

## LAND READJUSTMENT PITFALLS IN PORTUGAL AND THE ROLE OF EQUITY

**Beatriz Condessa**<sup>1</sup>, Paulo Cambra<sup>2</sup>, Ana Morais de Sá<sup>3</sup>, José Antunes Ferreira<sup>4</sup>

### Abstract

Planning has not always preceded the development of urban land. The rapidly increasing growth rate of urban territories can easily lead to the emergence of pieces of fragmented, unqualified and unconnected urban fabric. Land readjustment is a century old technique that is attracting growing interest worldwide as a means of achieving planned, equitable and efficient urban development. This practice has been adopted and adapted by various countries in order to accommodate differences in both legal frameworks and public-private relationships. Various levels of success and degrees of implementation have been reported as well as pitfalls and obstacles, some of the latter being common in and/or experienced by more than one country alone.

In the case of Portugal, land is predominantly privately owned and the public administration has played a passive role in the urban planning process, limiting itself to the issue of permits for isolated private operations. In the light of the principle of equity, Portuguese law establishes that urban development plans are obliged to provide land readjustment mechanisms to eliminate, or at least mitigate, the inequalities they themselves bring about.

After more than a decade of existence/practice, however, the application of these mechanisms still has not achieved a satisfactory output, and has come up against a number of obstacles and problems. These, in short, are related to property structure and records; land owners' engagement; technical expertise; availability of public funds; time consuming processes; ineffective dispute resolution instruments; and lack of reliable land evaluation mechanisms, truly embedded in the planning process, for calculation of reference values for both property and building rights in the context of the distribution of benefits and charges.

To address the latter aspect in particular, a methodology for the fair distribution of benefits and charges was developed and applied to the urban expansion of the Portuguese city of Sines. This paper will share how land value appraisal combined with property size was used as a distribution driver, together with a universal and

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<sup>1</sup> CESUR/IST – Center for Urban and Regional Systems - Research Group on Urban Planning and Environment, Instituto Superior Técnico, Technical University of Lisbon, Lisbon, Portugal – bcondessa@civil.ist.utl.pt

<sup>2</sup> CESUR/IST, Lisbon, Portugal - pjcambra@gmail.com

<sup>3</sup> CESUR/IST, Lisbon, Portugal – ams@civil.ist.utl.pt

<sup>4</sup> CESUR/IST, Lisbon, Portugal – antunes.ferreira@civil.ist.utl.pt

free property valuation tool – the national online property tax calculator. The global market value of the proposed urban plan was estimated and to each landowner was assigned a share of this value according to the surface area of each one's property. Also, the market value was estimated for the units one had the right to build. The distribution of development costs (infrastructure, public space) was made in proportion to the latter, that is to say, the higher the value of one's building, the higher the charges to be paid. For each proprietor a balance was made between the assigned plan value, the actual value of their building units and the development fee, resulting in a lump sum payable or receivable.

This approach made it possible to achieve better communication with and understanding of landowners, bringing transparency and equity to a process locally perceived as somewhat blurry. Better understanding and grasp of the land readjustment model by private and public stakeholders can be a step forward in achieving cooperation and plan implementation.

**Keywords:** planning practice, land readjustment, equity, land appraisal, land evaluation

## **1. Introduction**

Statutory planning process itself is inherently discriminatory. Land use plans contain specific proposals for development that often represent considerable restrictions to urban development and strongly affect land value in the market.

Despite the fact that most western countries in Europe have adopted the principle that constraints on urban development are not subject to public compensation (Renard, 2007), the problem of inequitable treatment between property owners still persists. As several authors argue, the diverse approaches to this problem are deeply related with different ideologies about property rights and land ownership and rooted in different planning doctrines (Linchfield, 1980; Adams et al., 2001; Louw, 2008).

Concerning planning efficiency, social equity and the guarantee of public facilities provision, two major approaches can be identified that represent opposite ideological sides: that which advocates public ownership of land for broad political and social reasons; and that which defends private property, individual rights and the operation of a free market (Kivell and McKay, 1988; Louw, 2008).

Strong arguments on both sides are discussed by several authors. Nevertheless, public and private developers commonly recognise fragmented ownership and the difficulty of assembling land as major constraints to urban development (Adams et al., 2001; Connellan, 2002; Hong, 2007, Louw, 2008).

Planning literature and practice all over the world have already demonstrated that conventional land assembly methods (voluntary exchange or public intervention in the form of expropriation) commonly produce weak outcomes in terms of efficiency

and equity, whereby this is particularly true where public funds for any form of compulsory purchase and infrastructure provision are limited. In this context, land readjustment (LR), also referred to in literature as land pooling or land consolidation, is generally regarded as an attractive alternative to the methods mentioned above.

