Land readjustment in Braga Municipality - Looking into the future, learning from the past

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Abstract
Land readjustment, a promising yet often underestimated approach, encounters numerous hurdles in Portugal. Like many urban centres, Braga confronts the pressing need to accommodate a growing population and economic expansion, while safeguarding urban quality.
The analysis delves into three case studies of land readjustment implemented through Execution Units, an operational planning tool. These cases underscore the challenges in balancing public objectives with private stakeholders' interests, steering legal frameworks, and achieving equitable outcomes. Despite successful collaborations and infrastructure developments in some instances, challenges persist in securing agreements, implementing comprehensive urban solutions, and fostering community engagement.
The findings emphasize the importance of adaptive policy frameworks, collaborative governance structures, and strategic planning to overcome these challenges and realize sustainable urban development goals in Braga Municipality.
Keywords: Master Plan; Braga Municipality; Execution Unit; Spatial planning

Introduction

The land readjustment process is an urban planning practice aimed at redistributing and reorganising land use in specific urban areas (Lombard and Rakodi, 2016; European Commission, 2020; Briata and Fioretti, 2023). In countries such as Spain, France, Germany, United States, and China, land readjustment is a common practice and is used for various purposes, such as infrastructure improvements, revitalisation of brownfields, creation of green spaces, promotion of affordable housing, and development of other real estate projects with public interest. “In dynamic and diverse urban contexts such as those found in Europe, effective collaboration among stakeholders is crucial for the success of land readjustment projects”, as highlighted by (European Commission, 2020). With urban areas across the country facing issues related to urbanisation and land use management, innovative urban planning strategies, such as land readjustment, are being explored as proactive tools for sustainable urban development.
Urban areas in Portugal are facing challenges akin to those observed in other European cities, encompassing land use conflicts, infrastructure provision, and environmental degradation (Freilich and Shultz, 2018; Briata and Fioretti, 2023). Within this framework, novel approaches in urban planning are imperative to navigate the intricate interplay between urban expansion and the pursuit of sustainable urban spaces (Magarotto and Costa, 2021; Schmid et al., 2024). Emerging urban planning instruments, such as land readjustment processes, endeavour to address the imperative of reorganising specific areas within urban agglomerations (Muñoz Gielen and Mualam, 2019; Schmid et al., 2024).
Land readjustment aims to redistribute and reorganize land use as a valuable tool in development areas and addressing the complex challenges of urban territory, including infrastructure needs and real estate pressure (Freilich and Shultz, 2018; Muñoz Gielen and Mualam, 2019; Schmid et al., 2024; Güngör and Polat, 2017; Samora-Arvela et al., 2017; Magarotto and Costa, 2021). In this regard, land readjustment emerges as a proactive response

to rapid urbanization and the need for more equitable and quality urban development, leading to the effectiveness of land readjustment in creating more efficient and inclusive urban spaces, promoting a better quality of life for residents (Xi et al., 2014; Fernandes and Seixas, 2018; Salvati et al., 2018; Zhang et al., 2022).

Moreover, academic research highlights the significance of land readjustment as an effective tool for fostering sustainable urban development and social equity. This perspective highlights the relevance of land readjustment not only as an urban planning tool but also as a mean to achieve broader social and economic development goals in cities.

The challenges associated with land readjustment in Braga resonate with broader global trends in urban development. The rapid development worldwide has led to increased pressure on land resources, exacerbating issues related to land use conflicts, infrastructure provision, and environmental degradation (Fernandes and Seixas, 2018; Salvati et al., 2018; Schmid et al., 2024). This states the urgent need for solutions to address the complex interplay between urban growth and sustainability.

While the theoretical benefits of land readjustment are widely recognised, its practical implementation often encounters challenges stemming from institutional, legal, and financial constraints. The success of land readjustment is contingent upon effective coordination among multiple stakeholders, including government agencies, landowners, developers, and local communities (Muñoz Gielen and Mualam, 2019). Moreover, the complex legal frameworks governing land tenure and property rights can complicate negotiations and delay project timelines on land readjustment. This legal complexity is also evident in European contexts (Muñoz Gielen and Mualam, 2019; Schmid et al., 2024). These outcomes underscore the importance of addressing institutional barriers and streamlining regulatory processes to facilitate the effective implementation of land readjustment initiatives in Braga.

In addition to addressing institutional and legal challenges, successful land readjustment in Braga must also consider the social and environmental dimensions of urban development. As emphasised by Bravo-Rodríguez and Rivas-Navarro (2021) in Spain, Condessa et al., (2015) in Portugal, Gueydan (2021) in France and Louw (2008) in Netherlands, community engagement and participatory decision-making are essential for ensuring the equitable distribution of benefits and mitigating potential social conflicts arising from land readjustment. Furthermore, proactive measures to protect natural ecosystems and enhance green infrastructure can contribute to the resilience and sustainability of urban landscapes.

