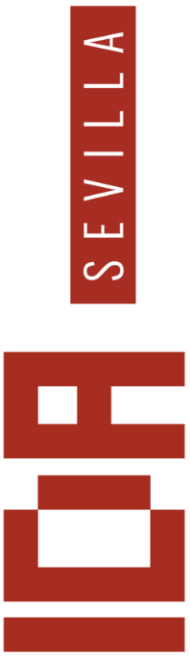

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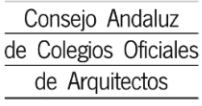

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LT 2

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METHODOLOGICAL PROPOSAL FOR THE ANALYSIS OF URBAN OBSOLESCENCE PROCESSES: THA CASE OF SPANISH HOUSING ESTATES

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Abstract: Housing estates -a characteristic urban form of functionalist urbanism- concentrate much of the urban vulnerability of our cities and they require special attention in urban regeneration processes. Although multiple disciplines have carried out diverse approaches, the perspective from the urban design offers an opportunity for study. In addition, fifty years after their construction, the current situation of housing estates presents a high divergence, compared to the homogeneity that characterized this urban form. Therefore, it is convenient to promote an approach to the housing estates through the processes that have led -or not- their urban obsolescence. The aim is to present an operational urban analysis methodology that, from the systematization of obsolescence processes characterization, specific to each housing estate, facilitates decision making in urban regeneration processes. For that, this paper suggests the use of graphic cards, considering specific variables to this urban form. These graphic cards systematize multiescalar information, using both advanced mapping techniques and consulting open or accessible data, guaranteeing a correct optimization of time and effort. During future research steps the result of this paper, framed in a more extensive research, will be applied to the study case of 32 housing estates selected between Madrid, Barcelona, and Zaragoza.

Keywords: Urban regeneration, Urban Design, Graphic indicators, Operational analysis, Graphic cards

1. Introduction

In respect of the systemic problems of physical, social and economic obsolescence that are present in the consolidated city, urban regeneration processes are considered an effective tool to improve our cities (Roberts and Sykes, 2000). Moreover, Habitat programme from United Nations (2015), or European Union (2007, 2010), have shown a recent institutional support to it, recognizing that the improvement of the most deprived urban areas is one of the most important challenges of our society.In this respect, recent studies have recognized the functionalist urban form as one of the most vulnerable (Hernández Aja *et al.*, 2015). Multiple disciplines have shown interest in the obsolescence of this urban morphology, from very different approaches (Monclús and Díez Medina, 2016). However, the urban approach –in which this research is framed- has been less considered[1]. Moreover, fifty years after housing estates construction, the 'real urbanism' of these areas shows a high divergence, compared to the homogeneity that initially characterized the 'ideal urbanism' of CIAM (Turkington, van Kempen and Wassenberg, 2004; Monclús, Díez Medina and García-Pérez, 2017a). This fact manifests the need to characterize the processes of urban obsolescence, specifically for each housing estates, focusing on urban design and urban morphology.Completing previous works as tools that facilitate the prioritization and evaluation of interventions (Rueda, 2012), or good practices manuals (García Vázquez *et al.*, 2016), the systematic characterization of theses obsolescence processes will allow specific analysis of each housing estate. This diagnosis tool will facilitate, from the operational analysis, decision making methods to the involved stakeholders during urban regeneration processes.Therefore, the aim of the paper, framed in a more extensive research, is to propose a methodology of systematic analysis for the characterization of urban obsolescence processes of the Spanish housing estates. For that, our starting hypothesis defends, on the one hand, the heterogeneity of urban processes. On the other hand, considering relevant urban discussions, the ability of good urban design to promote urban regeneration processes is being relied upon[2] (Urban Task Force, 1999, p. 49).

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[2] "Successful urban regeneration is design-led. Promoting sustainable lifestyles and social inclusion in our towns and cities depends on the design of the physical environment. This does not mean that design alone will be sufficient. It must be accompanied by investment in health, education, social services, community safety and jobs. But design can help support the civic framework within which these institutions function successfully. This is why, together with the other key management, policy and financial instruments described in subsequent chapters, design features strongly in our recommendations to secure urban regeneration."