The precise scope of LR differs from country to country and author to author and it seems to be strongly related with specific institutional, legal, social and economical contexts. There are several models, each particular to its own country, as has been shown in the literature on LR experiences in countries such as Japan; in Europe: Germany, Sweden, France, Netherlands, Turkey; and other overseas countries: India, Australia, Taiwan, amongst others (see for instance: Doebele, 1982; Larsson, 1997; Sorensen, 2000; Müller-Jökel, 2004; Lin, 2005; Davy, 2007; Hong and Needham, 2007; Souza, 2009).

Although LR is a broad term without a precise definition there is a relatively high consensus about its relevance as a technique used for both the development of new areas and the reorganisation of the structured areas in urban regions (Larsson, 1997; Sorensen, 2000; Krabben and Needham, 2008; Turk and Altes, 2010); as an efficient tool to equalise the advantages and disadvantages between landowners resulting from urban planning; and as a means of financing the development process, allowing the public sector to capture part of the land value increment created by land use plans (Connellan, 2002; Müller-Jökel, 2004; Lin, 2005; Needham, 2007; Souza, 2009).

In other words, LR is potentially an effective tool for: assembling land parcels and therefore to improve the economic use of land (in long-term land assembly processes, landowners are tempted to keep their land out of the market in order to get higher market prices); facilitating the equal sharing of the benefits and costs of the project; and relieving the financial pressure on public authorities in providing the needed infrastructure and public facilities.

Despite the specificities of each country, in most LR processes, landownership and its physical structure is transformed and the land redistributed amongst landowners in the form of serviced plots or other economic compensation (established in proportion to either the surface area or the value of land inputs), whereas land for public usage comes to public ownership. Implementation is based on private agreements and exchanges of land, formalised in legal processes. However, very often, cooperation has to be facilitated or even instigated by public authorities, public enterprises or large private entrepreneurs (Larsson, 1997; Louw, 2008; Turk, 2007).

Pursuing planning efficiency, social equity and the guarantee of the provision of public facilities, and reducing financial pressure on public governments are, therefore, the main objectives LR processes aim to achieve.

Although the planning literature acknowledges the virtues of this method of land assembly (several case studies in developed countries such as Japan, Germany and France, as well as in developing countries in Asia and Australia, have revealed how

the LR method is applied efficiently and successfully in urban development), major constraints on its application have been experienced and outlined.

Some critical success factors are identified by different authors: the presence of a robust and rising land market; a strong and sustained atmosphere of trust amongst all the parts involved; a culture of collaborative and consensual decision making; and finally, a significant proportion of public will and finance to facilitate the process (Home, 2007; Needham, 2007, Hong, 2007; Sorensen; 2007; Louw, 2008; Souza 2009).

In Portugal, after more than a decade of legal existence and practice, the achievements with the use of LR mechanisms fall well short of expectations. A weak performance in terms of the critical success factors listed above could be, in itself, a reasonable explanation. However, other causes must also be highlighted.

In the first section of this paper, we will briefly examine the present legal framework of LR in Portugal. In the light of the international literature and of the Portuguese urban planning experience in the last decade, the main drawbacks, within the institutional framework for LR, will be outlined.

In the following section we will present a LR methodology developed for a detailed plan in the Portuguese city of Sines in order to cope with some of the major constraints identified. Particular emphasis will be given to the so-called distribution stage of LR processes, considered to be fundamental, as the principles of equity, transparency and fairness take form in this stage (Turk, 2007).

In the final section, discussion of results and final conclusions will be presented. We will start by arguing that the approach followed made it possible to achieve better communication with landowners, bringing transparency, equity and efficiency to the process. Improving the understanding and grasp of the LR model by private and public stakeholders proved to be a step forward in achieving cooperation and plan implementation and emphasises the idea that the core principle of LR is to build consensus and cooperation among the parties involved in land development (Hong and Brain, 2012).

## **2. Equity in Portugal and *Perequação***

### **2.1 Legal framework**

The principle of equity was only legally formalised in Portugal in late 1990s. According to the law, *perequação* was designed in order to guarantee an equitable redistribution of the costs and benefits resulting from urban planning amongst landowners. Particular emphasis was also given to its potential as a way to promote efficiency and sustainability in financing the costs of urban development, traditionally mainly assumed by the public sector. As a consequence of these first two characteristics, a third category of objectives was expected to be accomplished:

improving the low levels of execution of urban plans, which has been referred to by different authors as a major problem in Portugal. In this sense, it seems fair to classify *perequação*, a term that comes from the Latin expression *per aequere* (meaning to make an equal distribution between different parts or to deal fairly and equally with all concerned) as an LR mechanism.