Incorporating these principles into the planning and implementation of land readjustment initiatives can help Braga navigate the complexities of urbanisation while fostering inclusive and environmentally sustainable development. The aim of this study is to discuss the challenges encountered in the land readjustment process in Braga Municipality, evaluate the effectiveness of Braga's Master Plan in addressing these challenges, and propose improvements to optimise land readjustment initiatives in the future master plan. Additionally, the study seeks to explore innovative territorial planning strategies and compare them with international experiences, with the goal of providing specific recommendations to promote sustainable urban development in Braga.

Methodology
Study area

The study area encompasses the Municipality of Braga, located in the northern region of Portugal. The city of Braga is renowned for its rich history, vibrant culture, and impressive landscape, being included in the UNESCO Heritage List for its landscape value since 2019. It is situated approximately 50 kilometres northeast of Porto and about 25 kilometres east of the Atlantic coast. The city is set amidst a mountainous landscape, with fertile valleys and winding rivers, providing a unique natural environment for urban development.

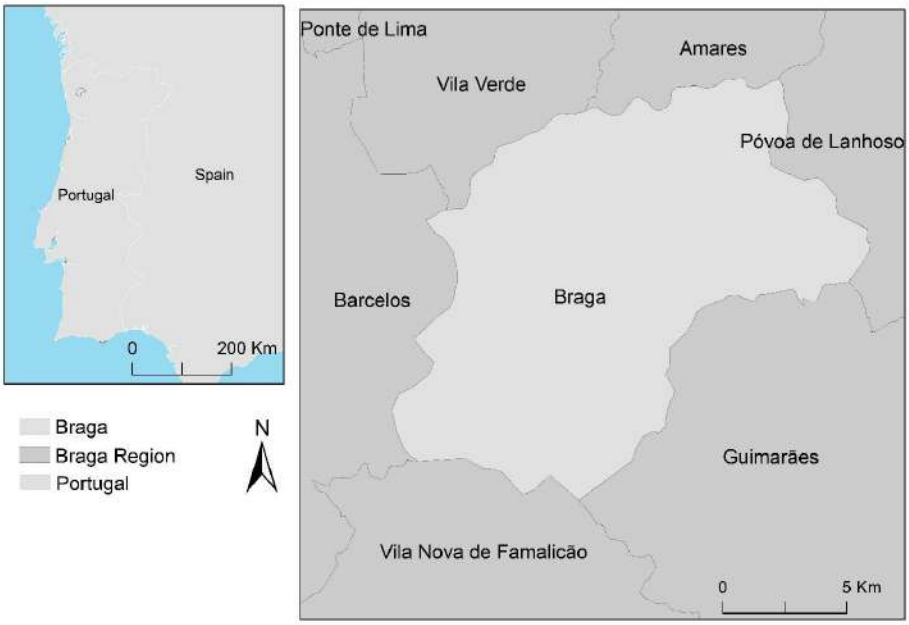

Figure 1 – Braga Municipality. Source: Own elaboration

Being one of the few municipalities in Portugal with population growth between 1991 and 2021 (6%), the increase in housing prices in Braga has emerged as a pressing challenge for residents and the city's economic industrial cluster. In tandem with this scenario, a significant reform of the Portuguese planning system has taken place, particularly focusing on the implementation of territorial management instruments. This reform has spurred the development of enforcement tools aimed at ensuring a coherent spatial planning framework. This transition is exemplified by Decree-Law no. 380/99, dated September 22, which introduced a new implementation entity alongside the traditional “loteamentos”, known as “unidades de execução”.

After decades of stagnant prices, juxtaposed with the expansive urban land traditionally delineated within the ambit of initial planning generations, this trend has recently sparked concerns regarding housing affordability. Many families now grapple with the challenge of securing suitable accommodation at reasonable prices. Additionally, the escalating land prices for economic activities in Braga present a significant challenge for both existing businesses and prospective investors. The economic expansion in Braga in the last decade increased demand

for industrial land, driving up prices due to heightened competition among businesses. As a result, it is crucial for local authorities and stakeholders in the real estate sector to proactively address this issue, seeking solutions that promote equity and fair access to land.
To explore the challenges and potential of land readjustment in Braga Municipality, we focused our study on three specific cases. Among the few cases already decided by the city council, we chose this set of cases for their significance and relevance to land readjustment scenarios. By examining these cases, we aim to gain valuable insights into the processes, obstacles, and results of land readjustment, aligning with the objectives of our study.

