

The transition urban planning history of Lisbon Metropolitan Area

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Abstract: Drawing from an ongoing research project 'SPLACH - Spatial Planning for Change, which aims to inform a sustainable planning transition of Portuguese metropolitan areas, this presentation identifies the planning paradigms which have guided the urban planning of Lisbon, its region and metropolitan area, during twentieth century. The influence of specific theories such as the Garden City (1898-1902), the Chartre d'Athènes (1933-1943), the Doorn Manifesto (1954) and the Compact City (1997) on strategic planning documents including the 'Plano Director de Urbanização de Lisboa' (1938-1948), the 'Plano Director Municipal de Lisboa' (1954-1958), and the municipal and regional masterplans established after the 1974 Portuguese Democratic revolution are here identified. Such analysis is constructed through an overview of municipal and subregional plans and of neighbourhoods created in them, which allows an analysis of the metabolic and morphological transitions which have marked twentieth century Lisbon Metropolitan Area (LMA) urban planning history. By doing so, we seek to establish which were the impacts of these transitions, including on urban form, how have these changed the role of urban growth in LMA and how to interpret and optimize such built heritage today, when Sustainability urges for change.

Keywords: urban form, sustainability transitions, urban planning paradigms, Lisbon Metropolitan Area.

Introduction

Urban Planning is fundamental for the sustainability of cities and their regions, particularly in metropolitan areas. Global urbanization, with its pressing socio-environmental challenges has led scholars to question existing planning tools (Oliveira, 2006). This kickstarted studies of problematics like air pollution, waste production, greenhouse gas, etc. Such studies accounted for energetic and material balances occurring in specific areas. Developed by engineers, ecologists and civil engineers, these allowed the first metabolic studies of real cities like Tokyo, Brussels and Hong Kong (Kennedy *et al.* 2010). Metabolic data analysis and models to account such data were made available worldwide (Beloin-Sain-Pierre *et al.* 2017, Kennedy *et al.* 2010). Particularly suggestive was the 'black box' metaphor attributed to the city by many urban metabolism studies (Erb *et al.*, 2016). The participation of other scientific areas, covering black box analysis, through physical form urged architects and urbanists to pursue a sustainability agenda. However, the application of such knowledge in transformation of the built environment proved to be slow (Jencks *et al.*, 2000). Clearly, urban form concurs to urban sustainability (Marat-Mendes, 2002), but the 'black box' needs to be better understood within architectural and urban design practices. Only then can planning authorities aspire to respond properly to the

sustainability agendas which international institutions (United Nations among other) were demanding, including the directives for the control of water and air quality.

The discourse of sustainability surpassed the engineering and natural sciences (Fischer-Kowalski, 1998) and generated societal pressures for politicians to promote adequate laws for maintenance of resources and planning of the built environment. The use of metabolism as a tool for design remains however inconspicuous in architecture and even urban design. In the beginning of the new millennium sustainability emerged as a common goal for cities, and it suggested the need for effective transdisciplinary processes (Baccinni and Oswald, 2008).

The concept of metabolism would be re-examined in neighbourhood (Kennedy *et al.*, 2010) and metropolitan (Rosado *et al.*, 2014) scales, and it underlies recent planning paradigms, including the Compact City (Jencks *et al.*, 1996; Rogers, 1998), which turned into the corollary of the EU Urban Agenda (Scoffham and Marat-Mendes, 2000). Within thirty years, the consolidation and materialization of the first metabolic studies of cities changed urban practice and theory, spawning a new urban model and a proliferous research area. This long process exposes the time loop that a cultural-scientific-political-sustainability-transition process requires in practice, as already argued and identified by Tibbs (2011).

Assuming the existence of this time-loop, an ongoing research project 'SPLACH – Spatial Planning for Change', aims to inform future urban policies on sustainability transitions in metropolitan areas, identifying the impacts of planning paradigms and corresponding urban forms. The role of the food system in sustainability transitions of the Lisbon Metropolitan Area (LMA) is highlighted. However, the functioning of the food system is closely interrelated to land-use and urban form, as well as socio-cultural contexts (Marat-Mendes and Borges, 2019). Thus, identifying planning paradigms which led to the specific context of today, is an important contribution to inform any exercise aiming to change current planning priorities.

This paper focuses on three specific areas of the LMA, as well as three moments of the urban history of its region, while identifying specific paradigms that guided urban development, in their morphological and metabolic dimensions. Furthermore, we analyze socio-ecological potentials for each of these areas today towards a sustainable transition of the LMA territory.

Methodology

For our overview of the LMA urban history, we selected three case-studies, namely the Eastern end of Lisbon, between Vale Escuro and Olivais; the Alfragide zone in Amadora, particularly the Alto do Zambujal neighbourhood and finally, the centre of Oeiras, including the old centre and the neighbourhoods of Nova Oeiras and Santo Amaro (See Figure 1).

Planning instruments relevant for developing these areas include:

- The PUCS (Plano da Costa do Sol), a sub-regional masterplan including Lisbon, Oeiras and Cascais, started by Donat-Afred Agache in 1935-1936, continued and concluded by Étienne de Groër in 1948;
- The PDUCL (Plano Director de Urbanização da Cidade de Lisboa), Lisbon's masterplan, designed by Gröer in 1938-1948;
- The PDUL (Plano Director de Urbanização de Lisboa), Lisbon's masterplan, designed by GEU (Gabinete de Estudos Urbanísticos), a municipal planning office;
- Several PDMs (Plano Director Municipal), the municipal masterplans initiated in 1982 by the democratic government.

