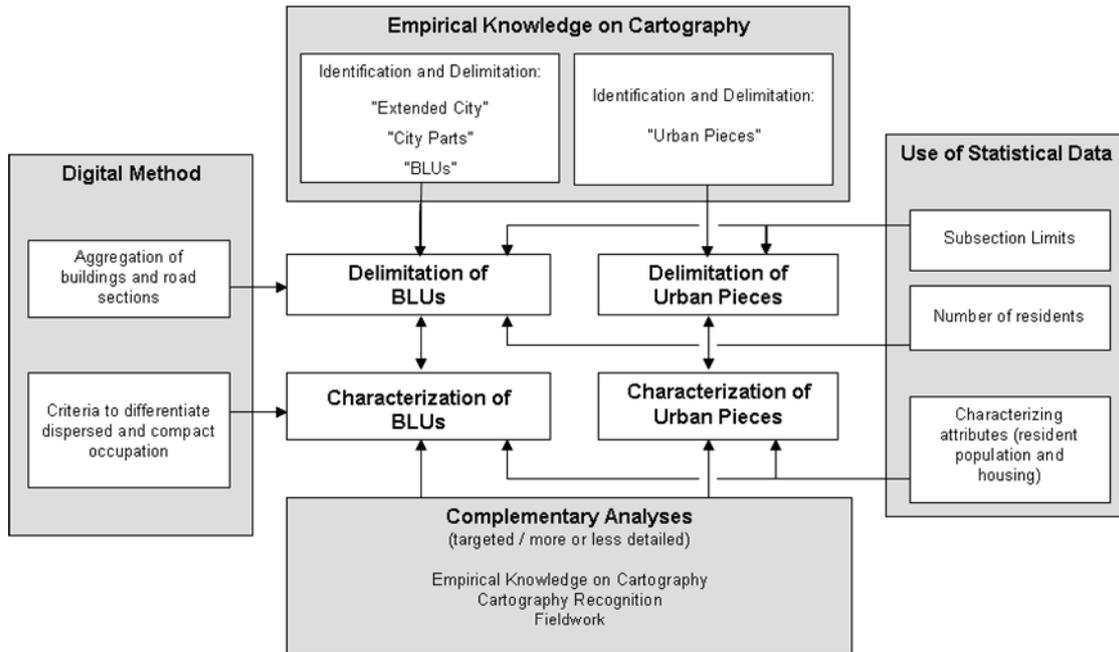
The Global Design of the Methodology for identifying and characterizing Local Scale Territorial Units within the Extended City – presented in Figure 2 – combines four complementary analysis methods:

- Digital Method;
- Empirical Knowledge on Cartography;
- Use of Statistical Data;
- Complementary Analyses.

The three first ones should take place in parallel, making sure that the territorial units delimited express different realities from the onset. *Complementary Analyses*, due to their auxiliary nature, may take place on a latter phase, if so needed, in order to gain deeper knowledge on each of the units.

Explaining the Methodology's Global Design requires a detailed description of each of its constituent's method.

Figure 2. Methodology Global Drawing



4.2 Digital Method

4.2.1. This method resorts to Geographic Information Technologies (ArcGIS) and consists of an aggregation of buildings, based on maximum distances between them, to which marginal strips of road sections directly serving them were added.

This aggregation allows the identification of *continuous*, *dispersed* and *rarefied* ensembles, each reporting to a successively larger distance between buildings. The distances considered in the abovementioned exercise (which will be explained further on) are presented in Figure 3.

Figure 3

	<i>Continuous</i> Ensembles	<i>Dispersed</i> Ensembles	<i>Rarefied</i> Ensembles
<i>Buffer radius of each building</i>	10m	45m	80m
<i>Buffer radius of road sections that marginate buildings</i>	40m	80m	120m
<i>"Islands" and "Peninsulas" Size</i>	≤ 5.000 m ²	≤ 10.000m ²	≤ 20.000m ²

It should also be mentioned that:

- Only buildings with covered areas of at least 30m².
- Ensembles of less than five buildings are disregarded.