Data Collection

The data collection process involved analysing relevant literature and documentation concerning land readjustment cases in Europe, Portugal and the Municipality of Braga. Initially, an extensive review of existing literature on land readjustment, urban planning, and sustainable development was conducted. This literature review focused on practices and experiences related to land readjustment cases, in countries with wider experience and contexts somehow related to the Portuguese framework. Through this analysis we identified trends, challenges, and best practices associated with land readjustment, providing a robust theoretical foundation for the study.
In addition to the literature review, official government documents, land readjustment project reports, and other pertinent materials pertaining to specific land readjustment cases were examined. These documents included urban development plans, zoning regulations, and project reports, all of which are publicly available.
Analysing these documents yielded insights into the objectives, strategies, implementation processes, and outcomes of land readjustment cases in Braga.
The combination of these data collection methods facilitated a comprehensive understanding of land readjustment cases, complementing the ones in the Municipality of Braga, and laying a solid foundation for the analysis and interpretation of study results.
However, it is important to acknowledge the limitations of this study. One limitation is the restricted availability of land readjustment cases in Braga, which may have influenced the depth of the analysis and the comprehensive understanding of each case's specific contexts. Additionally, given the predominantly qualitative nature of the approach used, there is a potential for bias in interpreting the results, as the conclusions are based on subjective interpretations of the collected data. These limitations emphasise the need for caution when generalising the findings and underscore the importance of future research to further investigate specific aspects of land readjustment in Braga.

Land Readjustment in the European Context

Despite the inception of the modern concept of land readjustment in the first half of the 20th century in Europe the tangible outcomes of land readjustment processes have only begun to materialise recently within the planning framework (Condessa et al., 2015). This delay is primarily attributed to reforms associated with decentralisation and the simplification of the planning process (ESPON, 2018). In land readjustment, the generated public value typically manifests as green spaces, infrastructure, social housing, and facilities. These outcomes are realised through instruments that vary significantly among countries (van der Krabben and Needham, 2008; Hartmann and Spit, 2015; Muñoz Gielen, Maguregui Salas and Burón Cuadrado, 2017).
For a brief overview of the European landscape, we explore the land readjustment tools in France and Spain, both of which have experience in applying such mechanisms and have

notably influenced the Portuguese system (Condessa et al., 2015). This influence stems from the administrative heritage of the two countries, particularly the Napoleonic tradition (Newman and Thornley, 1996; Pollitt, Thiel and Homburg, 2007).

These countries are known for their rigid planning structures, which are mainly hierarchical and involve significant state interference in all planning processes (Organization for Economic Cooperation and Development, 2017).

France stands out due to its long tradition in this field, dating back to 1803 when landowners were encouraged to collaborate for spatial planning actions (Gueydan, 2021). This historical context offers unique insights into the evolution and implementation of land readjustment practices compared to other countries. However, it was only in 1967 that the association foncières urbains became a legal tool, established by the Code de l'Urbanisme (Law 67/1253 of Decembre 30th, 1967). This tool, still in force today, coexists with traditional forms of urban management like licensing. The creation of association foncières urbains (where land parcelling is deliberated) allows for the subsequent development of a zone d'aménagement concerté.

Typically, these tools involve land parcelling and subsequent urban design (Vacher, 2014; Hartmann and Spit, 2015), underpinned by a complex legal framework aimed at providing clarity and facilitating interaction between public and private landowners (van der Krabben and Needham, 2008). The initiation of the land readjustment process commonly relies on both cadastre and urban design, a consistent practice observed across the identified cases. These characteristics are also associated with active involvement from planning authorities (Hartmann and Spit, 2015; Muñoz Gielen, Maguregui Salas and Burón Cuadrado, 2017) and operational urbanism, which became more prominent in the planning landscape with the integration of neoliberal ideals. In this paradigm, the State delegates competences to the private sector and lower levels of administration to pursue their interests and address bureaucratic hurdles that impede public action (Alonso, Clifton and Díaz-Fuentes, 2015; Gray and Kallin, 2023).

While significant, it's noteworthy that land readjustment isn't the prevailing approach to development management in these countries. Instead, licensing, and isolated actions of rehabilitation and building tend to take precedence. This dynamic exists within a legal framework where the rights of private ownership are constitutionally established (Condessa et al., 2015).

Despite extensive literature on land readjustment, specific cases are not deeply-described in scientific literature (Condessa et al., 2015) and are challenging to compare (Louw, 2008). Nonetheless, we address five significant cases in France and Spain that either contributed to the discussion or suggested improvements to the case studies of Braga.

In Spain, the expansion of the AVE (*Alta Velocidad Española)* network and the development of Murcia's airport contribute to enhancing the metropolitan area, which faces challenges in establishing its position within the territorial hierarchy. Land readjustment processes have been reported as crucial in securing land reserves and achieving the primary objectives of the municipal plan, which has been in place since 1985. In Murcia, urban development primarily relies on local plans or detailed studies, with detailed studies being predominant: out of 550 planning processes, 486 were conducted through detailed studies, while only 117 were through execution units (Moncada-García, 2022).

Another notable case in Spain concerns Granada, where at the beginning of the plan implementation, the municipality adopted a strategy of collaborating with the private sector by abdicating the allocation of land reserves for public use. Since the beginning of the century, the approach has shifted, and planning authorities have guaranteed land provision to ensure social cohesion, as by the establishment of two sports pavilions reported by Bravo-Rodríguez and Rivas-Navarro (2021).