2. Urban analysis as tool for characterize urban obsolescence

CIAM 4 found in the elaboration of thematic cartography an operational analysis a tool to compare cities and propose their functionalist urbanism (Van Es *et al.*, 2015, pp. 15–27). This research, analogously, uses the operational analysis. This time to characterize obsolescence processes in housing estates, developing a series of cartography and thematic graphic cards.But not only the aim pursued is different. Current methods and materials available are also different. Specific characterization needs, on the one hand, systematization to facilitate comparative visions between housing estates. On the other hand, it requires the use of advances analysis techniques, such as Geographic Information Systems (GIS), combined with other Computed Aided Design (CAD). The use of these techniques will improve control the complexity of urban processes, optimizing the amount of resources, effort, and time.To justify the study variables, a recent text written by Frank Wassenberg (2013, pp. 131–140) has been considered, which compiles the systemic problems that housing estates accumulate. Among them, this research considers those related to urban design physical dimension. To a large extent these problems are related to radically new aspects of functionalist urbanism, such as zoning and uses separation, seriation, quantity, and quality of open space, etc. widely discussed in the national and international panorama. It is interesting to know both measurable data and empirical analysis results. More specifically, among the first: the size and adequate density of housing estates. And between the latter: the integration processes though the evolution location -peripheral or not- and its enclave character, the strategies of planning and its evolution -uses distribution or shape of road system-, and finally, the evolution of open spaces character.Each variable is discussed in subsequent sections. For that, firstly, the study variables are justified, identifying their relevance in relation to the obsolescence of housing estates. Secondly, the information sources are described, introducing analysis criteria and methods. Next, we describe both the classification methods which are combined between the more quantitative to the more qualitative. Finally, we describe some graphic criteria and the scale representation, from the city scale -1:200.000- to the urban detail -1:5000- (Table 1, figure 1).

3. Measurable data

First, measurable data helps to characterize housing estates. Complementary to the design and construction dates, the work team and the type of promotion -public or private-, the size and density establish a first approach to diversity and heterogeneity of housing estates.

3.1. Size

Although size is not cause of development of more or less urban obsolescence, it is a key factor in order to characterize a housing estate. In general terms, the size of housing estates has increased from the 1950s to the 1970s, due to the increase of housing demand and the viability of promotions (Monclús, Díez Medina and García-Pérez, 2017b). In future research steps, the detailed analysis of the results will allow to verify if there is correlation between size and obsolescence.Primary information sources, both the original cartography and the specific bibliography allow to characterize housing estates size. We checked the previous work of Amador Ferrer for Barcelona case (1996), Ramón López de Lucio for Madrid (Bataller Enguix *et al.*, 2004), and Javier Monclús for Zaragoza (2012), have allowed to characterize not only numerically but also geographically the 32 study cases selected in the framework of this research.

3.2. Density

As some authors point out, the designing of a non-optimal density is one of the reasons of the obsolescence in some housing estates. Optimizing density allows to generate a support with a correct relationship between cubic volume, population and open space, promoting a desired intensity of use (García Vázquez *et al.*, 2016, p. 23). Thus, against the specific meaning of density that sometimes predominates in Spanish planning (Ezquiaga en Monclús and Díez Medina, 2015, p. 208), the classical urban discussion has shown an interest in urban density from a comprehensive perspective. J.Jacobs (2011) or L.Martin (2000) reflections not only remain in force but also assist as a starting point for many other recent research. Many of them study the relationship between urban form and density, proposing new tools to measure density, from a more qualitative approach (Berghauser Pont and Haupt, 2010; MIT faculty, 2011; Fernández Per *et al.*, 2015). Although researches consulted have their own specificities, they all have common study variables. Our starting point, based on these researches, considers the definition of four variables:

- Dwelling per hectare, expressed as number of houses and total housing estate surface ratio (dw. /ha).

