Chapter 8
Assessing Urban Ecosystem Services:
Different Methodological Approaches Applied in Brazil, Germany, and Portugal

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ABSTRACT

By integrating social, ecological, and economic perspectives, the assessment of ecosystem services (ES) provides valuable information for better targeting landscape planning and governance. This chapter summarizes different participatory approaches for assessing ES in urban areas of three countries. In Belo Horizonte (Brazil), a conceptual framework for the vacant lots ES assessment is presented as an attempt to integrate landscape, social, and political dimensions. In Leipzig (Germany), a combination of site surveys, interviews, and remote sensing provides a valuable data set that fostered a comparative study between two forms of urban gardening. In Lisbon (Portugal), the study is based on interviews that offer a social insight into the horticultural parks situation, which in turn demands a better dialogue with the municipality. In general, the studies demonstrate the potential benefits of utilizing the ES assessment approaches on urban landscapes, especially for better understanding the interactions between people and nature in urban sites.

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INTRODUCTION

There is a growing recognition that the assessment of the Ecosystem Services (ES) can provide valuable information for better targeting landscape planning and governance, especially for shaping innovative adaptation strategies in the context of global environmental change (Brendan, Costanza, Turner, & Morling, 2007; de Groot, Alkemade, Braat, Hein, & Willemen, 2010; Gómez-Baggethun et al., 2013). Many authors agree that the concept of ES (designated as the benefits people obtain from nature) is currently widespread and accepted, providing a useful framework that aggregates social, ecological, and economic perspectives (Burkhard, Petrosillo, & Costanza, 2010; Gómez-Baggethun et al., 2013; Koschke, Fürst, Frank, & Makeschin, 2012; Millenium Ecosystem Assessment [MEA], 2005; Primmer et al., 2015).

Although ES offer valuable insights concerning the human and nature connections and dependencies, the concept has however remained away from the political applications (Burkhard et al., 2010). In this sense, empirical applications and tools are required for the development and improvement of the ES concept and its insertion in the decision-making process (Burkhard & Müller, 2015).

Over the past decades the assessments of ES have been favoring the biophysical and economic aspects, leaving aside the social dimension formed by the services beneficiaries and the institutions (Martín-López, Gómez-Baggethun, Garcia-Llorente, & Montes, 2014; Primmer et al., 2015). The biophysical approach involves the ecosystem services supply and demand, and it is influenced by Land Use and Land Cover (LULC) structures and processes, which change in space and time (Burkhard & Müller, 2015). The economic view comprises the monetary valuation of services varying from local to regional and global scales (de Groot et al., 2012).

More recently, the accumulated knowledge in the field has raised the need for integration, which enables the overcoming of the limitations through the incorporation of applied methods and tools to bring ES assessments closer to the political and decision-making agendas. One avenue for moving forward in the decision-making process is the insertion of the socio-cultural dimension through the utilization of participatory approaches (Bixler, Dell´Angelo, Mfune, & Rob, 2015). Participatory approaches are based on interactivity and include social interaction, mutual learning, and communication (de Montis, 2007).

In this context, attempts have been made focused on the use of participatory approaches for broadening the traditional biophysical ecosystem services perspective into a set of social and political processes (Haines-Young & Potschin, 2014; Martín-López et al., 2014; Turnpenny, Russel, & Jordan, 2014). Among the tools and methods utilized, it is possible to highlight the social surveys and interviews organized for collecting data on ecosystem services, concerning the mode in which multiple users or beneficiaries acknowledge ecosystem´s capacity to deliver services and the economic value attached to it (Martín-López et al., 2012; Martín-López et al., 2014; Haines-Young & Potschin, 2014).

For urban areas, there is a set of studies evaluating ES that have used participatory approaches. Participatory ES assessment often focuses on social processes and governance, working with city actors that interacts with urban ecosystems (Ernston, Barthel, Anderson, & Borgström, 2010). In this context, vacant lots in the cities, allotments, and community gardens are types of landscape components that provide important ecosystem services to urban communities, such as local climate and water regulation, as well as habitat provision for biodiversity. However, the ways urban dwellers perceive ES need further attention.

In this chapter, it is explored how different participatory processes have been developed in the distinct socio-cultural contexts of three countries (Brazil, Germany, and Portugal), through the ES assessment

in urban areas. The goal of the study is therefore to characterize different participatory methods that were used to appraise urban dwellers perception on spaces composed of vacant lots, allotments and community gardens.

The overall chapter structure includes a literature review on participatory approaches and on how those participative methods have been developed for assessing ES in urban areas and, a presentation of case studies comprising participatory approaches for assessing ES in urban sites. The first case study addresses the public preferences for land cover (a feature associated with ES) in vacant lots in the city of Belo Horizonte, Brazil. It is followed by the assessment of ES in two different types of urban gardens, namely allotments and community gardens, in the city of Leipzig, in Germany. The third case illustrates the issues involved in the management of community gardens in Lisbon, Portugal. The discussion and conclusion presented at the end, summarize and offer reflections on the use of participatory approaches for assessing ES in urban areas.