Table - 1: Cases in France and Spain. Source: Own elaboration based on literature review

Case of study		**Spain** *(Sur Granada)*	**Spain** *(Murcia)*	**France** *(Les Charmes du petit bois)*	**France** *(ÉcoQuartier La Baudière)*	**France** *(Marne Europe)*
Base information		Plan	Plan	*AFU*	*AFU*	*ZAC*
Frames	Started	1978 and 1985	1977	2007	2010	2020
	Higher level plan	*Plan General de Ordenación Urbana*	*Plan General de Ordenación Urbana*	*Plan Local D'urbanisme*	*Plan d'Occupation des Sols*	*Plan Local d'Urbanisme*
	Aim of the land reserve/Public entities responsibility	Reserve land for equipment and road infrastructure as part of the sequence of urban actions	Reserve land for green spaces, airport, road, and rail infrastructure as part of the sequence of urban actions	Reserve land for green spaces, amenities, and road infrastructure as part of the sequence of urban actions	Reserve land for green spaces and amenities as part of the sequence of urban consolidation actions	Reserve land for green spaces, amenities, metro, and road, as part of the sequence of urban consolidation actions
	Implementation	Coordinated by the municipality. The land readjustment could be done by *unidades de ejecución* or detail studies	Coordinated by the municipality. The land readjustment could be done by *unidades de ejecución* or detail studies	Coordinated by the municipality and executed by private. The process of land readjustment was based in *Agence Foncière Urbaine*	Coordinated and executed by the municipality. and The process of land readjustment was based in *Agence Foncière Urbaine*	Coordinated by the municipality and executed by private. The process of land readjustment was based in a *Zone D'aménagement Concerté*
	Purpose	Give scale to the city by creating amenities and consolidating the metropolitan space	Design the city to accommodate significant investments that improve connectivity with the countryside and incorporate extensive green spaces	Provide housing options, including social housing, and establish amenities in the outskirts of the Dijon	Prevent urban densification in the neighbourhood by establishing amenities and green corridors in a rural context	Urban consolidation in a global metropole around a expansion network of the metropolitan system
Status		Completed	In progress	In progress	In progress	In progress

In France, the Les Charmes du Petit Bois case initiated a land readjustment process to facilitate the provision of social housing. Landowners were to sell their land to the agence foncière urbaine if they lacked interest in participating in the development process. Forty percent of them opted to sell their parcels, thereby enhancing the attractiveness of the urban development project. Public investment was implemented in stages (Vacher, 2014).

Similarly, in the case of ÉcoQuartier La Baudière, land readjustment aimed to mitigate undesirable urban density in a rural setting and establish facilities to alleviate the impacts of low density. The revision of higher-level plans facilitated the construction of green spaces, and public investment followed a phased approach (Vacher, 2014).

The third French case, Marne Europe, aimed to anticipate externalities generated by a metro station to consolidate urban space, illustrating the versatility of land readjustment in addressing different scales and purposes. The objective was to remediate a brownfield as part of the Grand Paris Express Projet (Mouton, Guelton and Poinsot, 2024).

The objective of this paper is not to offer an in-depth analysis of these cases and as, such, additional details are summarized in Table 1. It is noteworthy that these cases have some

common grounds. First, there is a strong subjacent public aim. These processes have been instrumental in securing land reserves, facilitating social housing provision, mitigating undesirable urban density, and anticipating externalities generated by infrastructure projects. Also, municipalities play a pivotal role in all cases, either by facilitating the execution of planned initiatives or by creating the necessary fiscal, legal, and expertise conditions for private landowners to pursue their intentions.
Overall, all these cases underscore the importance of context-specific planning approaches, the need for innovative solutions to urban challenges, and the role of collaborative efforts between public and private stakeholders in achieving sustainable urban development.