- Areas corresponding to “islands” and “peninsulas” are added (small spaces inside each ensemble – see Figure 3)

The method is essentially digital. However, it demands some manual checks and additions, namely regarding the inclusion of road sections that are part of the ensembles’ internal structure and of “peninsulas”.

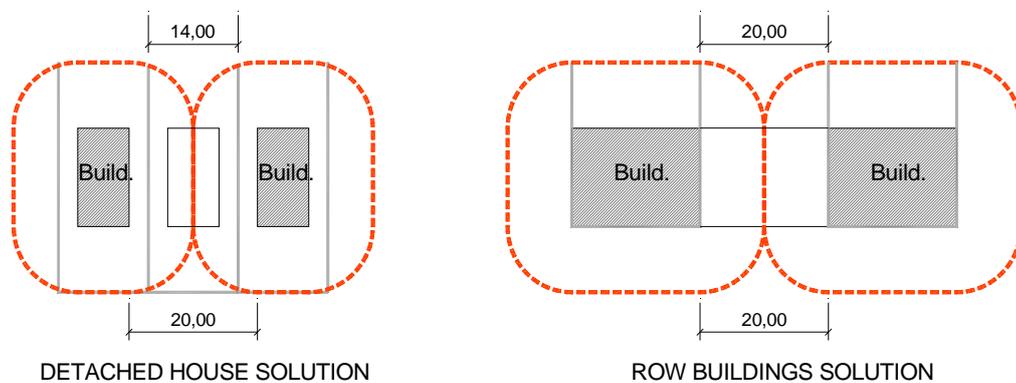
4.2.2. One should bear in mind that each building’s *buffer*, multiplied by two, equates the maximum distance between two buildings to include them in the same ensemble.

The criterion behind the distances defined was that of two buildings belonging to the same ensemble whenever the distance between them allows enough space for one lot and the construction of one building (and no more) with similar characteristics of the urban fabric in question.

Specifically:

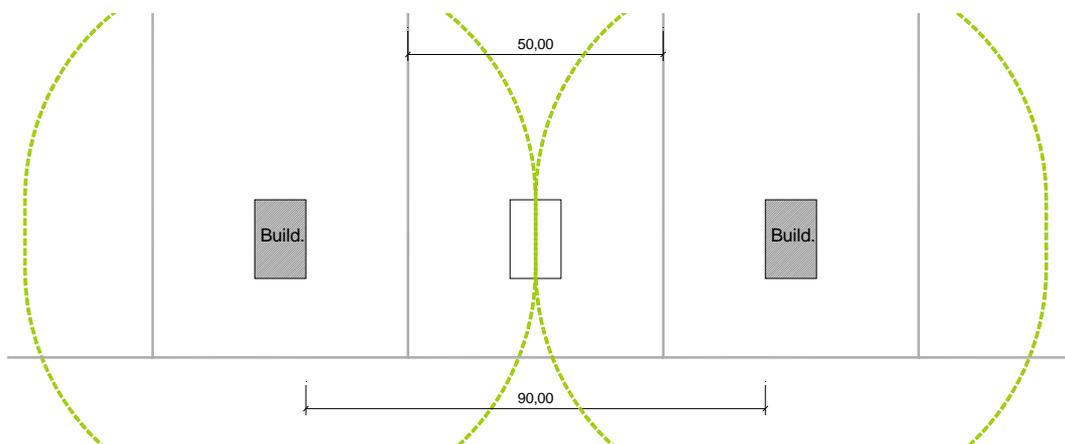
- In continuous ensembles, a *buffer* radius of 10m (distance between buildings – 20m), translates into:

Figure 4. Buffer radius in Continuous Ensembles



- In dispersed ensembles, the *buffer* radius of 45m (90m distance between buildings), is based on estates of $50\text{m} \times 100\text{m} = 5.000\text{m}^2$ (minimum area for horticulture)³ and translates into:

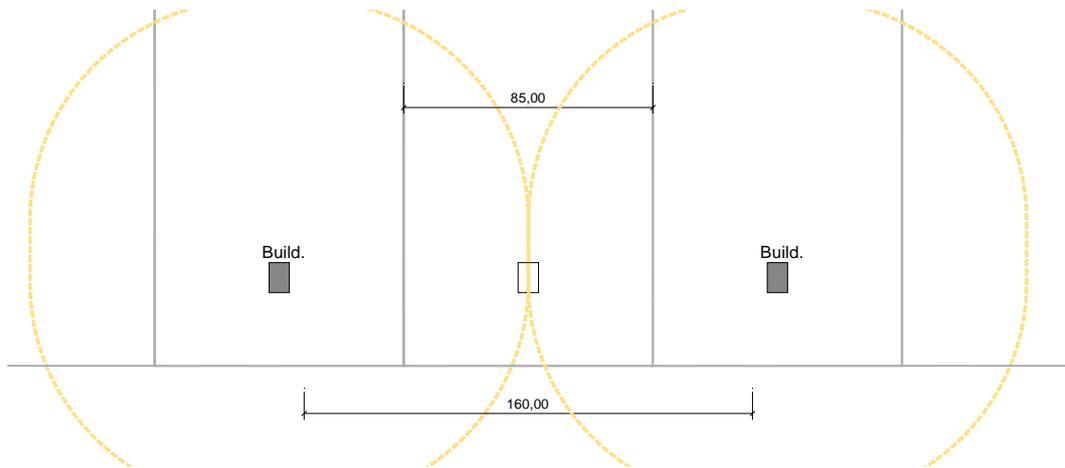
Figure 5. Buffer radius in Dispersed Ensembles



³ Decree n.º202/70, of 21 de April

- In rarefied ensembles, the *buffer radius* of 80m (distance between buildings of 160m), is based on properties *circa* 15.000 m² (85m x 170m), an area between the minimum area for horticulture (5.000m²) and the one for tillable land (25.000m²)⁴, translating into:

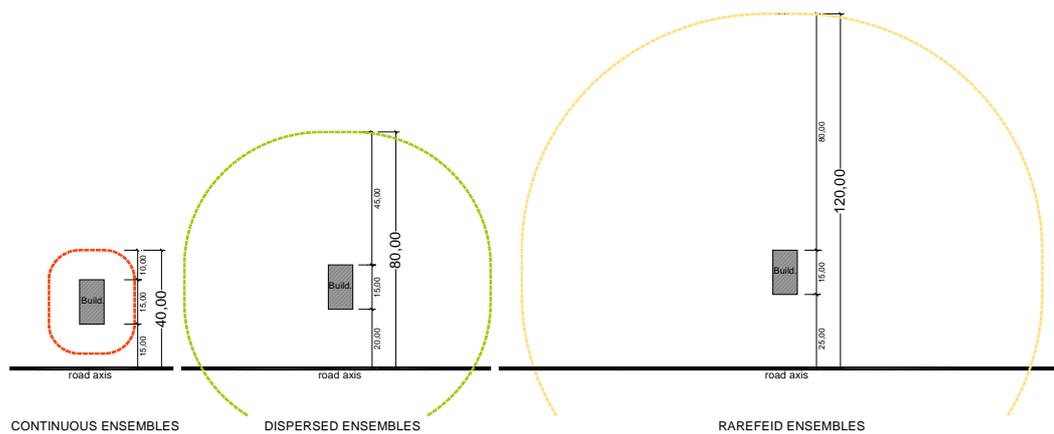
Figure 6. Buffer radius in Rarefied Ensembles



4.2.3. Only road sections marginating buildings belonging to the ensemble or those essential to its internal connectivity are included.

The *buffer* considered consists of two strips, one on each side of the way's axis. Respective depths coincide with those of the buildings' buffers, in standard situations for each ensemble typology, as shown in Figure 7.