The first three were designed during the New State, a conservative dictatorship which ruled Portugal between 1933 and 1974. However, from these, only the PUCS was fully approved. The PDM is more concerned for management than for planning itself, and so its nature is different from the remaining plans, as will be explained.



Figure 1 - Case-studies: 1 – Eastern end of Lisbon; 2 - Alfragide; 3 – Oeiras centre

Lisbon Metropolitan Area Urban Planning Evolution

The PDUCL and the PUCS and the Garden City paradigm

The first period under analysis represents the moment when urban planning was adopted in Portugal as strategic for the modernization and development of the Nation, but also as an emerging area within the curricula of Architecture Schools, whose urban dimensions were absent until then (Marat-Mendes *et al.*, 2014). Thus, some Portuguese architects were invited to conclude their architectural studies in foreign universities, including the Institut d'urbanisme de l'Université de Paris (IUUP). It was precisely from the IUUP that architect-urbanist Étienne de Groër came to work in Portugal, invited by the Portuguese Ministry of Public Works (Marat-Mendes *et al.*, 2014). The planning paradigm guiding Groër on his planning work was Ebenezer Howard's (1902) Garden City theory, as Groër (1945-1946) stated himself in his 'Introduction to Urbanism'.

Groër's work, justified in the written document that complemented the drawings of the PDUCL (1938-1948) attests the crucial role of Garden City concepts to the urban development of Lisbon and its region. He planned a rural zone conditioned by urban legislation, a buffer to urbanization he assigned for agriculture. Groër also worked on the urban design scale. Thus, he proposed building principles, and advanced solutions for street sections, urban grids, urban blocks and plots for several neighbourhoods in Lisbon and Costa do Sol. The family unit constitutes a basic issue in Groër's (1948) urban planning, determining public space organization according to family needs (creating schools, churches and

other equipment within walking distance) as well as private space (for instance the requirement of a private backyard for growing food and resting).

The PUCS allowed Groër to deepen his interpretation of the Garden City, working at a sub-regional scale. He established a maximum population for the city and its subregions – 1.100.000 inhabitants for Lisbon and 550.000 for the suburban municipalities (Groër, 1948). Furthermore, Groër established a zoning system to delimitate different urban land-uses (industry, commercial, mixed, residential) to protect rural zones, prohibiting their urbanization. The green belts were implemented in the surroundings of the Lisbon municipality, as well as in Oeiras and Cascais subregion, known as Costa do Sol (Marat-Mendes, 2009).

Although the PDUCL failed to get approval from the central government, it was partly implemented and changed irreversibly the course of the Lisbon's development (Marat-Mendes and Oliveira, 2013). Municipal architects like Paulino Montez, Luís Benavente and Zinho Antunes drew specific plans for garden-suburbs, including neighbourhoods as Alvito (1937), Restelo (1938-1947), Caramão da Ajuda (1947), all in the Western end of the city, Alvalade (1945) in the north-central area; and Madre de Deus (1942) and Encarnação (1940) on the Eastern end.

The PDUL and the Chartre d'Athènes and the Doorn Manifesto paradigms

While the PDUCL and the PUCS were being developed, Portuguese architects started to urge for political changes and a new modern aesthetic to counteract the one established by the New State. In Europe, modernist urbanism, developed under CIAM – Congrès Internationaux d'Architecture Moderne, produced the 'Chartre d'Athènes', a synthesis for the new functional city.

Selections of the Chartre were translated into Portuguese in 1944 by Nuno Teotónio Pereira and Manuel Costa Martins for 'Técnica', a magazine of engineering students. From February 1948 to September 1949, the integral version was published in the mostly magazine 'Arquitectura', translated by Francisco Castro Rodrigues and Maria de Lourdes (d'Almeida, 2015).

These translations became a public statement of Portuguese architects – and engineers – pursuing new planning paradigms. Nevertheless, such transition would take time. After the approval of the Costa do Sol Plan in 1948, Groër concluded the PDUCL, but the central government did not approve it. New urban plans would be delineated for Lisbon, culminating with the 1959 PDUL elaborated by the GEU, which included 14 engineers, 15 architects and 2 landscape-architects. This new plan acknowledged Groër's contributions and confirmed the importance of the regional scale to tackle urban problematics including overcrowding, inadequate distribution of regional populations, and lack of region unity which affected social, economic and environmental cohesion (PDUL, Int.3-4). However, the PDUL is closer to the principles of the Chartre d'Athènes, including mobility, functional zoning and high-density construction. The maximum population for the city coincided with Groër's, but the PDUL proposed new treatments for rural zones. While the PDUCL established a green belt around Lisbon (at the northern bank of Tagus) to prevent the city from extending to rural settlements, the PDUL omitted this possibility in the north side of Tagus river. Instead, it identified the green areas of protection (green belts) in the limits of the orographic valley areas (water streams) which constituted the natural areas of provision of open spaces for leisure. Only in the southern bank of Tagus, would the PDUL identify areas for agriculture to be preserved (PDUL, I.2.1-2.2/1). Despite its ambitious project for Lisbon, the PDUL failed to get approval. A new version coordinated by Georges Mayer-Heine was concluded in 1967 but approved only ten years later.

By assigning green areas for leisure, instead of agriculture and food production, the PDUL announces a transition of paradigm, as the ideas of international modernity were slowly being absorbed by Portuguese architects and planners. Moreover, greater attention is given to building structures themselves, instead of the family principles that guided Groër's (and even Howard's) planning ideas. Nevertheless existing rural ways of life were not neglected by the Portuguese architects, which by the late 1950s were highly interested in the debates around popular and traditional architecture (Marat-Mendes and Cabrita, 2015). Would this be a symptomatic reflection of the Doorn Manifesto?