Prior to this, Portugal was indeed “ill equipped to deal with the urban development processes, which accompanied the significant migration flows of the 1960s and 1970s and the economic and spatial changes in the 1980s and 1990s” (Carter and Silva, 2001). Aiming to bring new drive to the role of urban planning against an outdated and persistent practice dominated by *ad hoc* urban development schemes led by the private sector, for the first time the principle of equity was introduced and the planning system was strengthened with a set of execution instruments that were regulated by Decree-Law no. 380/99 of 1999 (the Legal Framework for Town and Country Planning Instruments – RJIGT).

Moreover, it was established that municipal plans, because they are binding for both public administration and private property owners, have to include compensation procedures to guarantee a fair redistribution of the resulting benefits and costs amongst the property owners involved and between them and the public administration.

The development of a *perequação* model requires that some questions have to be answered during the planning process and before the legal approval of municipal plans: what are the physical boundaries where *perequação* is going to take place? To what extent will local authorities be involved directly in urban development promotion or will they act mainly as facilitators between the different parts concerned? What are the equity mechanisms or the compensation rules that will be adopted? Which execution instruments will be required? Because of their specific nature, contents and scale, it is in detailed plans that these answers can be provided.

According to the RJIGT, plan implementation should take place in specific territorial units, designated as execution units, which are defined by local authorities at their initiative or, whenever required, by private landowners. This process implies the identification on a cadastral map of the physical boundaries of the area subject to urban development and the identification of all property owners.

For each execution unit the plan should define to what extent the municipal administration will be directly involved in urban development as “regulator”, “enabler” or “provider”. Three different types of execution systems are defined (Table 1):

Table 1. Execution systems

Execution system	Who takes the initiative?	Who defines the execution programme?	Who executes public infrastructures and public facilities?
Compensation	Private stakeholders	Private stakeholders	Private stakeholders
Cooperation	Public administration	Public administration	Public administration and/ or Private stakeholders
Imposition	Public administration	Public administration	Public administration directly or through a concession agreement

The approaches suggested by the compensation and the cooperation systems fit very well with the concept of LR, as it is presented in this paper through the literature revision. In both cases, replotting is an efficient instrument for formalising the required transfer of ownership and property rights.

Under the imposition system, local administration undertakes urban execution directly or through a concession agreement with a private developer. As the land developer, the municipality has to assemble all the land, ensure the costs of land acquisition and infrastructure provision, and, at the end of the process, it will benefit from the income derived from selling the serviced plots. In this case, a land banking process, as it described in the international literature of land assembly (see for instance: Louw, 2008), seems to be a better portrayal of the Portuguese imposition system rather than a LR approach.

In the compensation and cooperation system, the definition of the specific mechanisms that will guarantee equity between all parties involved, and support the compensation in the form of serviced land or cash is, indeed, critical, as the principles of equity, transparency and fairness take form in this stage.

According to international practice, RJIGT law suggest some equity mechanisms, namely: Gross Average Floor Area Ratio (FAR)<sup>5</sup> (also includes the surface of land parcels affected to public usage) and the allocation of the urbanization costs (redistributed amongst the property owners in proportion of the correspondent gross floor area). Nevertheless, local authorities have the power to define some others mechanisms, as long as the principle of equity is respected.

Taking the FAR as reference, two different criteria can be used to redistribute the so-called *redistribution mass* amongst original landowners (Müller-Jökel, 2002): the relative size or the relative value of their former plots.

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$$FAR = \frac{\sum F_n}{S_g}$$

where  $\sum F_n$  represents the sum of the gross area of each floor of the built area in the execution unit, being  $F_n$  the area of the  $n^{\text{th}}$  floor;  $S_g$  represents the gross surface of the execution unit.

Whenever there is a difference between the abstract developments rights (in sq. m. or the correspondent monetary value) and the effective redistributed built rights to each owner, the RJIGT law imposes that compensations have to take place.

In order to make these compensations more agile and flexible, the RJIGT law also considers the option for property owners of selling their *unused* development rights. This possibility sketches the legal framework for the introduction of transferable development rights programmes (TDR) in Portugal.

## **2.2 Major pitfalls to *Perequação* in Portugal**

After more than a decade of legal existence, however, the application of *perequação* in Portugal still has not achieved a satisfactory output. Not only the number of legally approved detail plans with equity mechanisms is scarce (compared to the witnessed urban growth), but also their level of implementation is very low (Cardeiro, 2009; Antunes, 2009).