PARTICIPATORY METHODS FOR URBAN ECOSYSTEM SERVICES ASSESSMENT

Although traditionally associated with rural development, participatory approaches have become popular as a tool for governance in urban areas (Mitlin & Thompson, 1995). The utilization of participatory methods in urban environments has been viewed as a suited approach for designing neighborhoods, promoting more than a formal consultation, as much as it fosters dialogues and interactions between actors (users, experts, decision makers) throughout the whole planning and governance processes (Montreal Urban Ecology Centre [MUEC], 2015). Participatory tools and methodologies are flexible and focused on the processes aiming at enabling local people to get dominance over the development process and governance (Mitlin & Thompson, 1995).

The participative policy processes normally involve a three-stage cycle composed of planning, implementation, and evaluation. Participatory approaches can be utilized in some or all of those phases (Elliot, Heesterbeek, Lukensmeyer, & Slocum, 2005). It is particularly important to consider that participation shall not be imposed but rather developed through dialogues and joint analysis among the various stakeholders (Mitlin & Thompson, 1994).

Participatory approaches integrate local people in exchange and discussions on resource distribution and control. This has the purpose of increasing awareness about key actors and groups involved; improving information concerning local conditions; enabling local people to recognize limitations, establish priorities and take initiative; and empowering local organizations and developing mechanisms to solve local conflicts (Mitlin & Thompson, 1995).

Elliot et al. (2005) synthesized the participatory methods in four groups according to the motivations and outputs desired: democratization, advising, mapping out diversity and reaching consensus. In the case of the democratization, the objective of using participatory methods is to capacitate participants to use their knowledge to generate their options, so that they can exert influence in the decision-making process. The advising perspective has the goal to expose stakeholder´s values, impressions and opinions pertinent or as a support to the decision-making process. Mapping out diversity has the objective to generate a range of information and choices allowing a group to reveal one sort of knowledge explicitly. The reaching consensus allows a group to get to a single agreement on a subject.

According to Drumond, Giovanetti, & Guimarães (2009), different methods and tools can be used to search information, to get insights, to scan problems, to plan jointly, to evaluate processes and to mobilize communities. The authors indicated a set of participatory methods and tools available for assessing, analyzing, facilitating, and coordinating the participative process comprising: brainstorming, semi-structured interviews, participative mapping, Venn diagram, crosswalks, seasonal calendar, daily routine or clock of activities, historic diagram, matrix, flux diagrams or problem tree, line of ideas, and SWOT analysis. Those methods are summarized in a comparative frame for participatory assessments presented next (Table 1).

Some other participatory approaches combine methods and tools such as interviews, mapping, and scenarios development (Villamor, Palomo, Santiago, Oteros-Rosa, & Hill, 2014). Mapping and scenarios building are promising tools for the ecosystem assessment with the public participation. Ecosystem services mapping facilitates incorporation into policies and decision-making as far as maps promote interpretation through visualization and synthesize complex information (Maes et al., 2012; Troy & Wilson, 2006). Scenario construction is an integrative and interdisciplinary framework that provides an examination of the ecosystem services spatial and temporal dimensions (Syrbe, Rosenberg, & Vowinckel, 2015). Using this tool, one can indicate desirable future changes and landscapes transformations for the improvement of the ecosystem services provision (Rosenberg, Syrbe, Vowinckel, & Walz, 2014).

CONCEPTUAL FRAMEWORK FOR BELO HORIZONTE´S VACANT LOTS ECOSYSTEM SERVICES ASSESSMENT

The participatory methodology under development for the vacant lots in Brazil has the purpose to outline a set of future scenarios and subsidize the design of politics, programs and strategies for a better urban sustainability (Carvalho-Ribeiro, Lovett, & O'Riordan, 2010; Carvalho-Ribeiro & Lovett, 2011; Carvalho-Ribeiro, Migliozzi, Incerti, & Pinto Correia, 2013a; Carvalho-Ribeiro et al., 2013b; van Berkel, Carvalho-Ribeiro, Verburg, & Lovett, 2011). The choice on participatory scenarios development relates to the fact that it can foster a social appreciation of the results, which helps in implementations and contributes to educational effects for the participants (Syrbe et al., 2015).