The Doorn Manifesto was written in 1954 by Team 10, a collective formed by younger architects attending post-WW2 CIAM. Members came from collectives such as De 8 (Aldo Van Eyck and Jaap Bakema), MARS (Alison and Peter Smithson) and AT.BAT-Afrique (Georges Candilis and Shadrach Woods). Their previous projects included multi-religious neighbourhoods, new towns, public equipment and council housing (Borges, 2017). The document constitutes a direct challenge of modernist principles, including the partition of land according to functional categories, instead accepting the historical and accumulative processes that shape particular urban forms. It takes a strong influence from the regional geography of Patrick Geddes. The identification of communities with their aggregation patterns and the need to integrate different urban densities and scales also question the rationalist planning paradigms of pre-WW2 CIAM (Borges, 2017). In the 1956 Dubrovnik CIAM, organized by Team 10, the Portuguese group of architects presented a proposal for rural habitat, exemplifying the articulation of modern and local architectural references (Marat-Mendes and Cabrita, 2015) which brings Portuguese architecture of this time close to Doorn principles.

Unlike the Chartre d'Athènes, the Doorn Manifesto was not translated to Portuguese. However, beyond Portuguese CIAM participations, the ideas and projects of Team 10 were known in Portugal through articles and photographic reports in architectural magazines, particularly under the influence of Nuno Portas. The editor of 'Arquitectura', an architect in the Alegria Street Studio, where several council estates were designed (Tostões, 1997) and on the Lisbon GTH (Gabinete Técnico de Habitação), Portas helped the principles of the Chartre d'Athènes and the ideas of the Doorn Manifesto reach the development of Lisbon, including neighbourhoods like Olivais Norte, Olivais Sul and Chelas. This marked a uniquely significant shift in Lisbon's urban history.

Post 1974 – The emergence of the PDM

Since 1982 the PDM, or Municipal Masterplan, is the centre of land-use management and of the democratic planning structure in Portugal (Marat-Mendes *et al*, 2018). The 1982 Law of Soils marked a shift from earlier urban planning. Municipal planning stipulates land-use and corresponding regulations, based on a fundamental opposition between urban and rural, but the PDM is not an instrument for planning the development of territories, instead, it manages its development mostly led by the private-sector (Marat-Mendes *et al*, 2018). The 1982 law was only replaced by a more detailed Ground Basis Law in 1998, updated in 2014. These required PDM revisions every decade, although such rule is not scrupulously followed.

Active PDMs in the LMA have been written in different times, handling specific local, territorial and socio-economic problems. Eight of the 18 PDMs which integrate the LMA are prior to the first Ground Basis Law, while five date from 2015, leaving unclear which Ground Basis Law guided them, and only one was approved after. All municipalities include urban and rural soils, except Lisbon, whose land is entirely urban. Other classes included in other municipalities range from 'rural soils' to specific classes of agriculture, forestry, agroforestry, green protection and natural spaces.

With respect to the municipalities included in our examples, Lisbon, Amadora and Oeiras, they show very different planning situations. We will focus our overview on the most recent versions of their PDMs.

Lisbon published the newest version of its Masterplan in 2012, a lengthy document pertaining to answer problems like population decrease and unemployment, while acknowledging major infrastructure needs are met (PDML, 2012). Other problems identified are resource waste due to a diffuse growth patterns, air pollution and mobility (PDML, 2012). With respect to land-use, the whole of the Lisbon is classified as urban (PDML, 2012, Art.9), containing operative categories as well as functional categories, a relevant set of dispositions for the Municipal Ecological Structure (MES) and an articulating system of Structuring Corridors to connect green and urban areas (PDML, 2012). Given its emphasis on conservation and heritage, the PDM has highly restrictive regulations for new constructions, including on façade preservation, height and occupation of block and lot, with direct impacts on the density of new buildings. However, several important recent buildings have obtained approval from the municipality, despite visibly violating the PDM, particularly in business areas.

The Oeiras PDM, from 2015 defends growth, compaction and multifunctionality. It is one of the few PDMs in the LMA with a clear tendency towards a specific urban model –the Compact City. It seeks sustainable and qualified development (PDMO, 2015). The territory is divided into several systems with specific regulations – from the MES to Systems of Protection for Values and Resources – overlapping with the land-use system. Another important aspect is the defence of multifunctional centres (PDMO, 2015, Art.31). Changes in land-use are allowed and encouraged, announcing a territorial dynamic, perhaps more than a territorial program. There is a certain boldness to how this PDM understands its territory appealing to multifunctionality (PDMO, 2015, Art.25 and Art.30 and Art.31). In ‘Housing spaces’, the goal is conversion into central spaces (PDMO, 2015, Art.31-1), which include housing, services and commerce (PDMO, 2015, Art.30-1). In all of this, the Oeiras PDM meets the theoretical principles of the Compact City, namely the creation of high-density buildings with free space of mixed land-use. Moreover, in 2015, the municipality issued a Regulation for Urban Allotment Gardens (DL.162/2018 – March 14th), acknowledging urban agriculture for its role in environmental quality, soil maintenance, farming techniques and social leisure, but not its role in food-security.

Finally, Amadora presents the most precarious situation of the three municipalities. The active PDM was written in 1994 and is not structured around a clearly stated goal, although it has some interesting points, especially concerning the environmental quality of the municipality, not very common in PDMs written in the 1990s. Not only there are careful stipulation as to natural spaces (and equivalent ones), there is whole chapter on pollution, including dispositions towards preventing it in the air, the water and the soil. The land-use system (PDMA, 1994, Chapter III – Section I) merely establishes land-use classes with regulations on scale, lining and height. Land-use is further distributed in each Operative Unit, adding specific interventions according to the needs of particular zones. On the other hand, it must be added that this PDM does not necessarily envision a multifunctional space: it presupposes urban settlements with industrial parks and natural spaces (or equivalent) between them. Another surprising aspect is the lack of clear goals towards articulation with the Lisbon municipality other than transportation.