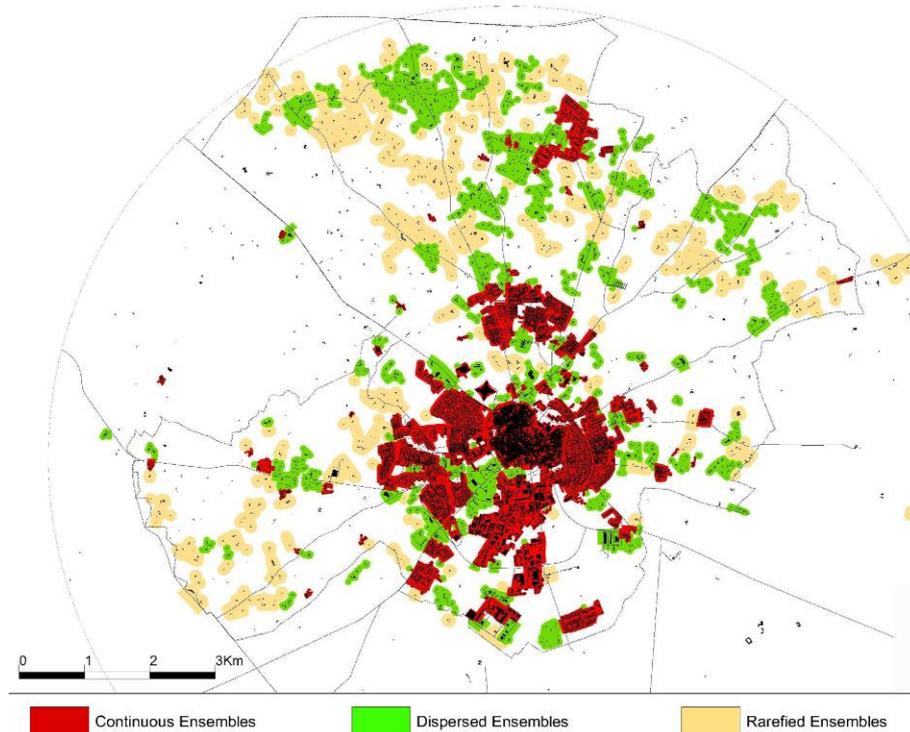
Figure 7



4.2.4. Figure 8 displays the output derived from applying this method to the city of Évora, Portugal.

⁴ Idem

Figure 8. Overview of Digital Method applied to Évora, Portugal



4.2.5. This method also allows the use of characterizing criteria (which, therefore, differentiate situations) for each ensemble. From each ensemble's area, perimeter, amount of buildings and implantation area, it is possible to create differentiating attributes, such as an implantation index, but also indicators of the ensembles' form and compactness.

4.3 Empirical Knowledge on Cartography

4.3.1 The Method is based on cartography and empirical knowledge. It takes place joining, around the cartography, connoisseurs of the territory provided with the concepts and the method. This process should be monitored by someone who, despite not knowing the territory, has experience in implementing the method. The aim is to identify and delimit, in the context of an urban territory, territorial units at various scales, in particular *Extended City*, *City Parts* and *Territorial Units (BLUs)* and also *Urban Pieces*, applying the concepts previously formulated. The attributes to differentiate units and pieces are listed in Figure 1.

Considering that the whole territory should be included in any unit, the most appropriate process begins with a general approach towards increasingly particular ones, identifying first *Extended City*, dividing it in *Parts* and then, each *Part* in *BLUs*. The identification of *Urban Pieces* is based on a different concept (essentially morpho-typological), so it can be carried out systematically and autonomously, or inside each *BLU*.

4.3.2 The experimentation of the Method has demonstrated that:

- Sometimes the recognition of units is clear and immediate, when the unit has identifiable characteristics and well delimited borders.
- Sometimes it requires discussion, some voluntarism, since the expected result is that the whole territory is integrated in units.