Land Readjustment in Portugal

While urban planning is constitutionally designated as a public responsibility, private developers have largely dominated its implementation in recent decades in Portugal, with recognised constraints for adequate urban development. In response to this prevalent practice, the principle of equity was introduced by a wide legislation reform in 1999 (by Decree-Law no. 380/99 of 1999 - Legal Framework of Planning Instruments – RJIGT). This piece of law mandated that municipal plans incorporate compensation procedures to ensure a fair redistribution of benefits and costs among property owners and between them and the local government. Municipal Master Plans are therefore required to delineate general criteria.
Land adjustment implementation occurs within specific territorial units known as Execution Units. According to RJIGT, "the Municipality promotes the coordinated and scheduled execution of territorial planning, with the collaboration of public and private entities, carrying out infrastructures and equipment according to the public interest, objectives, and priorities established in intermunicipal and municipal plans, using the means provided for by law" (cf. Article 146).
This process entails identifying the physical boundaries of the area intended for urban development and identifying all property owners. These boundaries are delimited by the municipality on its own initiative or at the request of interested owners (cf. Article 147 of RJIGT) and are subject to a period of public discussion on terms analogous to those foreseen for Detailed Plans or Urbanization Plan.
Each Execution Unit must specify the extent of municipal administration involvement in the process. To uphold the principle of equitable redistribution of benefits and costs, three distinct execution systems are outlined: compensation, imposition, and cooperation (Condessa et al., 2015).
In the compensation system, private stakeholders, such as landowners and developers, take the initiative to develop the urban layout, provide necessary infrastructure, and determine the distribution of costs and benefits among all involved parties, including the municipality. Moreover, they are obligated to compensate the municipality, often through the allocation of land parcels for public use or payment of taxes, in accordance with municipal regulations. The municipality retains the authority to approve, modify, or reject the proposal based on legal provisions outlined in municipal plans and regulations.
In cases where the local government spearheads Execution Unit projects, landowners' participation is typically compulsory, although full consent may not always be legally required. Under the imposition system, the municipality undertakes urban execution directly or by setting agreements with private developers.
Conversely, in the cooperation system, the municipality initiates the process and collaborates with private stakeholders voluntarily or at the municipality's instigation.
In both cooperation and compensation systems, the definition of specific mechanisms to ensure equity among all parties involved and support compensation, whether in the form of cession of

land or currency, is crucial. This stage is where the principles of equity, transparency, and fairness are conceptualized.
Nevertheless, local authorities and private stakeholders retain the legitimacy to define additional mechanisms, provided they adhere to the principle of equity.
The rights and obligations of the parties are defined by an urbanization contract as defined in, specifically aiming at (a) establishing the rights and obligations of the parties involved in the execution unit; (b) specifying the obligations of the parties involved regarding the execution of urbanization works, the responsibilities they are subject to, and the deadline for compliance; (c) outlining the formalization of the transfer to the Municipality of the areas to be relocated by private parties for infrastructure purposes (Articles 148 and 150 of RJIGT).
Land readjustment in Portugal has indeed faced numerous challenges, resulting in few successful cases being delivered. Despite its potential, there is a scarcity of literature on the subject, indicating a lack of comprehensive understanding and documentation of land readjustment initiatives in the country. Additionally, municipalities grapple with the implementation and effectiveness of execution units, which are intended to facilitate urban development projects. This struggle underscores the complexity and obstacles inherent in land readjustment processes, highlighting the need for further research, effective governance, and innovative strategies to overcome existing challenges and promote sustainable urban development.

Braga Municipality cases

Land readjustment processes in Braga Municipality are relatively recent, having been incorporated since the 2015 version of the Master Plan (Notice No. 11741/2015 of October 14). It represents the third iteration of Master Plans in Braga, following versions from 1994 and 2001.
The current zoning of Braga Master Plans includes 40 Unidades Operativas de Planeamento e Gestão (UOPG), where Execution Units delimitation is mandatory unless specific requirements outlined in Article 99 of the Master Plan regulation are met. These requirements stipulate that a development project must be proven to be the most appropriate solution, not harm the environment or significantly compromise any possible integrated solutions with adjacent land, not compromise the potential application of land readjustment mechanisms to adjacent plots and have the necessary infrastructure provisions such as access to public roads, water supply, and sewage systems, within a specified distance from road.
The UOPG cover a total area of 3371 hectares, representing 16% of the municipality's territory. They vary in size, with the largest covering 807 hectares and the smallest 7 hectares, with an average size of 33.84 hectares. Execution Units may encompass sub-areas within these larger UOPG, with specific limits to be decided and approved by the city council.
As of April 2024, the Braga City Hall Council had approved five Execution Units under the provision of the Master Plan, while three others were awaiting final decisions after the public participation period. All these units were initiated under private initiative, and none required the distribution of charges and benefits. This lack of requirement stemmed from either having a single owner or alternative agreements in cases where there were multiple owners.
More recently, the Braga Municipality has undertaken additional land readjustment initiatives under the *Plano de Urbanização das Sete Fontes*. This plan, published in 2022, encompasses 26 execution units and includes detailed urban design and land readjustment procedures. It aims to create a large park surrounding the historic water supply system to Braga City, dating back to the 18th century, covering 30 hectares, and featuring various amenities.

While the land readjustment within the Sete Fontes Plan presents interesting dynamics, its highly specific context sets it apart from land readjustment cases governed by the Master Plan. Consequently, the Sete Fontes Plan will not be examined within the scope of this paper.
The paper conducts an analysis of three land readjustment cases within Braga Municipality outlined by the Master Plan. These cases were selected based on their representativeness and complementary nature, allowing for an elucidation of primary challenges, stakeholder perspectives, and resultant outcomes. Despite not necessarily being considered successful from the authors' standpoint, these cases are viewed as initial efforts aimed at transcending prevailing development approaches and addressing challenges in integrated planning practices.