Planning paradigms at the neighbourhood scale

Here, we focus our overview on the neighbourhood scale. These are the Eastern end of the Lisbon municipality, the Alfragide area in the Amadora municipality, and the centre of the Oeiras municipality (see Figure 1). The first was urbanized during Gröer’s PDUCL and during the legal void left by the PDUL. The second had a municipal integral plan in 1982, but was mostly constituted by autonomous housing units. The third was one of the areas contained in the PUCS but continued to grow, revealing the non-accomplishment of several goals included in the Plan.

Eastern Lisbon



Figure 2 – Locations: 1 – Madre de Deus, 2 – Chelas, 3 – Olivais Sul, 4 – Encarnação, 5 – Olivais Norte

Eastern Lisbon was mostly occupied with industrial facilities near the riverbank, as well as some low-density housing areas, convents, large farms and some slums, most only demolished in the 1960s. The municipality constructed two neighbourhoods in the northern and southern areas of the Eastern end of Lisbon, both included in Gröer's PDUCL.

The Encarnação neighbourhood was planned by Paulino Montez in 1940 for the Northeast end of Lisbon, nearby the Lisbon Airport, also an element planned by Gröer. Housing types are by municipal engineer Jácome da Costa, single-family detached and semi-detached terraced houses with a small front lawn and a backyard. Encarnação is a large-scale neighbourhood and includes gardens, a school, markets, a police station, a church and other equipment. One of its streets was intended for commerce (Montez, 1958), and continues to be so.

The Madre de Deus neighbourhood was planned by architect Luís Benavente in 1942. With a radial plan rising over a hilltop, Madre de Deus is also constituted by Jácome da Costa's housing types. Some blocks are used as public gardens and the neighbourhood is topped by a small school and a green park. After its construction, some four-storey housing slabs were added to its higher and lower ends. The lower one is separated from the Xabregas area by a large guerrilla garden, while the higher eventually turned into Quinta do Ourives, a high-density estate designed by the GTH.

Both these neighbourhoods effectively created low-density housing areas with good living conditions. However, they also confirmed Howard's vision of a Garden City, with a rural area and connected to other satellite towns was not so influential in Lisbon as was the vision of a garden-suburb, presented in Raymond Unwin's 1909 'Town Planning in Practice' (Lobo, 1995).

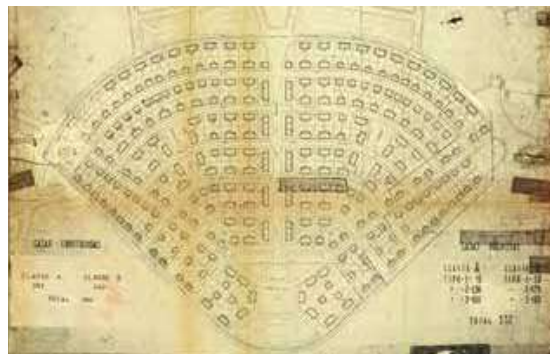


Figure 3 - Madre de Deus plan by Luís Benavente



Figure 4 - Encarnação plan, by Paulino Montez



Figure 5 - Madre de Deus neighbourhood



Figure 6 - Encarnação neighbourhood

During the legal void left by the lack of approval of the PDUL, urban plans drew extensively from the interests of planners. The Olivais Norte and Olivais Sul neighbourhoods followed the principles of the Charte d'Athènes, the first starting in 1955 and the second in 1960. Olivais Norte is a relatively small development, in which housing slabs and towers are placed in a green park, according to a dynamic compositions independent from the structuring motorways and with free space and free circulation within its own limits (Gonçalves *et al*, 2016). Separated from Olivais Norte by the Encarnação neighbourhood, Olivais Sul expands on the planning principles of Olivais Norte. In a cellular partition, housing estates stand in urban green parks, all defined by a regular motorway structure. Traditional urban elements like streets, blocks and plots were rejected, and instead housing slabs, towers and tower-blocks were preferred. Vacant space was abundantly filled with grass and trees, which also harboured public equipment but dismantled pre-existing agricultural activities (Santos, 2015).

The further experience with the development of the Chelas Valley, starting in 1960, shows a different planning attitude from the GTH, more akin to the Doorn Manifesto. Like the Olivais Sul plan, it refuses conventional streets, blocks and lots, and opts for a cellular division. But most of the estates developed according to the original Plan are structured by continuous commerce and service pathways – some pedestrian and some for traffic – around which high-rise housing towers, blocks and slabs stem in informal and anti-geometrical compositions. The Plans for Zone I, Zone J and Zone N2 present several interpretation of these core principles, echoing those of residential neighbourhoods inspired by the Doorn Manifesto, including the Carrières Centrales by AT.BAT-Afrique (1951-1953), the Golden Lane Cluster City by Alison and Peter Smithson (1952-1953), the Park Hill-Hyde Park housing complex coordinated by John Lewis Womersley (1957-1965) and the Toulouse-Le Mirail town extension by Candilis-Josic-Woods (1963-1973). These projects share similarities with Chelas not only in the urban layout, but also in the employment of specific elements of urban form like unifying plateaus, pedestrian walkways, deck-accesses and city-buildings (Heitor, 2001; Borges and Marat-Mendes, 2019).