- Floor Area Ratio, expressed as the gross floor area divided by the total land area (m^2r/m^2f)
- Height index, expressed as the gross floor area divided by the covered area.
- Coverage, expressed as the relationship between the covered area and the total area (%).

For its realization cadastre information (alphanumeric and cartographic data) have been consulted. The results area classified in a double approach. Firstly, according to the 'canonical' density measure (dw./ha): high, medium and low (Díez Medina and Monclús, 2017). Later it is classified according to the relationship between height index and coverage, characterizing housing estates from the most intensive to the most extensive.Density has a triple representation: the first one, through numerical data. The second one, using a graph, relating height index and coverage, representing different bubbles sizes considering also density as dw./ha. Finally, visualizing the shape of density, through a isometric view of the estate at 1:5.000 scale.

4. Empirical analysis

The empirical analysis characterizes urban obsolescence processes in a multiescalar approach: city scale, housing estate scale and detail scale.

4.1. City scale

Considering Toledo Reference Document (EU Ministers for Urban Development, 2010), Integrated urban regeneration is a process that implies attend comprehensive visions of the city as a whole through 'area-based' approach. For that, we consider first the relationship between the housing estate and the city as a whole. Our study attends, among all variables that could be studied at this scale, those important variables considering the physical dimension of urban design. It is worthwhile to deepen the integration processes that took place in the housing estates, describe through the evolution of peripheral location and its enclave character.

4.1.1. Integration processes: peripheral location and enclave character

The relevance of the study of integration processes is inescapable, especially when numerous studies have found in the lack of accessibility one of the reasons for the rapid physical obsolescence of housing estates (Hillier, 2007, pp. 138-170). One of the most important challenges of estates is to improve their connectivity with the rest of the city, both farther and nearby scale. Furthermore, forty years after housing estates were built, the initial scenario, more or less homogeneous, has changed, presenting nowadays much more divergence.

We study the integration through two variables: peripheral location and enclave character that, although their differences, they present similarities, justifying their methodological study jointly. If peripheral location considers the evolution of the housing estate position according to the rest of the city, enclave character studies the evolution considering the relation between the housing estate and its close urban fabric. Both cases show the need to focus on the relationship between housing estates and the rest of the city.

To the specific characterization of each case space syntax methodology is used. The analysis tool - recognized internationally as one of the possible analysis tool of this processes whose design has led the University College of London for more than trhee decades- allows to quantify the integration of streets of an urban area (Al_Sayed *et al.*, 2014). In this case, more interesting than the quantification is the processes characterization, observing both initial and final scenario.

For that, two temporary scenarios have been developed. The first one, in 1975, when all housing estates had been built. Our study considers both historical cartography and photogrammetry from the National Geographic Institute (Centro Nacional de Información Geográfica, 2017), on Geographic Information Systems (GIS). The second one, currently, forty years after the initial scenario, has been developed considering open databases as *Open Street Maps* (Geofabrik GmbH and OpenStreetMap Contributors, 2016).

During the prost-process the integration results are analysed according to streets hierarchy. While streets with infrastructural character, which serve as access to the housing estates, are considered in peripheral location analysis; primary and secondary roads are considered in enclave character analysis. Finally, results are represented both as diagram and as cartography. The diagram includes a valuation of the integration process carried out in each housing estate. The cartography shows both the evolution of the relative integration with the rest of the city (E 1:200.000) and with its close urban fabric (E 1:10.000).

4.2. Housing estate scale

At this level, it is interesting to study the main urban design options applied in the housing estates: planning criteria, coverage, land uses, housing plots, and road system.