Lomar Unit

The Lomar Unit project began in 2017 as the first of its kind in Braga. It was initiated to support the expansion of Bosch, the municipality's main industry, which employs around 5,000 people and generates two billion euros in revenue annually. Bosch has invested in land acquisition and proceeded with the construction of a new building for production infrastructure and offices, a new cafeteria, and a new parking lot, reinforcing human resources with the creation of 1,000 full-time positions, totalling an investment exceeding 36 million euros (CM-Braga, 2017).
The Execution unit is part of the UOPG 25 – Parque Oeste e envolvente – Ferreiros, a major UOPG located in the South-West part of the city of Braga. Its main objectives include enhancing the Este River by creating a park along its banks, structuring the road network to facilitate the expansion of industrial zones and the organization of economic activities, providing the area with general infrastructure, notably the South Wastewater Treatment Plant, and ensuring adequate coordination with existing urban clusters (Article 110 of Master Plan regulation). According to the same document, this Execution Unit should be ensured through a system of cooperation. The Municipality of Braga considered there to be an unquestionable public interest in the execution of urbanization works (such as road, parking spaces and sidewalks) that can ensure appropriate use for economic activities, as well as recognised the interest in supporting and promoting investment projects that are pivotal for the municipality's economic development.
The preliminary proposal for the execution unit limits approved in June 2017 was enlarged, after the participation of three neighbouring landowners during the public hearing period. The final proposal required cooperation from the municipality and the seven landowners, who held property of the 15 parcels of land within the Execution Unit limits. After adjustments, it was approved in November 2017.
The urbanization agreement among the stakeholders took place in September 2019 and aimed to regulate the relations between the parties involved and establish the terms and conditions of their participation, through a cooperation system, in the partial execution of UOPG 25.

Figure - 2: Lomar Unit final proposal. Source: Braga Municipality website (CM-Braga, 2024)

The agreement foresees three stages of implementation. First phase comprehended a construction of the road and Bosh buildings. Phase two regarded another stretch of road and building the parking area. Both these phases are concluded and in use, as shown in aerial photographs (Figure 3). Third phase foresees the construction of a local access to a local (to be built) park in the west limit of the Execution Unit and is not yet complete.

Despite being an interesting and successful example, we can point out that the only executed infrastructure was dependent on a single company, with high interest in the development. The remaining part, subject to investment of other private owners and the municipality has not yet been undertaken, revealing difficulties in implementing upon the need to conciliate different landowners.

Figure - 3: Current situation of Lomar area. Source: Aerial view of 2021 (DGT, 2021)

Quinta da Mata Unit

The Quinta Mata Unit was established in response to the Municipality's urgent need to construct the South Wastewater Treatment Plant. This facility is essential for augmenting the city centre's sewage treatment capacity, which has been strained by recent urban growth. Consequently, there is a significant public interest in defining the boundaries of the Execution Unit and ensuring prompt land allocation. The initiative has been spearheaded by the Municipality in collaboration with AGERE, the local company responsible for water and sewage management. The proposed urban project entails the construction of industrial pavilions, in accordance with the zoning regulations outlined in the Master Plan. Meeting the maximum index is imperative as it guarantees the allocation of land required for the sewage treatment station. Additionally, the urban design necessitates the construction of a new road in the southern part of the unit to facilitate connectivity with the local road network. Despite extensive negotiations with the landowner, consensus on the allotment design has not yet been achieved.

It is noteworthy that, under Portuguese law, the approval of execution unit delineation does not hinge on the acceptance of landowners. However, as seen in the Lomar case, a public hearing is conducted, allowing citizens to participate. If any landowner within an execution unit opts out of the land readjustment process, the municipality is obligated to initiate expropriation proceedings and assume their duties and rights. Nonetheless, the provision of land for infrastructure, equipment, and green areas can only be realized upon reaching a land adjustment agreement, typically through replotting or joint allotment, followed by land registration.

In this case, although expropriation is a viable option, the municipality has refrained from initiating procedures in anticipation of reaching an agreement. Given that expropriation processes tend to be protracted, the municipality risks missing funding deadlines if an agreement is not reached in time. In Braga, as in Portugal generally, expropriation is considered a last resort due to various structural challenges. These include the inefficiency of the legal

system, the absence of a standard method for evaluating land value (leading to potentially high payments by public authorities), and the complexity of legal procedures. This aligns with Condessa's observation that a lack of a reliable land valuation mechanism integrated into the planning process is a major pitfall of land readjustment initiatives (Condessa et al., 2015). Consequently, in Braga municipality, expropriations are infrequent, and efforts are made to secure agreements whenever possible.