The impacts of these on urban form are decisive for the development of Lisbon. After more than a decade of new neighbourhoods planned according to the garden-suburb model, the need of optimizing construction and creating a significant amount of new houses led to the adoption of different urban models more accepting of mass-housing, but also more aware of the possibilities of State intervention for strategic planning of equipment, public space and transportation systems. The territory is transformed to a great extent – particularly considering that Olivais Norte, Olivais Sul and the Chelas Valley were previously agricultural areas – but so does the urban landscape, which, for the first time, sees the construction of integral high-density areas, whose urban development continues to this day. Yet, it must be noted that these plans were not totally implemented and considerable changes were made that distanced them from their original goals. Amongst these, transportation systems were paramount, and these areas were deeply affected by their segregation from the city.



Figure 7 - Olivais Norte Plan by Sommer Ribeiro and Falcão da Cunha

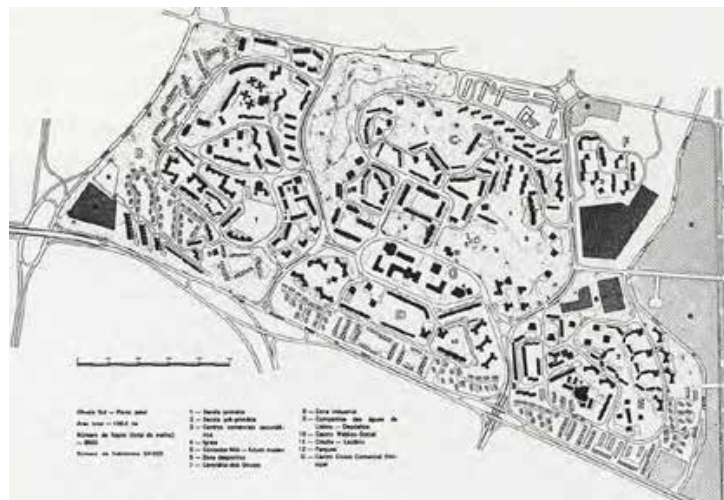


Figure 8 - Olivais Sul Plan by José Rafael Botelho and Carlos Duarte

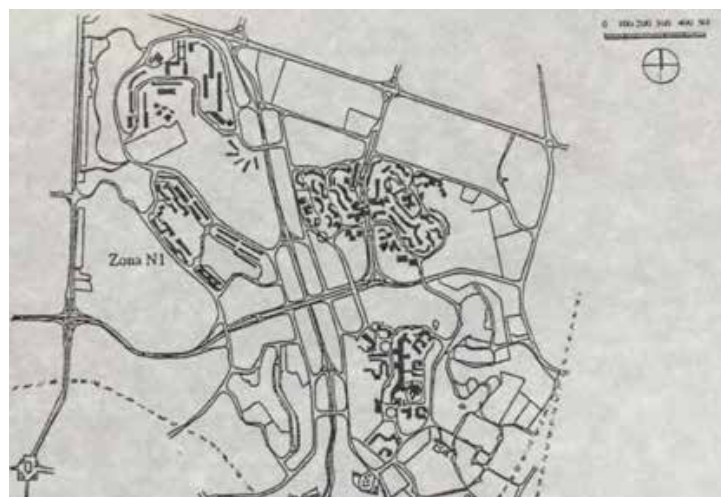


Figure 9 - Chelas Plan by Francisco Silva Dias and J.R. Botelho [excluding zones that broke the plan]



Figure 10 - Olivais Norte neighbourhood



Figure 11 - Olivais Sul neighbourhood



Figure 12 - Chelas neighbourhood - Amendoeiras Estate



Figure 13 - Chelas neighbourhood - Lóios Estate

Alfragide zone



Figure 14 - Location: 1 - Alto do Moínho, 2 - Zambujal

The Alfragide area is now fully urbanized, although most of its area was included in the rural zone assigned by Gröer in the PUCS. Indeed, present-day Alfragide was, by the 1930s, constituted by three large farms, to which a growing amount of industrial facilities was added in the 1940s. The Alto do Zambujal neighbourhood was urbanized in the 1970s, in conditions similar to those of Eastern Lisbon a decade earlier. Its original council estates were however designed in different terms.

Alto do Moínho, on the lower end of the slope, is a low-density estate where urban and architectural form are merged, designed by Francisco Silva Dias. The ‘evolutive’ single-family houses are linked together in a series of slabs separated by patios and small flowerbeds. The estate occupies only a part of the land, leaving a large green area around the ruins of a pre-existing windmill, which are now occupied with small agricultural plots. The design has some distanced similarities to the garden-suburb paradigm, but its scheme is more overtly drawn from the experience of Silva Dias in a survey on popular architecture conducted in Portugal in the late 1950s (Bordalo, 2005).

On the higher end of the slope, the Zambujal estate was designed by Vítor Figueiredo and Duarte Cabral de Mello, a high-density area with several slabs built around urban parks and gardens. As the bottom of the slope is reached, the slabs become a block of two-storey houses. This estate shows a considerable influence of modern urbanism, although it belongs to a critique of the Chartre d’Athènes more than a wholehearted expression of it.

After the democratic revolution, the Alfragide zone continued to be developed, but private-sector urban developments targeted especially the middle-classes, as the Alfragide Towers, designed by the studio of architect Conceição Silva in a Brutalist aesthetic that does not necessarily follow the Doorn Manifesto principles from which English Brutalism emerged (Borges, 2017). Moreover, the Alto do Zambujal neighbourhood, which had been the object of an Integral Plan from 1973 to 1982 ended up being revised, towards greater densification. As such, most of its planned green areas have been urbanized, without a specific development strategy, but clearly guided by principles of compaction. However, as happened in many neighbourhoods influenced by the Compact City model, public transportation was not developed accordingly, and much of the mobility in the area can only be ensured by private car. Despite the relative lack of investment in improving public spaces in the Alto do Zambujal neighbourhood, there has been a considerable amount of community appropriation of vacant space, as several small areas within the urban park in the lower end of the slope are used as small allotment gardens. Moreover, in the terrain between the lower end of the Zambujal Estate, the Laboratório Nacional de Energia e Geologia (LNEG) building and the corridor of the CRIL highway, a large guerrilla garden has

been created by locals, adding another function to an urban area that includes residential, commercial and industrial activities.