4.2.1. Planning criteria and evolution

The planning criteria could predetermine the support on which complexity and urban diversity will develop. The existence -or not- of main or commercial axes, the relative position of amenities -integrated, peripheral or as barrier-, or the greater or less diversity on open spaces have been deal with more or less success in our housing estates (Bataller Enguix *et al.*, 2004). Therefore, beyond the 'ideal' homogeneity of the functionalist urbanism, it is convenient to check the different planning criteria that can influence in a greater or less urban obsolescence.
In addition, an evolving perspective allows to know, on the one hand, when those criteria came into force -there are many cases whose amenities was built years or even decades later-. On the other, it allows to visualize the experiences -more or less radical- of renewal, retrofit or regeneration in the estates.
For the representation of the current state of planning criteria, cartography and cadastre alphanumeric data are used as primary sources (Dirección General del Catastro, 2013a, 2013b), completing with current planimetry and on-site visits. On the other hand, the georeferencing of the original planimetry allow to hypothesize an initial scenario, facilitating the comparison between both scenarios.
The plan representation of the two scenarios (E 1:5.000) allows to observe and characterize the processes. The most common, on the one hand, represent the improvements in amenities that during the years after the estates construction have tried to correct some planning deficits. On the other, the interventions of renewal, retrofit or regeneration are systematized. Finally, an urban section (E 1:2.000) completes the visualization of the planning criteria. Its realization has been carried out with advanced computer tools, due to a 3D model of the housing estate.

4.2.2. Coverage

The coverage concept, according to Colin Rowe or more recently Michael Hebbert, on the proportion between built and open space area, is a key factor of the characterization of urban obsolescence. Functionalist urbanism reversed the figure-ground proportion, and its effects have been numerously discussed (López de Lucio, 2013, p. 86). However, from an opportunity approach, low coverage represent a great occasion in new regeneration interventions (Ferrer en Sotoca, 2012, p. 256).
But, during the systematic analysis both built area and open space need detailed attention. Built area is defined according to the use of the building ground floor, distinguishing between residential, amenities, commercial, tertiary and others. At the same time, open space could be classified in detail as: road space and pedestrian space, in turn classified considering access and control: pedestrian space with public access and public control, pedestrian space with public access and private control and pedestrian space with private access and private control. This last variable holds dear because, on the one hand, has divergence patterns between estates, and on the other, conditions urban regeneration approaches.
Cadastre cartography provides information related to open spaces and built area. In combination with more local open data it is possible to know more detailed information, useful to obtain the road space (Ayuntamiento de Zaragoza, 2010; Ayuntamiento de Madrid, 2015; Área Metropolitana de Barcelona, 2016). The use of all this information in a GIS environment simplifies its processing.
A bar diagram helps to visualize the coverage specific characterization of each housing estate, representing coverage percentages of each particular use analysed using the same legend of colours than planning criteria maps.

4.2.3. Housing plots

Unitary interventions that characterize housing estates influenced a new way of building our cities. The traditional scheme 'fragmentation, urbanization and construction' is overcome as Mª José Rodriguez Tarduchy argues, generating "a morphological change that entails a remarkable simplification of the urban fabric" (2011, p. 134). Plots have disappeared, at least from a morphological dimension. However, they still exist from an administrative approach. The lack of clarity in this new plot system creates confusion for the agents in charge of maintenance, sometimes causing obsolescence due to their lack of qualification. From an urban regeneration approach, the less clarity, the more difficult is the management and the viability of many of the interventions.

A systematic analysis of the diversity of housing plots in housing estates Will help to improve the readability and management of open spaces. Also, to propose specific solutions in regeneration interventions in order to improve the qualification of open spaces. However, the public-private dichotomy must be overcome, proposing a new classification that consider both access and control of plots (Dovey, 2016, p. 155).
Both cartographic and alphanumeric cadastre data provides information to characterize the housing plots. A first classification defines the control of the open space (public, it there were no plots, or private, if any). On-site visits complement the characterization, adding information about open space access (from public to private). This information can be visualized together with planning criteria map, at current scenario at 1:5.000 scale.