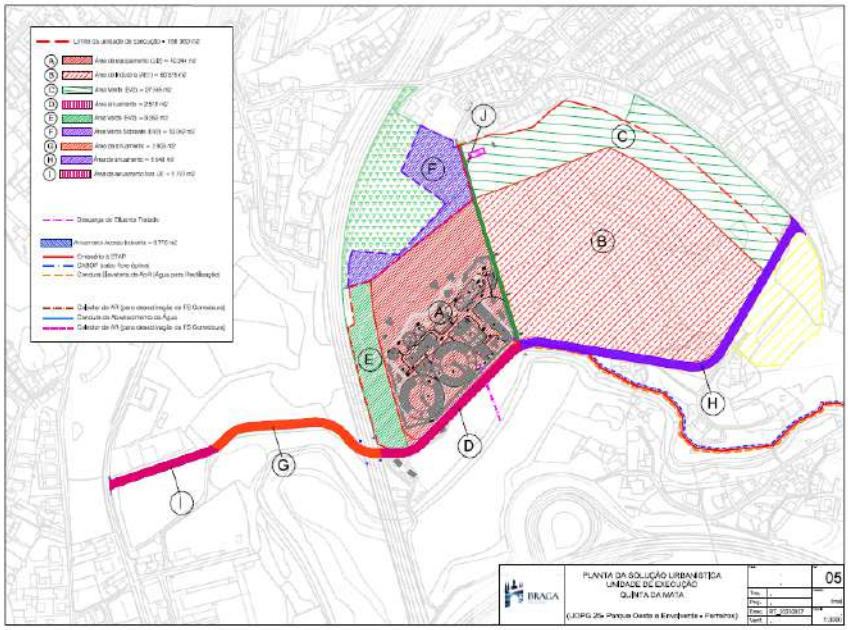

Figure - 4: Quinta da Mata final proposal; Source: Braga Municipality website (CM-Braga, 2024)

Alto da Vela Unit

The Alto da Vela Unit had its preliminary version approved on November 2023 and the final limit on March 2024. The project includes the provision for 24 detached housing units, supported by a winding road adapted to the hilly location. Initially, it encompassed two landowners, but the owner of the major parcel acquired the smaller one to avoid negotiating. This is a recurrent situation. In fact, five out of the eight execution units in Braga Municipality today have a single owner, despite including several parcels. This may be explained by a reluctance to deal with partners in development projects but also denotes a high acquisitive capacity from local companies.

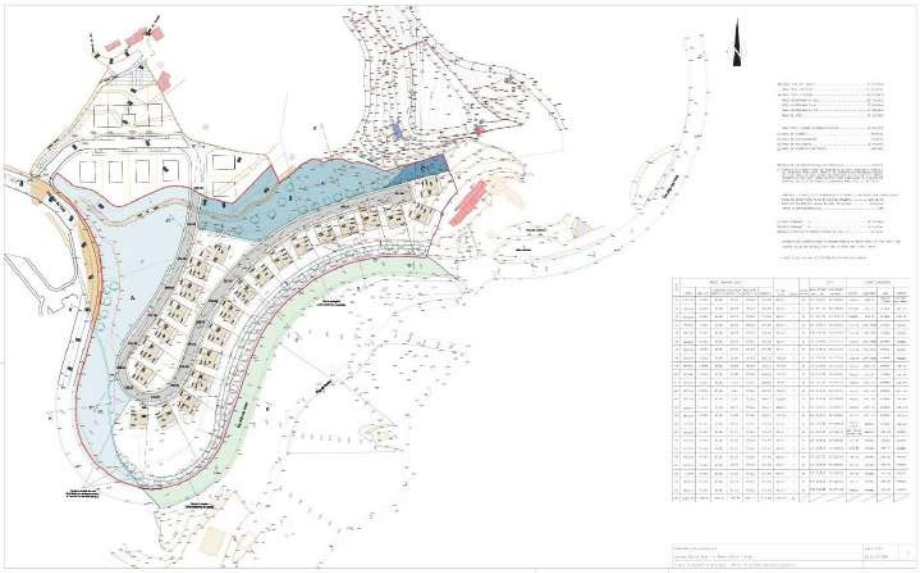

Figure - 5: Alto da Vela final proposal. Source: Braga Municipality website (CM-Braga, 2024)

The urban infrastructure for Alto da Vela is, from our perspective, not entirely satisfactory. The new road is a continuation of an existing one (which supports the construction of seven detached houses) but fails to ensure a connection with the existing local road further north. A new execution unit is expected to fill that gap. However, there is no guarantee on the timing of that development, leaving the Braga territory with yet another dead-end road.

The lack of road terminations is a highly common outcome from the past years' policy of development in Braga Municipality, often limited by the cadastre, enhanced by the new roads indicated in the Master Plan, and the lack of proper land management. The Master Plan design has contributed to this situation by "drawing" many new roads on the zoning plans. As developers frequently report that reaching agreements with neighbours is not possible, the municipal management has allowed bits of roads to be started without the guarantee of connections (see examples in Figure 5).

The Alto da Vela Execution Unit was successful in assuring two pieces of land to be joined, but it does not provide what we believe is one of its main objectives – to provide a comprehensive road structure and connections to the local network. Despite having gone through all the formal procedures of an execution unit, in our opinion, it fails to deliver an adequate urban solution. This proves yet again the municipality's fragile capacity for negotiation and its ability to be firm on objectives. Despite its pitfalls, this is an example has representativeness among current practice.