Figure 15 - Alto do Zambujal Plan - 1982 version



Figure 16 - Alto do Moinho Estate



Figure 17 - Zambujal Estate

Oeiras centre



Figure 18 - 1 - Oeiras Centre, 2 - Santo Amaro, 3 - Nova Oeiras

The PUCS is a close interpretation of Howard, with an urban centre linked to satellite towns beyond a rural fringe. These formed a continuous structure of leisure, but mostly of agricultural and forestry activities valued for their role in balancing urban sprawl and ensuring environmental quality (Marat-Mendes, 2009). Gröer was also keen on ensuring the development of existent settlements which needed to grow. In the centre of the Oeiras municipality, he mostly focused on consolidating the old settlement, and integrating it in newly created neighbourhoods, mostly designed as low-density garden-suburbs. That is the case of Santo Amaro, the Eastern zone of Oeiras, in which Gröer planned such a garden-suburb, constituted by detached terraced houses and cottages, with several public gardens facing the beach.

The PUCS will also absorb the plan for Nova Oeiras, a new neighbourhood for the Western zone of Oeiras, with semi-circular streets with cottages placed around a housing estate fully tributary to the urban principles of the Chartre d'Athènes, designed by architect Luís Cristino da Silva.

Although Gröer planned the urban centres in the region, he understood these as parts of an integral scheme that included the rural areas. This shows the greatest changes in the Oeiras centre, as urbanized area has eliminated a considerable rural area. Between Gröer's Santo Amaro neighbourhood and the beach now stands a high-density estate, while on the northern end the Augusto de Castro neighbourhood was built, also with high-density tower-blocks. Other areas were since urbanized in the Oeiras centre, most of them high-density. However, this has often been made possible by land-use conversions which deeply affected the rural structure of the PUCS. This green belt is only visible in fragments now, and some of its remnants have not been prioritized in urban planning (Marat-Mendes, 2009).



Figure 19 – Oeiras centre and Santo Amaro Plan by Étienne de Gröer



Figure 20 – Nova Oeiras Plan by Luís Cristino da Silva



Figure 21 - Old Oeiras Centre



Figure 22 - Nova Oeiras neighbourhood



Figure 23 - Santo Amaro neighbourhood

Discussion

The case-studies enlighten transitions within the urban history of Lisbon and its region. These are verified at three levels. First, the political, with the development of planning instruments for multi-scale development of the territory. Second, the cultural, with different urban paradigms informing the urban design. And third, the socio-metabolic, with the regional transformation of landscapes, ecosystems and lifestyles.

Considering the ruralist politics of the New State, Gröer found in Lisbon a political climate favourable for exploring his interest in the Garden City – expressed before he came to work in Portugal (Gröer, 1932). He succeeded at planning low-density comfortable neighbourhoods but failed to predict the real changes the city would undergo and design solutions to tackle such problem. However, Gröer's vision is not without merit, as it balanced urbanization with the preservation of rural activities, with positive metabolic impacts.

Ideas emerging from modernist planning and its post-WW2 critics would eventually become influential in Lisbon, although the PDUL, which integrated those references, was not approved. High-density was a necessary solution for housing shortages in several urban centres of the region, and although most urban designs would plan great amounts of green space, these no longer negotiate with the agrarian past of their territories. A schism is assumed between urban and rural that lasts until today.

Democratic planning became more focused on territorial management, rather than planning, to respond to a liberalized market, but recent construction is moderately compromised with the principles of the Compact City in high-density construction, but less in transportation or reduction of car-dependency.

The case-studies reveal urban form contrasts in planned neighbourhoods according to their urban models. In these contrasts are implied different metabolic processes. In neighbourhoods planned during Gröer's PDUCL and the PUCS, the garden-suburb model is the most preponderant, as new neighbourhoods do not have particular relations with either the city centre or a rural hinterland, fundamental for the Garden City. Individual detached or semi-detached houses are the preferred type, with individual yards and public green areas providing free space and sometimes public equipment.

This changes in the 1950s. Given Gröer's unrealistic predictions for urban growth and the continued existence of slums in Lisbon, urban models reviewed in architectural publications were used by several architects working in the development of Eastern Lisbon. High-density solutions are accepted, and multi-storey buildings were incepted into green parks divided by large motorways in Olivais Norte and Sul. In Chelas, there are similarities with the Doorn Manifesto, as mass-housing estates cluster around a central motorway.

These neighbourhoods represent great metabolic changes– they stand on former agricultural land expropriated by the Lisbon municipality, and present a great variety of residential density, from single-family houses to massive tower-blocks within a large extension of green areas mostly meant for leisure and landscape. In Chelas, an horticultural park and guerrilla garden are the exception, while several guerrilla gardens of several dimensions can be found in the fringes of Madre de Deus today. Another important aspect is the conversion of pedestrian and low-traffic routes into motorways, and the appropriation of green areas for parking, showing a dramatic increase in car-use (and corresponding CO₂ emissions), despite the presence of public transportation (except in Madre de Deus).