Taking into account the background provided by the international LR literature review and the authors' knowledge about the Portuguese urban planning reality in this last decade, major pitfalls to *perequação* concerning the institutional framework, can, therefore, be outlined as follows:

*The absence of a win-win negotiation culture between public and private sector;*  
Since urban development is mostly dominated by private sector, the implementation of *perequação* is highly dependent on the extent to which public planning authorities can successfully encourage landowners, developers, and investors to be committed with the plan. However, lack of appropriate technical expertise in the domains of collaborative and consensual decision-making processes, weakness the potential role of local authorities as the main driving force.

*The lack of efficient and effective dispute resolution mechanisms;*  
Traditional methods of assembly land when voluntary negotiations are not possible, such as expropriation, often, lead to lengthy timescales processes and to higher costs, that end up to be supported mainly by public authorities, being this particularly critical as local governments' funds in Portugal are scarce.

*The lack of efficient and effective mechanisms to induce *perequação*;*  
Not only more effective dispute resolution mechanisms are needed, but also, strong incentives to urban development within *perequação* have to be created (e.g. urban, financial, or fiscal incentives). The landowners' economical and financial gains from *perequação* must be larger than if they do not take part in the process.

*The inexistence of land value evaluation mechanisms reliable and truly embedded in planning process;*

The knowledge of land values and land evaluation processes is critical to create a sustained atmosphere of trust amongst all the parts involved in any kind of LR

project. In Portugal, however, land use plans and, in general, the planning system, do not consider in a comprehensive way the influence that planning rules have in land value. Not only the planning system does not incorporate independent land evaluation boards, as public administration, itself, uses different land evaluation processes for diverse public purposes leading, sometimes, to very different evaluation results (e.g. land and property taxation or the definition of the fair compensation in the context of expropriation processes). This ambiguous environment, combined with ineffective mechanisms for public capture of property value increase resulting from land use plans (and its transfer to the society), very often, contributes to threaten the sense of social justice and equity in urban planning, and creates the opportunity for land speculation.

The obstacles listed above do not pretend to be exhaustive. However, in conclusion, it can be highlighted that urban planning in Portugal seems to fail to understand the critical relationship between planning making and its implementation. In this sense, a more integrated approach to *perequação* within the planning system, urban economy and governance, is considered to be critical to improve the efficiency and success of its application.

In the following section we will present a *perequação* methodology developed for a detail plan in the Portuguese city of Sines in order to cope with some of the problems identified.

### **3. Study area: the city of Sines and the detail plan for expansion in the north of the city**

#### **3.1 Evolution of the city of Sines**

The city of Sines is located on the coast of the Portuguese region of Alentejo, roughly 150 km south of Lisbon. Thanks to its deepwater port, it is part of a geo-economic context that is of strategic importance to Portugal. A small fishing town up until the 1960s, the urban development of Sines is closely linked to its development as an industrial hub and port. From the 1970s onwards, the decision to establish in Sines an extensive area for basic/heavy industries gave rise to strong urban growth. Since then, the municipality's urban policies have been dependent above all on decisions taken at the central administration level and on important public and private investments in the port, the industrial and logistics zones and transport infrastructures.

While in 1991 the city had 11,000 inhabitants, by 2001 the number of residents had reached 12,500. At the end of the 1990s major investments were earmarked for the port and logistics platforms, justifying the population evolution scenarios, drawn up in 2003, which indicated that the city's population would almost double by 2011. However, the greater part of the planned investments was not made and the results of the Census of 2011 (14,260 inhabitants) show that, although there was indeed a considerable rise in the population, the growth fell short of what had been expected.

This context of uncertainty as to the economic and social development of Sines requires that the municipal plans have the capacity to monitor and adapt to this development. It is therefore no surprise that the process for the drawing up of the Detail Plan for the Expansion Zone North in Sines (hereinafter the “PP Norte”), in which the methodology described further below was tested, has been a particularly lengthy one.

### **3.2 The PP Norte elaboration process**

The process for drawing up the PP Norte began in 2001 and its first proposed version was finalised in 2003. This version, which was subject to public discussion, manifested the differing expectations of the various types of property owners. The greatest resistance to the proposed design came from those who already lived in the area of intervention, as they opposed to the demolition of their dwellings. Meanwhile, the postponement of some of the main structuring investments at the industrial and logistic levels, added to the delay in the execution of the new road and railway infrastructures and the accompanying slow-down in the population growth rate, led to Sines Council requesting alterations to the proposed design. A new detail plan proposal was presented in 2008.