The last situation suggests that this analysis method is not completely adequate. It should, especially in these cases, be complemented by other methods.

This situation demonstrates, also, a disordered and confusing territory lacking identity, which makes the difficulty in recognizing units a challenge to overcome. The method is, therefore and in any event, a good contribution to the planning effort.

4.4 Use of Statistical Data

4.4.1 The statistical data are, naturally, a vital source when characterizing a territory. Portugal, as other countries, draws up census covering the universe of the population and housing, covering the whole territory, using necessarily a geographic reference base of information (BGRI).

The BGRI is based on administrative units, the smallest one being the parish, divided into sections (with about 300 dwellings each), which are, in their turn, divided into subsections (Instituto Nacional de Estatística, 2003). The limits adopted are not based on analysis, morpho-typological or functional criteria, rather on operational issues associable to the questionnaire, searching for physical and comprehensible limits, as barriers or roads.

4.4.2 Intending to use the information of the census, one should try to make the limits of Territorial Units and Urban Pieces coincide, as far as possible, with the limits of BGRI 2001.

Looking for maximum flexibility, one should consider the smaller units, the limits of statistical subsections. But this is not always possible, especially in cases where the statistical limits consist of roads that are aggregative from a functional and experiential standpoint. The biggest inadequacy found in the ongoing Project emerges in situations of linear dispersed occupation, in which:

- The functional/experiential units are centred on the road, their separation is the water course;
- The statistic subsections use the opposite criteria, as illustrated in Figure 8.

In such cases, to adopt appropriate Territorial Units and use the statistical data, one must devise weighing factors, to distribute the occurrences by the several Territorial Units the subsection integrates.

Figure 8. Statistic Subsections in Aveiro-Ílhavo



Source: Aerial view - Microsoft Virtual Earth. Statistic subsection limits (BGRI 2001) available in INE

4.4.3 The statistical information, in particular the number of residents, must be used concurrently with the method *Empirical Knowledge on Cartography*, since, according to the criteria set out, each BLU should have around 3,000 residents.

In addition, all the remaining information on population and housing contributes to the characterization of units, in particular for socioeconomic and cultural characterization, demographic dynamics and typologies of buildings and housing.

4.5 Complementary Analyses

The global methodology adopted allows the integration of *Complementary Analyses*, aimed at increasing knowledge about the delimited Base Land Units and Urban Pieces. Of diverse type, these analyses can and should vary according to the purposes for which they are used, with the appropriate level of detail. They may be based on cartography recognition or require survey, fieldwork, or other type of exhaustive study. In the elaboration of spatial plans, for example, the characterization of Territorial Units requires *complementary analyses* on the infrastructure service network (water, sewer, gas...) and facilities, to detect available capacities and shortcomings. This information requires a survey, fieldwork and contact with responsible entities.

If one wants to, for example, formulate norms to regulate urban form, an additional analysis of Urban Pieces is required, namely a study on urban fabric, particularly about characteristics and relationships between building, lot and public space. In the context of the Research Project *Costs and Benefits of Urban Dispersion on a local scale* (within which this Methodology was designed) a sample of territorial units had to be selected for the application of a questionnaire. This sample must be representative of abstract urban forms; to achieve them, a complementary analysis consisting in the classification of each Urban Piece according to a selected set attributes was needed.

5. Search for Taxonomy on BLUs and Urban Pieces

In addition to diverse practical use, some aforementioned, we intend to test the potential of the Methodology for the formulation of taxonomy on BLUs and Urban Pieces:

- First, to distinguish urban continuous occupation, dispersed occupation and rural occupation;
- To test a typological classification applicable to urban continuous occupation, confronting it with knowledge acquired in the field of History of Urbanism;
- And, finally, to test a typological classification applicable to dispersed occupation, anticipating that it will involve *complementary analyses* on biophysical referents and on the *Extended City's* agricultural and forested areas' characteristics.

These are, then, research objectives, now set forth.

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