Either inspired by the Garden City or by ulterior ideas, these neighbourhoods are mostly linked with agricultural production (fundamental for Howard) through grassroots initiatives. That these and other initiatives did happen proves there were socio-cultural but also spatial conditions for their development, confirming space is the asset that allows urban change to happen (Scoffham and Marat-Mendes, 2000). However, aside from the Chelas Horticultural Park, the municipality seems to promote mostly urban rehabilitation and redevelopment in these areas.

Considering the Alto do Zambujal neighbourhood and its surroundings, one can detect a planning tendency towards compaction, as most housing is high-density and land-uses are relatively mixed. However, ease of access and public

transportation which are core to the Compact City model are lacking, as transportation is based on the major nearby motorways. The loss of green space in the Alfragide area is also noteworthy, particularly considering that nearly 100 years ago, it was an agricultural area. The guerrilla gardens in Alto do Zambujal are important counterbalances for such loss, but it must be noted they have no legal right to occupy the land.

Despite having been minutely planned, the PUCS rural structure was dismantled. Its network of farms decayed with lifestyle changes throughout the 20th century (Marat-Mendes, 2009). This also signals a socio-metabolic shift, with agriculture withering, along with local ecosystem, irrigation systems and soil-maintenance practices (Marat-Mendes, 2009). Furthermore, this effaces most of the Garden City principles applied in the PUCS, and often, low-density neighbourhoods planned by Gröer are surrounded by tower-blocks and large public buildings, showing an increase in construction, but also in population and urban activities. Gröer's restrictive planning of the urban centres, based on his own underestimation of population growth, may have determined the ill fate of the rural areas, since these were later considered less important than avoiding housing shortages. However, the urban forms of new housing schemes did not consider the implied metabolic changes in the territory, with great increases in traffic and waste, as well as corresponding infrastructure.

In Oeiras, the development of several high-density residential neighbourhoods runs parallel to a great emphasis on industrial and urban activities. Although the current Oeiras PDM encourages residential suburbs to become mixed-use, it is unclear if the envisioned multifunctionality is only directed at fundamentally urban activities. Although it is not discarded that rural soil may turn to urban (PDMO, 2015, Art.25-3), the opposite is less evident. The Compact City model implies high-densities and mixed land-uses, but also ease of transportation, while Oeiras remains strongly car-dependent with an underdeveloped public transportation system.

Concluding remarks

The socio-ecological urban history of Portuguese cities is a promising field of research, Lisbon in particular. Considering that after an earthquake in 1755, the city was rebuilt as the capital of the Kingdom of Portugal (Marat-Mendes, 2002), such urban vision would change drastically. Under the New State's rural politics, Portugal remained underindustrialized for a significant part of the 20th century. Many problems associated with the industrial socio-ecological regime (Fischer-Kowalski, 1998) arrive late to Portugal. The PUCS tries to turn the Garden City model to the regional scale, planning an integral sequence of urban and rural areas. Only after the planning of the Alvalade neighbourhood high-density solutions start to be accepted, to be taken to a greater scale in the GTH neighbourhoods in the Eastern end of the city. In Lisbon, these neighbourhoods were developed in land expropriated by the municipality, but elsewhere, as is the case in Oeiras, further development implied land-use conversions and significant subtractions from Groer's green belt.

What has also been lost throughout the 20th century was part of the productive capacity of the LMA, particularly in urban centres and their surroundings. Gröer's strategies have perhaps too hastily been identified with the conservative politics of the New State. However, his municipal and regional plans emerge as those which more strongly identified the important role of rural areas for food-production. As the phenomenon of urban agriculture continues to grow in the city (Marat-Mendes et al, 2018), perhaps in the future we will need to articulate the high-density solutions that are adequate for the increasing urban population, with regional rural structures as those which have been decimated until now.