4.2.4. Zoning

Orthodox separation of uses promoted by the Athens Charter turned some housing estates in dormitory towns. Adolf Sotoca explains the obsolescence of this model in relation to the lack of urbanity in the estates, where some strategies that increases use intensity has been proved as effective improvements (2012, p. 21). In addition, a first approach to the 32 study cases shows significant differences. There are two possible causes for this heterogeneity: firstly, when the Urban Development Promotion Law *(Ley del suelo, 1956)* come into force demanded the provision of amenities. These amenities were built years -or decades- later. Secondly, because during the 80s and 90s housing estates live an era of improvements, based on the correction of planning deficits (Sotoca, 2012).
Alphanumeric cadastre data provides detailed information on floor area ratios of each building use. Knowing the total built area, it is possible to calculate each use percentage, for each housing estate. The study considers four uses: residential, amenities, commercial-tertiary and other. Finally, a bar diagram represents these variables allowing a comparative vision between housing estates.

4.2.5. Road system

Functionalist urbanism in proclaiming the ‘death of the street’ modified radical the road system character. Obsolescence of this new model lies in the simplification and specialization of the morphological relationship of the street with the rest of elements that make up the city. However, this new scenario of hierarchical and specialized streets is not as homogeneous, at least as one might think a priori. A first approach to the analysed study cases has shown significant differences. For that, characterizing each road system could be useful in order to verify their influence on urban obsolescence.
To do this, we develop an initial (1975) and current scenario (2015), as section 4.1.1 described, considering both the open cartography provided by *Open Street Maps* and the historical cartography and photogrammetry of CNIG. According to A. Ferrer (1996, p. 191), road system could be classified as cluster network (prioritizes building system), hierarchical grid (prioritizes open space), or isotropic grid (the road is a key planning mechanism).
The road plan incorporates at 1:10,000 scale overlapping the initial and current scenario, allowing its representation the characterization in the categories considered.

4.2.6. Urban layout

In spite of the laudable ideals pursued by the typological experimentation in housing produced by the Modern Movement, nowadays its results have not been as meritorious in some cases. Although seriation and standardization have proved advantageous in some respects, they have also produced a residential monoculture that is incapable of generate diversity (Jornet in Sotoca, 2012, p. 228). Therefore, the urban obsolescence of housing estates should consider the ability to generate complexity, taking into account both the diversity of their urban typologies and their forms of aggregation.
The direct observation, based on the information collected in previous sections, allows to know this complexity, classifying the results from a double approximation. When redrawing to scale each of the urban typologies (1: 5,000), and counting their repetition in the housing estates, a diversity index is described. An aggregation analysis, more subjective, characterizes through the planning criteria, the simplicity or complexity of the resources used during the design process.

4.3. Detail-scale

The importance of detail-scale study becomes relevant when urban design plays an important role in the user's experience through the closest details (Gehl, 2014). At this closest scale, the analysis is performed on a selection of the most representative types of spaces of each housing estate. At this level

become important some variables such as porosity, human scale and façades character, along with others more dynamic as evolution of open spaces, especially in relation to its ‘green’ areas and the motorization of its spaces.

4.3.1. Open spaces evolution

In contrast to some invariable features that customise open space, such as porosity or human scale, as argued J. M. Ezquiaga others have developed processes (in Monclús and Díez Medina, 2015, p. 205). At this level, it is interesting to know whether the 'green areas' of 'ideal' urbanism survive the lack of maintenance of 'brown areas' or the pressure of the motor vehicle that characterize 'grey areas' of 'real' urbanism. These characteristics qualify in part the open space, being its evolution an indicator of obsolescence at this scale.
The comparison between historical and current photogrammetry provided by CNIG (2017), georeferenced and at the same scale (1: 2.000), allows us to characterize the possible open space evolution, summarized in a process diagram. The diagram is composed of a time line that includes the qualitative characteristics of vegetation type and presence of motor vehicles of the study spaces in both scenarios.
In addition, a user-level view carried out by the interpretation of on-site visits, photographs or *Google Street View* complements the plan and diagram. On this view, the 'green', 'brown' or 'grey' areas are displayed through coloured spots.