The alterations are most visible in the eastern part of the PP Norte, where land ownership is divided into smaller fractions, with a view to avoiding that the implementation of the main infrastructures be dependent on the initiative of small property owners or their substitution by the local council. Also, responding to the main questions raised during the public discussion, the built structures that existed in this part of the intervention area that showed good conditions of habitability were retained and the offer of detached and terraced houses was increased.

Furthermore, in the 2008 version, the PP Norte did not present a clear indication of how much the property owners would have to pay or how much they would receive, so that, in the final version approved in 2011, the *perequação* model described in section 4 below was developed.

### **3.3 The area of intervention**

The area of intervention – 36 ha in size – covers 34 property owners, two of which are public. One should point out the exceptional situation in the national context of the public sector owning more than one half of the area of intervention (52%). Of the other landowners, six are commercial companies (holding 37% of the total area), three are small groups of two or three private citizens sharing ownership of the land (only 2% of the total area), and the remaining owners are individual citizens (9% of the total area).

The average size of the land parcels is 5,600 sq. m, but there are large discrepancies in terms of parcel size. Figure 1 shows the distribution of the land parcels by size in the original land register and the types of property owners.

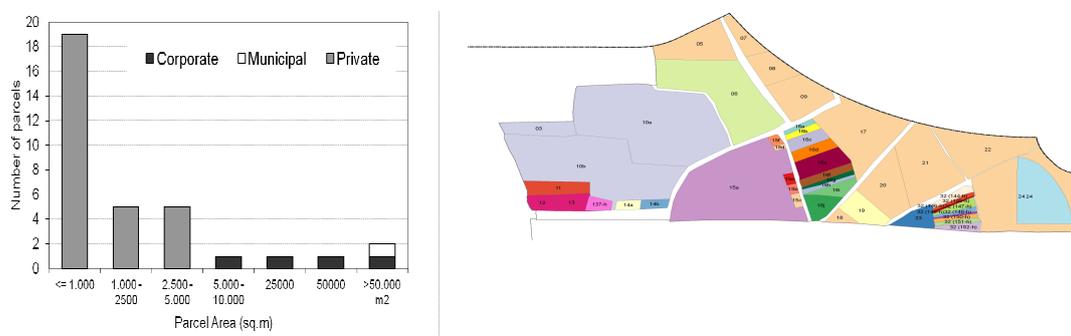


Figure 1. Distribution of the land parcels by size and the types of owners (original land register)

The final version of the plan clearly favours residential use, which takes up some 66% of the gross floor area (only residential) or 95% (including residential and commerce mixed use). The commercial and services areas (approx. 5% of the gross floor area) are located along the two main roads which are the most easily accessible and have an avenue profile. Table 2 shows the building typologies adopted in the plan.

Table 2. Building typologies

Use	Residential				Commerce & Services	Mixed Use (Res. + Com.)	Total
	Detached Houses	Semi-detached houses	Terraced single-family houses	Apartment Buildings	Buildings	Buildings	
N. of Units	22	30	76	16	3	13	160
Average lot Area [m <sup>2</sup> ]	478	310	237	1.874	1.348	1.311	---
Average Floor Area [m <sup>2</sup> ]	240	221	177	4.181	2.076	3.113	---
Total floor area [m <sup>2</sup> ]	5.272	6.640	13.427	66.898	6.226	40.472	138.935
% of Plan floor area	3,8%	4,8%	9,7%	48,2%	4,5%	29,1%	100%
Average Unit Valuation (by SIGIMI) [€]	194.463	175.381	138.037	2.926.086	1.321.967	2.168.998	---
Total valuation [€]	4.278.180	5.261.420	10.490.800	46.817.370	3.965.900	28.196.970	99.010.640
% of Detail Plan value	4,3%	5,3%	10,6%	47,3%	4,0%	28,5%	100%
Average Floor Area value (by SIGIMI) [€/m <sup>2</sup> ]	811	792	781	700	637	697	713

## 4. Methodology for distribution of benefits and charges

### 4.1 Objectives and assumptions

The particular characteristics of the PP Norte, namely in terms of the initial property structure – with the presence of large and small landowners, with some houses to be

demolished and others to be kept, but whose plots have characteristics that are reasonably homogeneous in terms of morphology and urbanistic situation – and in terms of final property structure – with diverse use typologies (commercial and service buildings and detached and terraced housing) with differing market prices per sq. m of floor area – led to a refinement of the most frequently used *perequação* method: the distribution of building rights.