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References

- Baccini, P., and Oswald, F., 2008, Designing the Urban: Linking Physiology and Morphology. In: Handbook of Transdisciplinary Research, edited by G. Hardon, H. Hoffmann-Riem, S. Biber-Klemm, W. Grossenbacher-Mansuy, D. Joye, C. Pohl, U. Wiesmann, and E. Zemp (Springer).
- Beloin-Saint-Pierre, D., Rugani, B., Lasvaux, S., Mailhac, A., Popovici, E., Sibiude, G., Benetto, E., and Schiopu, N., 2017, A review of urban metabolism studies to identify key methodological choices for future harmonization and implementation. *Journal of Cleaner Production*, 163, Suppliment, 163, (S), pp. S223-S240.
- Bordalo, A. 2005. *Bairro do Alto do Moinho - Estudo de caso*. Unpublished MSc Dissertation, ISCTE, Lisbon.
- Borges, J.C., 2017, *The dissolution of the modern complex*. Unpublished MSc Dissertation, ISCTE, Lisbon.
- Borges, J.C., Marat-Mendes, T., 2019, Walking on streets-in-the-sky – Structures for democratic cities. *Journal of Aesthetics and Culture*, 11(1), doi: 10.1080/20004214.2019.1596520.
- D’Almeida, P.B., 2015, *Bairro(s) do Restelo* (Lisbon: Caleidoscópio).
- Diário da República. 2018. Decreto-Lei n.º 162/2018 de 14 Março.
- Erb, K.-H., Fetzl, T., Haberl, H., Kastner, T., Kroisleitner, C., Lauk, C., Niederstschneider, M., Plutzer, C., 2016. Beyond inputs and outputs: opening the black-box of land-use intensity. In: *Social Ecology*, edited by H. Haberl, M. Fischer-Kowalski, F. Krausmann and V. Winiwarter (Switzerland: Springer), pp. 93-124.
- Fischer-Kowalski, M., 1998, Society's Metabolism. *Journal of Industrial Ecology*, 2(1), pp.61-78.
- GEU – Gabinete de Estudos Urbanísticos. 1959, *Plano Director de Urbanização de Lisboa* (Lisbon: GEU).
- Gonçalves, J.M., Carvalho, L.S., Santos, J.R., 2016. A cidade entre edifícios. Reflexão sobre meio século de mudanças num conjunto habitacional modernista. Handle - <https://www.researchgate.net/publication/310321346>.
- Groer, E., 1932, L’urbanisme au Canada. *Urbanisme*, 2(May), pp.65-70.
- Groer, E., 1945-1946, Introdução ao Urbanismo. In *Boletim da Direcção Geral dos Serviços de Urbanização*. I Volume. (Lisboa: Ministério das Obras Públicas, Transportes e Comunicações), pp. 17-87.
- Groer, E., 1948, Relatório do Plano de Urbanização da Cidade de Lisboa (Lisboa: Ministério das Obras Públicas, Transportes e Comunicações).
- Heitor, T.V., 2001. *A vulnerabilidade do espaço em Chelas* (Lisbon: Gulbenkian).
- Howard, E., 1902, *Garden cities of to-morrow*. (London, UK.: Swan Sonnenschein).
- Kennedy, C, Pincetl, S., and Bunje, P., 2010, The study of urban metabolism and its applications to urban planning and design. *Environmental Pollution*, 159 (8–9), pp. 1965-1973.
- Lobo, M.S., 1995, *Planos de urbanização – a época de Duarte Pacheco* (Porto: FAUP).
- Marat-Mendes, T., 2002, *The Sustainable Urban Form*. Unpublished PhD Thesis, The University of Nottingham, UK.
- Marat-Mendes, T., 2009. O PUCS e os vazios planeados. Novas oportunidades para o ordenamento sustentado da Costa do Sol. In: *O Plano de Urbanização da Costa do Sol. Uma visão inovadora para o território*, edited by Pereira, M. (Oeiras, Câmara Municipal de Oeiras), pp. 92-122.
- Marat-Mendes, T., Oliveira, V. 2014. Urban planners in Portugal in the middle of the twentieth century: Étienne de Groër and Antão Almeida Garrett. *Planning Perspectives*, 28(1), pp. 91-111.
- Marat-Mendes, T., Sampayo, M., 2015. The Plano de Urbanização da Cidade de Luanda by Étienne de Groër and David Moreira da Silva (1941-1943). In *Urban Planning in Lusophone African Countries*, edited by Silva, C. (UK: Routledge), pp. 57-77.

- Marat-Mendes, T., Cabrita, M., Oliveira, V., 2014. Teaching urban morphology in Portugal. In: *New Urban Configurations*, edited by R. Cavallo, S. Komossa, N. Marzot, M. Pont and J. Kuijper, (Delf: Delf University of Technology) pp.131-136.
- Marat-Mendes, T., Cabrita, M.A. 2015. Morfologia Urbana e Arquitetura em Portugal – Notas Sobre uma Abordagem Tipo-Morfológica. In: *O estudo da forma urbana em Portugal*, edited by Oliveira, V., Marat-Mendes, T., Pinho, P. (Porto: Universidade de Porto), pp.65-94.
- Marat-Mendes, T., Borges, J.C., Dias, A., Lopes, R. 2018, Food system and Spatial Municipal Planning - analysis of its integration in the 18 municipalities of the Lisbon Metropolitan Area. Presentation at ‘Dinâmicas socioeconómicas e territoriais contemporâneas IV’ - ISCTE, Lisbon, December 17th.
- Marat-Mendes, T., Borges, J.C., 2019, Mapping sustainability transitions in contemporary culture. Presentation at ‘GFIC 2019’, ISCTE, Lisbon, May 20th.
- Montez, P., 1958, Lisboa – extensão nordeste da cidade (Lisbon: Author’s edition).
- Oliveira, V., 2006, The morphological dimension of municipal plans. *Urban Morphology*, 10 (2), pp. 101-113.
- PDMA – Plano Director Municipal da Amadora. 1994. Resolução do Conselho de Ministros n.44/94. Diário da República —I Série – B. N.27 – 22 Junho.
- PDML – Plano Director Municipal de Lisboa. 2012. Aviso n.11622/2012. Diário da República, 2.ª série — N.168 — 30 Agosto.
- PDMO – Plano Director Municipal de Oeiras. 2015. Aviso n.10445/2015. Diário da República, 2.ª série — N.º 179 — 14 Setembro.
- Rogers, R., 1998. *Cities for a small planet* (London: Basic Books).
- Rosado, L., Niza, S., Ferrão, P. 2014, A Material Flow Accounting Case Study of the Lisbon Metropolitan Area using the Urban Metabolism Analyst Model. *Journal of Industrial Ecology*, 18 (1), pp. 84-101.
- Santos, F.S., 2015, *Entre cidade e habitação*. Unpublished PhD Dissertation, FAUL, Lisbon.
- Scoffham, E., Marat-Mendes, T., 2000. The ‘ground rules’ of sustainable urban form. In *Achieving Sustainable Urban Form*, edited by Williams, K., Burton, E., and Jenks M., (London, UK.: E&FNSpon), pp.97-104.
- Tibbs, H., 2011, Changing Cultural Values and the Transition to Sustainability. *Journal of Futures Studies*, 15(3), pp.13 – 32.
- Tostões, A. 1997. *Os verdes anos na Arquitectura Portu-guesa dos Anos 50*. (Porto: FAUP).
- Jenks M., Burton, E., Williams, K., 1996, *The Compact City* (London, UK.: Routledge).
- Jenks M., Burton, E., Williams, K., 2000, *Achieving Sustainable Urban Form* (London, UK.: E&FNSpon).