4.3.2. Porosity

The concept of porosity defines the characteristics of the close encounter between the building and the open space. The number and distribution of possible contacts -or interactions- determines, in part, what activities, who and for how long they can occur in open space (Gehl, Kaefer and Reigstad, 2006). Little porous encounters are therefore poorly permeable. A poorly permeable urban support presents clear signs of obsolescence by not facilitating the life between buildings (Gehl, 2006). However, although functionalist urbanism was not concerned to these considerations, some examples show in their design a greater concern -consciously or unconsciously- about it.
The location of potential interactions (doors, access, etc.) facilitates the systematization of the porosity. The georeferenced cadastre information of 'gates' provides a first approximation that is later verified through in-site observation. Finally, the result is plotted on a map (E 1: 2000), which indicates not only how many interactions exist but also where they occur, noting if there are particularly sensitive areas over which urban regeneration intervention is needed.

4.3.3. Human scale

A current widespread criticism of functionalist urbanism says that the lack of human scale in some open areas is in part responsible of the dehumanization of open space. However, add some nuances to this general criticism is needed, because there is more heterogeneity in the solutions adopted. Therefore, interventions in urban regeneration should consider the recovery of the human scale in open spaces, optimizing the design of the space to the user in the most critical cases. Thus, according to the research carried out by J. Gehl, the challenge is to ensure that the fundamental principles guiding the human scale are naturally coupled to the urban fabric (2014, p. 59).
To carry out the analysis we start reinterpreting photographs of each ‘type of space’ -both own and *Google Street View*-. After drawing all spaces at the same scale (1: 500), and placing a person into the drawing it is possible to evaluate the relationship between the open scape and the human scale. We consider three categories: oversized, balanced - the two most common, or undersized.

4.3.4. Façade character

One of the causes of the lack of qualification of open spaces is related to the poor interaction that frequently occurs between buildings and public space. This design decision affects the open space on two levels: the encounter with the ground floor, first and the configuration of its façades afterwards.
Firstly, the open space can be affected mainly at the user level. As J. Gehl (2006) argues, people have developed a panoramic view, and are especially sensitive to the configuration of ground floors. Although some housing estates have developed some interesting configurations, many have large plinths, walls or dwellings that do not facilitate a good user experience. In the same way, the configuration of facades helps to define open spaces. Again, although there are some good examples, many spaces are configured by façades without any window. In relation to J. Jacobs contributions (2011) this singularity

affects not only from a visual point of view, but also from a safety dimension. Having at least the possibility of looking at the public space, generates spaces where security based on citizen control, described by Jacobs, can work.
The photograph reinterpretation is used in order to know the influence that design has on the configuration of building-open space interface. The analysis takes place at two levels, the first evaluates the interface of the ground floor, characterized by the analysis of J. Gehl in active -presence of activity, transparency, etc.-, or inactive-walls, plinths, walls, dwellings, etc.-. The second level values the raised floors, distinguishing again between active façades -with windows-, and inactive -no windows or small residual voids-. Finally, the use of colour codes helps to visualize the results on the user-level view (E 1: 500).

5. Conclusions

This paper presents a methodology of analysis of urban obsolescence processes, adapted to the case of the Spanish housing estates. Characterizing the processes of obsolescence allows, firstly, to add nuances to the general view with which the literature has sometimes dealt with housing estates. Forty years after their construction housing estates present a greater divergence pattern, with respect to the apparent homogeneity with which they were designed. Secondly, it facilitates a comparative approach between housing estates. Not all have evolved in the same way. Completing this analysis will allow to discover if the ones that present a higher urban design quality concentrates today less obsolescence symbols. Finally, the operational analysis facilitates the intervention in processes of urban regeneration, helping to involved stakeholders to make decisions.
The proposed methodology has found in the urban operational analysis an effective tool for the characterization of obsolescence processes. For this purpose, a graphic card has been developed which, through the combination of graphical material such as maps, sections, views and diagrams, and on the other with measurable information, analyses quantitative and qualitative variables that help to systematize the processes of obsolescence that concern Spanish housing estates.
Future research steps must consider the application of the methodology described to the 32 selected study cases, between Madrid, Barcelona and Zaragoza. This analysis will allow extrapolate the characterization of processes of obsolescence to many other housing estates. Subsequently the research could acquire a more applied role, if the knowledge generated by this urban analysis contributes to help in the decision making of future intervention strategies.