Hence, the *perequação* process would have to incorporate other calculation mechanisms that would need to be simple and clear. The methodology we developed is based on the equitable division of the charges and benefits, based on the average valuation (in euros) introduced by the plan. The compensations to property owners are the equivalent of the difference between the average valuation and the valuation attributed to each owner. In other words, in terms of benefits, there is an equitable distribution not of the floor areas but of the value of the floor areas, given that the different typologies proposed have different market values. The distribution of the charges followed the same philosophy; they were distributed amongst all the owners based on the value of the floor area attributed to each one and not on the basis of the floor area itself.

The greatest challenge to overcome is precisely which valuation method to use to translate the benefits and charges into monetary values. It is essential that the plan's value calculation method is objective, transparent and easily accepted by the property owners.

In operative terms, the equity methodology used in the PP Norte was the result of the combined application of the following concepts: (a) the overall plan value, which is the sum of the values for each land parcel obtained by means of property appraisal; (b) an abstract value that is the equivalent to the fraction of the overall value corresponding to each owner in accordance with the surface area of the plot, given that it is assumed that there are no significant differences in value between those parcels; and (c) the concrete value, which is the equivalent of the value of the new lots attributed to each owner.

The following input data were taken from the initial plan situation (original register) and the proposed solution:

- Property owners,  $p_j$
- Surface area of land held by each owner,  $s_j$
- Built structures belonging to each owner,  $F_j$
- Lots proposed by plan,  $i$
- Building typology proposed for each lot,  $T_{ip_i}$
- For each proposed lot: floor area  $F_i$ ; dependency surface area  $AD_i$ ; lot surface area occupied by the principal building  $A0_i$ ; lot surface area  $Al_i$ .

## 4.2 Methodology steps

In accordance with the objectives and assumptions identified in the preceding point, the following steps were defined for application of the methodology:

- 1) Defining the different types of players and the rules (benefits, charges, compensations) applicable to each player. This is followed by the classification of the owners by player type.

The description of the four player types identified and the distribution of the owners by type is summarised in Figure 2:

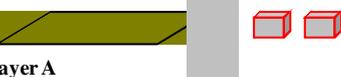
Player Types	No. of owners	% of Plan Area	Type of ownership
 <p><b>Player A</b> Land without construction &gt; Lots assigned for construction (given typology)</p>	9	67 %	Municipal (80%) Corporate (15%) Private citizens (5%)
 <p><b>Player B</b> Land with construction &gt; Construction demolished Lots assigned for construction (given typology)</p>	11	26 %	Corporate (87%) Private citizens (13%)
 <p><b>Player C</b> Land with construction &gt; Construction maintained Lots assigned for construction (given typology)</p>	8	5 %	Private citizens
 <p><b>Player D</b> Land with construction &gt; Construction maintained Lots reconfigured without assignment of new lots</p>	6	1 %	Private citizens

Figure 2. Types of players

For each of these different player types there are corresponding reactions proposed by the plan:

- Player A  
In this case there is the assignment of lots in proportion to the surface area of owner's land. The benefits result from the difference between the concrete value and the abstract value. The charges are calculated on the basis of the concrete value attributed, with no compensations to be received.

- Player B

Player B is similar to Player A, but existing structures are to be demolished. In this case, the compensation amount for demolition should be calculated on the basis of the building's registered value as given in the property registration document.

- Player C

Property owners in the Player C category keep their houses but their original property is reconfigured, with the portion of the plot that is not suitable for the design of the plan being separated. The same rights and charges as Player A are attributed to this portion of the land.

- Player D

Player D-type owners are similar to the Player C type, only with a difference in the assignments of lots, where, as the separated land surface areas are not large enough to translate to the attribution of lots, they directly translate to the attribution of benefits (in monetary units). As they are not involved in the plan's urbanisation, they are not allocated charges.

2) Calculating the net value of the plan – the value in euros of the plan proposal (total value) minus the cost of construction of the buildings.

The plan's total value is the sum of the values attributed to each lot as defined in the plan proposal. In order to value the lots, the national property tax calculator (SIGIMI) was used, which is a free Web-GIS based property valuation tool (see Figure 3). It takes into consideration a number of parameters for characterising a property, including location, floor area and typology.