Figure - 6: Example of dead-ends in Braga, highlighted in yellow.

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Discussion & Conclusions

The analysis of three distinct cases of land readjustment within Braga Municipality provides valuable insights into the complexities and challenges inherent in urban development initiatives. These cases offer a comprehensive view of the varied dynamics and outcomes associated with such projects as we also verified with the European examples.
The cases in Braga do not present significant indications of community involvement, despite the mandatory public hearing periods stipulated by law. Similar challenges are observed in the European examples. On one hand, there is recurrent situation of a single landowner in land readjustment process and on the other hand processes that involve several landowners have difficulties in meeting their end (as in the Lomar case). This is an aspect, the outcome could benefit from improved communication, (as well as fiscal, juridical, and policy changes) to

attract private landowners to collaborate more closely with the planning authorities. However, this scenario differs significantly from European cases where most of the processes progress independently of the number of owners. We believe this is primarily due to the strategic and public objectives associated with these operational tools in spatial planning instruments. This process implies a high level of information, and the cases suggest that Portuguese landowners may not yet have the skills to understand and recognize the benefits for themselves, others, and the collective. This aspect is considerably relevant due to the recent introduction of land readjustment tools into the daily planning practice. The longevity of land readjustment in the national context seems to have a significant impact and Portugal is quite a youthful player in this matter, namely compared to other European counties.

The examination of the case studies also highlights a tendency of the municipality to prioritize procedural fulfilment over the pursuit of urban solutions of sufficient quality. Land readjustment is frequently approached as a mere obligation rather than an opportunity to guarantee optimal urban solutions.

Across all cases, the tension between public interest objectives and the interests of private stakeholders is evident. While projects like the Lomar Unit demonstrate successful collaboration between the municipality and major industry players, challenges arise in reconciling diverse interests and ensuring equitable outcomes for all stakeholders. The municipality's need to address pressing infrastructure requirements, such as the South Wastewater Treatment Plant in the Quinta da Mata Unit, underscores the imperative of balancing public utility needs with private property rights.

Negotiating agreements among multiple landowners and coordinating diverse stakeholder interests emerge as significant challenges in all the cases under study. The delays and obstacles encountered in reaching consensus on infrastructure provision and land allotment design highlight the complexities of navigating legal frameworks and competing priorities. Despite legal provisions for land readjustment processes being met, as seen in the Alto da Vela Unit and in European examples, challenges persist in securing agreements and ensuring timely project implementation.

Another common thread across the cases is the inadequacy of infrastructure planning and implementation, particularly regarding road connectivity and comprehensive urban solutions. While certain infrastructure components, such as road construction and building developments, have been realized in the Lomar and Quinta da Mata Units, challenges remain in achieving seamless integration with existing urban networks. The fragmented road network and lack of connectivity, exemplified in the Alto da Vela Unit, reflect broader issues in municipal negotiation capacity and urban planning effectiveness. The European cases appear to concur that the urban project must be interdependent with the surroundings.

Conclusions point out that while land readjustment holds immense potential for transforming urban landscapes and fostering sustainable development in Portugal, overcoming these challenges is paramount. Addressing fragmented land ownership, streamlining regulatory processes, securing funding, and fostering community support are essential steps towards successful land readjustment projects in the country. In addition, strengthening the legal bases governing land readjustment is imperative to promote investor and community confidence.

The cases underscore the importance of collaborative governance structures and strategic planning in navigating the complexities of urban development. Effective coordination among stakeholders, transparent negotiation processes, and proactive engagement with the community are essential for addressing diverse interests and achieving sustainable outcomes. The success of projects like the Lomar Unit highlights the potential for fruitful collaboration between the municipality and private sector entities in driving economic growth and infrastructure development.

Addressing the challenges identified requires adaptive policy and legal frameworks that facilitate streamlined decision-making, expedite project approvals, and ensure equitable outcomes for all stakeholders. Proactive measures to streamline land readjustment processes, clarify legal requirements, and provide support for negotiation and dispute resolution can enhance the efficiency and effectiveness of urban development initiatives.

Investing in integrated planning approaches and prioritizing infrastructure development are critical for addressing the evolving needs of growing urban areas. Comprehensive strategies that emphasize connectivity, sustainability, and community engagement can help mitigate infrastructure shortcomings and foster inclusive and resilient urban environments.

The analysis of land readjustment initiatives within the Municipality of Braga provides valuable insights into the complexities of urban governance and the challenges of translating intentions into tangible outcomes. By acknowledging the importance of community engagement, skills development, and policy adaptation, the Municipality of Braga can design the next Master Plan with more suitable tools. Consequently, these cases serve as significant milestones in the municipality's journey towards transcending traditional development approaches and realising its vision for a prosperous and inclusive urban future.

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