	Sources	Criteria and methodology	Classification	Representation	Variation	References
Measurable data						
1Size	Specific bibliography Original cartography	Housing estate delimitation	Small Medium Big	A	●	
2Density	Cadastre	Variables: -density (dw./ha) -floor area ratio (m^2r/m^2f) -height index -coverage (%)	Double classification, according to density (high, medium, low) and height index and coverage	A 3D 1:5.000	●	1,2, 3
Empirical analysis						
City scale						
3Peripheral location evolution	*OpenStreetMaps*, historical cartography and photogrammetry (IGN)	Develop two temporal scenarios: current and initial. Space syntax methodology is used in combination with GIS	Double classification, considering initial and current situation, concerning integration processes	M 1:200.00 0	●● ●	4,5, 6
4Enclave character ev.				M 1:10.000	●● ●	
Housing estate scale						
5Planning criteria and evolution	Cadastre, original cartography, in-site visits	Compare original and current scenario. Georeferencing original cartography using GIS		M 1.5.000 S 1:2.000	●	7,8
6Coverage	Cadastre, in-site visits	Classification of built and open areas considering both cadastre data and in-site visits	Percentage: figure (residential, amenities, commercial-tertiary, others) and ground (road, and open spaces considering access and control from public to private).	D		9
7Housing plots	Cadastre, in-site visits	Considering cadastre data base (control) and in-site visits (access)	Considering control and access (from public to private)	M 1:5.000	●	9,10
8Zoning	Cadastre	Alphanumeric cadastre data, considering the m2 of use of each building	Residential Amenities Commercial-Tertiary Others	D	●	11
9Road system	*OpenStreetMaps*	Overlapping initial and current scenario, and classifying street types	Cluster network Hierarchical grid Isotropic grid	M 1:10.000	●	12
10Urban Layout	In-site visits	Obtaining urban layouts (classified as initial or current)	From more diverse to more monolithic	3D 1:5.000	●	11
Detail scale						
11Open space evolution	Historical and current orthophoto (IGN)	Comparison between initial and current orthophotos of green areas evolution and motor vehicles evolution	'Green' 'brown' or 'grey' area, and presence of motor vehicles in both scenarios: initial and current	M 1:2.000 V 1:500	●●	13
12Porosity	Cadastre, in-site visits	According to cadastre data, checked after in-site visits	Localized distribution of accesses	M 1:2.000	●	14
13Human scale	*Google Street View*, in-site visits	Reinterpreting photographs, placing a person into the drawing	Oversized, balanced, undersized	V 1:500	●	14
14Façade character	*Google Street View*, in-site visits	Reinterpreting photographs, completing information after in-site visits	Plantas bajas y alzadas (activas o no activas)	V 1:500	●	14

Table 1. Methodological summary. Sources: 1 (Berghauser Pont and Haupt, 2010), 2 (MIT faculty, 2011), 3 (Fernández Per *et al.*, 2015), 4 (Rueda, 2012), 5 (Al_Sayed *et al.*, 2014), 6 (García Vázquez *et al.*, 2016), 7 (Bataller Enguix *et al.*, 2004), 8 (Hebbert, 2016), 9 (López de Lucio, 2013), 10 (Rodríguez-Tarduchy, Bisbal Grandal and Ontiveros de la Fuente, 2011), 11 (Sotoca, 2012), 12 (Ferrer i Aixalá, 1996), 13 (Ezquiaga en Monclús and Díez Medina, 2015), 14 (Gehl, 2014). Legend: A – alphanumeric, M – map, S – section, D – diagram, V – user view, 3D - isometric; ● low variation, ●● medium variation, ●●● high variation