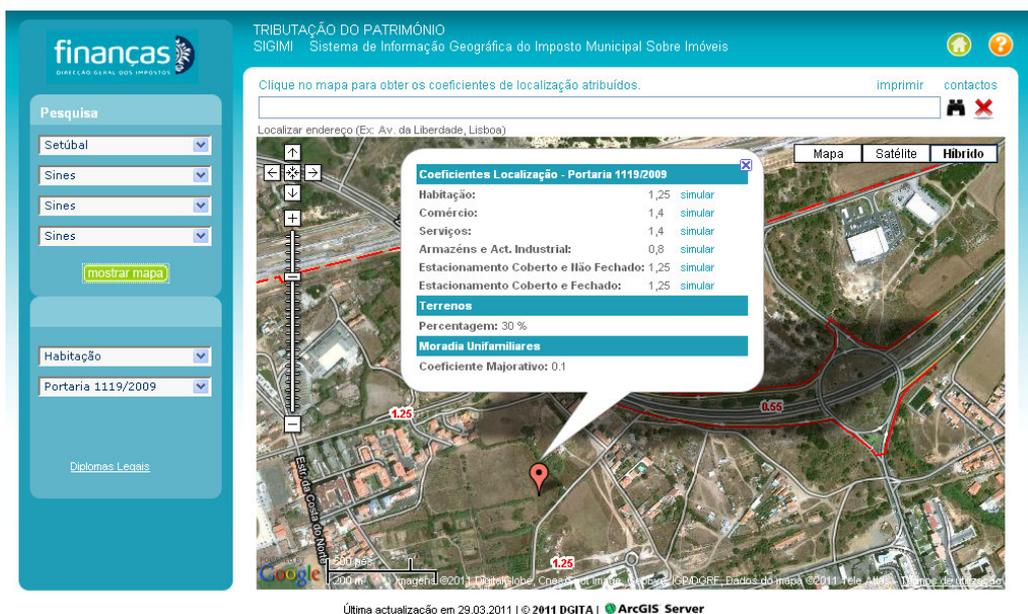


Figure 3. Portuguese property tax calculator – SIGIMI (available at <http://www.e-financas.gov.pt/SIGIMI/default.jsp#>)

For the valuation of each lot, the parameters to be entered in the SIGIMI include the proposed building typology ( $Tip_i$ , e.g., collective housing or single-family dwelling; shops and service buildings), the lot surface area ( $Al_i$ ), the lot occupied area ( $A0_i$ ), the floor area ( $F_i$ ) and the dependency area ( $AD_i$ , which includes, for example, parking spaces or annexes within lots). One should point out that, as far as the dwelling typology, a valuation coefficient was taken into consideration for single-family homes in relation to collective housing, i.e. the coefficient was given a zero value for collective housing building typologies; 0.03 for terraced single-family houses; 0.06 for semi-detached houses; and 0.1 for detached houses.

Once the overall value of the plan is obtained one then proceeds with calculating its net value, i.e. subtracting the costs of construction of the buildings. The reference construction cost used was that taken into consideration in the SIGIMI at the time of valuation (€609/sq. m of floor area).

### 3) Calculating the abstract value attributed to each owner

To arrive at this value it is necessary to first quantify the value of sq. m of land before the construction, for which one divides the net value of the plan by the total area of land subject to *perequação*, resulting in a monetary expression of the construction rights to be attributed to each owner. By multiplying this land unit value by the surface area held by each owner one can calculate the abstract value in the plan for each owner.

### 4) Calculating the concrete value attributed to each owner

The concrete value is the sum of the value of the lots attributed to each owner minus the construction costs. The distribution of lots with capacity for construction amongst the owners is the most critical step in the whole process. With a view to, on the one hand, reducing conflicts and improving acceptance of the plan's solution by the owners and, on the other, minimising compensations amongst owners, the main concerns in this distribution process have to do with: (a) the lots attributed being located as much as possible in the original parcel of land or close to it; (b) the value of the attributed lots being as close as possible to the pre-calculated abstract value.

### 5) Calculating the benefits attributed to each owner

The benefits are calculated by the difference between the abstract value and the concrete value, as defined in the preceding steps, expressed as a monetary value. When the result is positive, i.e. when an owner does not realise the whole value they are entitled to, they receive monetary compensation. When the result is negative, i.e. when an owner realises greater value than that they are entitled to, a payment is necessary. The sum of the benefits attributed to each owner should be null. In other words, those who pay compensate those who receive.

## 6) Distribution of the urbanisation charges

Calculating the charges is based on the internal costs of the plan for infrastructures, public spaces, green spaces and proximity facilities, added to the compensations resulting from demolitions. These charges are distributed on the basis of the concrete attributed to each owner.

As already pointed out, calculating the compensation for buildings to be demolished should be based on the land register value of the properties given in the register records.

## 7) Calculating the final balance per owner

In the last step, the final balance, i.e. the net result of what each owner has to pay or receive on the basis of plan's proposals, is expressed in euros and represents the difference between the benefits and the charges, adding to this the value of compensations for demolitions.

The result of the application of the methodology was validated by Sines Council and that validated resulted in minor adjustments to the distribution of the lots amongst the owners. These adjustments were carried out in an easy and expedite way, given that all these calculations were based on a geographic information system.