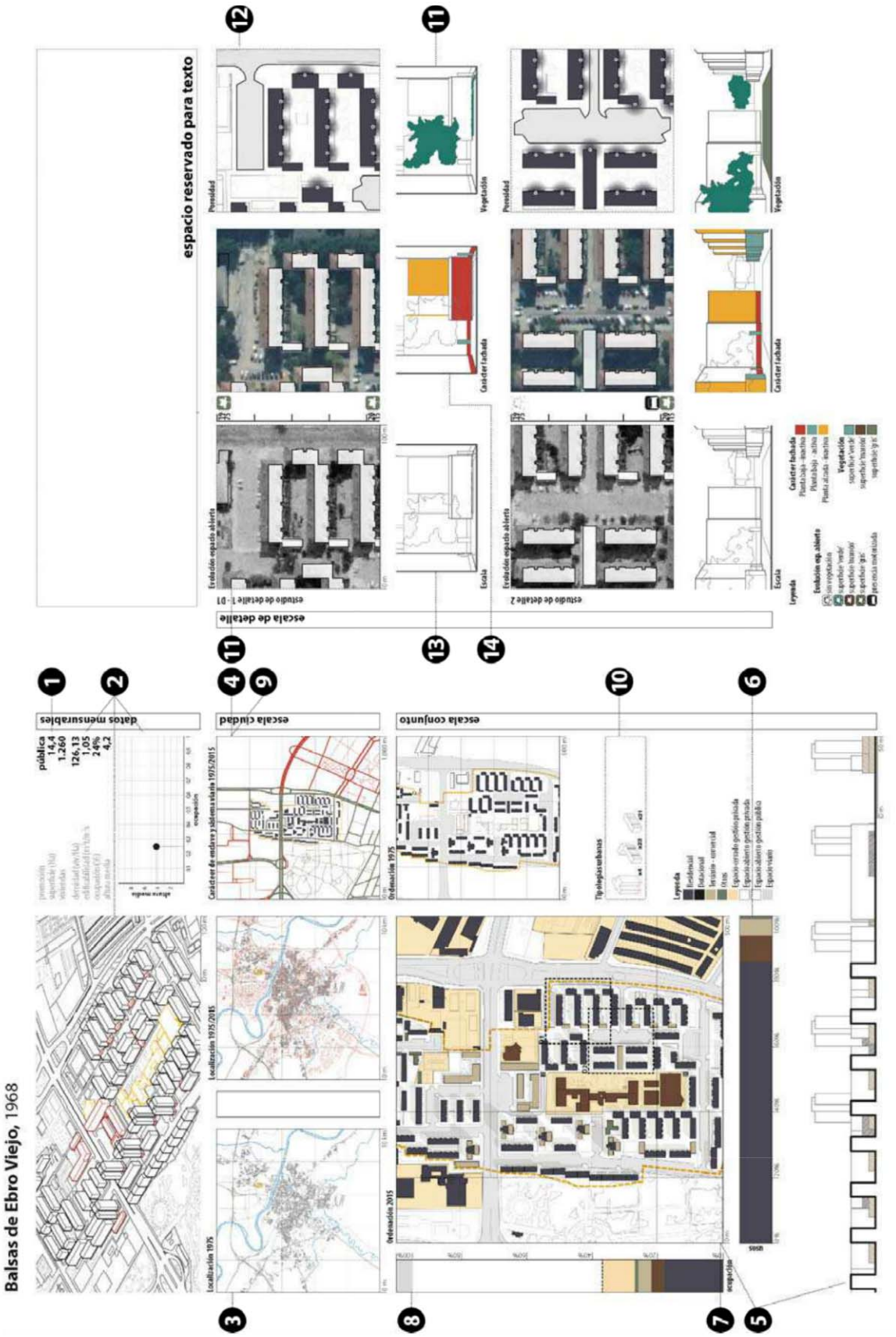

Figure 1. Graphic card example. (Original size A3)

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