Table 3 summarises the methodological steps described above and gives the respective calculation formulae.

Table 3. Methodological steps

Description	Formula
Calculation of area subject to <i>Perequação</i> , S	$S = \sum s_j$
Real estate valuate of each proposed lot, $v_i$	$v_i = f(F_i, AD_i, A0_i, Al_i, Tip_i)$
Calculation of the plan's overall value, V	$V = \sum v_i$
Calculation of the plan's net value, subtracting the construction costs, $V'$	$V' = \sum (v_i - 609 * F_i)$
Calculation of the value per sq. m in the plan before construction, $u'$	$u' = V' / S$
Calculation of the abstract value attributed to each owner, $v'p_j$	$v'p_j = u' * s_j$
Calculation of the value of the lots attributed to each owner, $v'_j$	$v'_j = S (v_i - 609 * F_i)$
Calculation of the benefits attributed	$Benefits_j = v'p_j - v'_j$

Calculation of the unitary charges	$\text{Charge} = (\text{Internal costs} + \text{Compensations}) / V'$
Calculation of the charges per owner	$\text{Charge}_j = \text{Charge} * v'_j$
Final balance per owner	$\text{Balance}_j = \text{Benefits}_j - \text{Charge}_j + \text{Compensation}$

## 5. Discussion and conclusions

One of the main achievements of the described methodology for distribution of the benefits and charges is the better communication with, and understanding of, landowners involved in the urbanisation process, bringing improved transparency to a somewhat blurry process.

One must bear in mind that the urbanisation process encompasses many different 'aspirations'. In a small/medium-sized city such as Sines the rural character is still dominant only a few meters away from the city's last buildings, both in terms of land use and way of life. Many people are out to gain from urban expansion plans, buying land and waiting for the right time either to develop it or to sell it to developers. For some the approval of the detail plan is the moment they've been waiting for, for others it is no more than a coloured printout and a list with more 'don'ts' than 'dos'. One must also consider that, in cases like this, people are to be told their land is going to be taken away from them, that their house is going to be demolished and that they will have to pay for the new roads that will be built on their land. People also are to be told they will make financial gain. Not only the professional developers will gain, but the residents also. And both will pay; and the amount of each one's potential gain and charges previously calculated is explicitly presented in a table included in the detail plan.

And that table will show 'the more you can get when you sell your land, the more you have to pay now for the plan implementation'. In other words, the more you get the more you pay, and the less the plan entitles you to, the less charges you will bear. By using the same valuation method that is used by the national tax board, which is freely available online, the property values obtained are to reflect the market values from an independent and impartial point of view.

By using this methodology it is expected that not only the communication and understanding of the urbanisation process will (desirably) be made clearer to the landowners and developers but also that it will be easier to manage from the local administration point of view. Knowing at this moment how much the benefits and charges are for each landowner within the detail plan is an urban management asset. Knowing how much they will be by the time a given landowner will develop their plot is a 'value added'. It is a 'value added' in the sense that it stands for the plan's own dynamics, allowing for the buying and selling of plots in a transparent way – the buyer will know how much they will have to pay (in addition to the land cost) to be able to pursue their building rights.

Caring for different players' 'aspirations' can be also understood as an equity measure, especially if it allows for the maintenance of the present social network – in the sense that it doesn't force the neighbours to leave, rather it grants them the right to develop their land and make a profit. But that profit comes with a cost. You can't have one without the other.

The Sines experience that is the object of this paper does not provide a full response to all the obstacles to successful plan implementation that are identified and described herein. The (non-)availability of public funds and the lack of reliable property records, to name just two, are hurdles that are not easily overcome. However, achieving the understanding and cooperation of the stakeholders is probably the most challenging issue.

One of the main problems in achieving equitable distribution of building rights and development costs is how to measure these benefits and charges. Instead of using the 'traditional' method based on land surface and floor areas, our approach relies on translating these benefits and charges into monetary values. The use of a universal and free evaluation tool for the calculation of the market value of the proposed plan proved to be very objective and was easily accepted by both public and private stakeholders.

To improve understanding of the application of equity in land use planning and how to overcome the lack of effectiveness of the instruments provided in the Portuguese legislation for achieving it, our team is now commencing a more comprehensive research project. This project – "Equity and efficiency in the urbanization process: a land readjustment execution model" – aims to contribute to proposing a more efficient land readjustment execution model with a view to addressing the problem of the conjugation of interests in the urban development process. The methodology developed and applied in the PP Norte may be considered as a first step towards that objective.

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