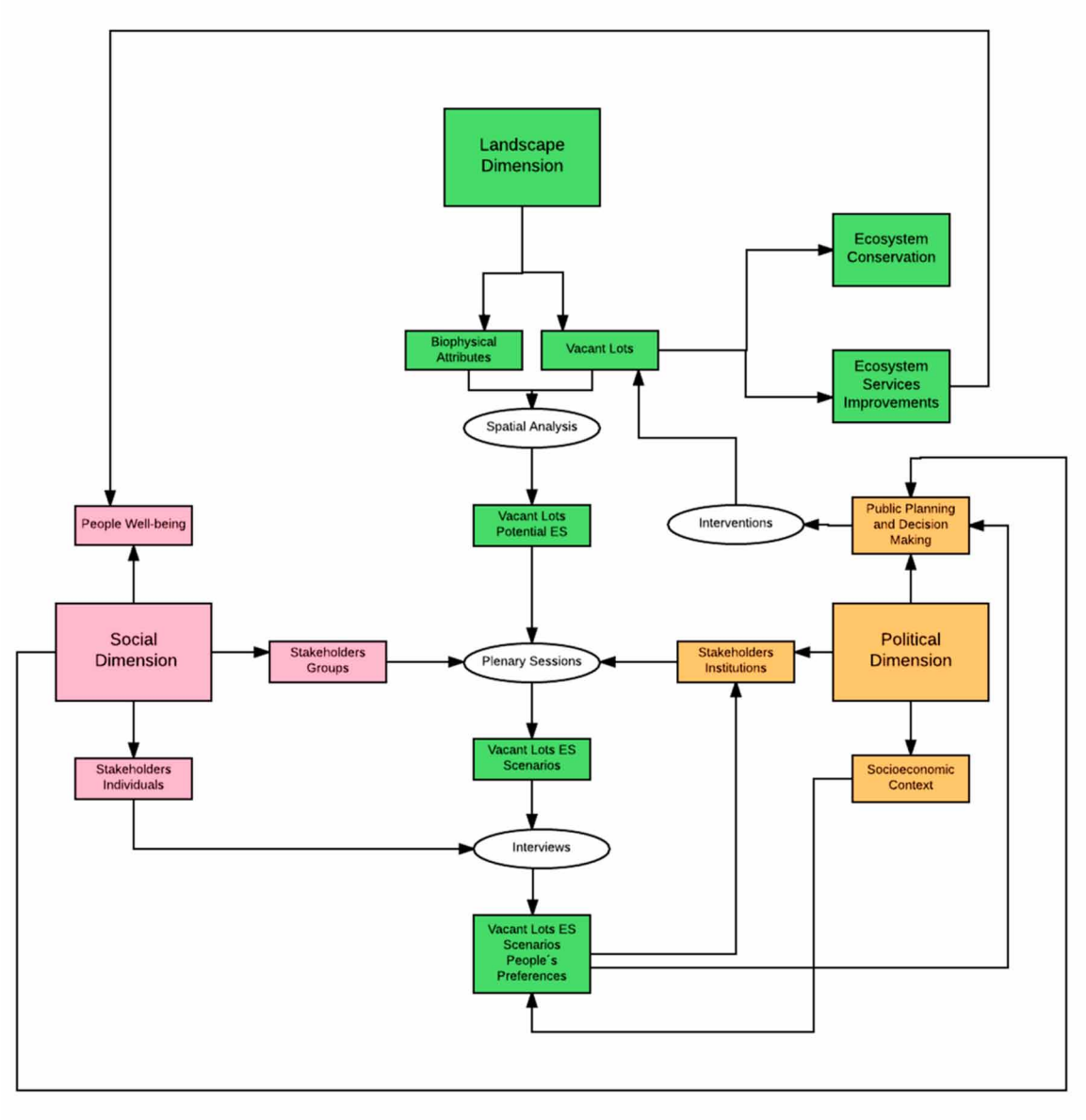
The vacant lots ecosystem services assessment in the city of Belo Horizonte has encompassed a conceptual framework guided by the utilization of different tools and methodological approaches. To this end, it seeks to characterize the landscape dimension and ecological attributes of the vacant lots and integrate them with the social, political and economic contexts. The assessments include spatial and socioecological aspects, potential ecosystem services mapping based on the Geographic Information Systems (GIS) utilization and the adoption of a participatory approach for the generation of ecosystem services scenarios in the city.

The framework delineated is, therefore, an attempt to integrate the landscape dimension - through the biophysical attributes and vacant lots - with the social and political ones (Figure 1). A similar approach was presented by de Groot, Alkemade, Braat, Hein, & Willemen (2010) aiming at integrating ecosystem services assessment, planning, and management. In that approach, it was indicated as an initial step the landscape and ecosystems characterization with the definition of the functions, including goods and services. That coincides with the present vacant lot´s ecosystem services assessment framework that begins with the study of the biological and physical characteristics of the generation of the vacant lots potential ecosystem services. The biological component is represented mainly by the vegetation land

Table 1. Comparative frame of participatory methods and tools (Drumond et al., 2009).

Methods/Tools	Objectives	What for?
Brainstorming	To stimulate participants to express their point of view on a topic.	For assessing opinions on topics such as the effectiveness of the participatory process; planning, monitoring and process evaluation.
Semi-structured interviews	To discuss openly and informally through conversations with individuals or small groups specific issues and important facts for the project.	For the diagnosis phase, when information can be obtained from the various stakeholders; useful for building trust.
Participatory mapping	To visualize features and issues spatially, such as natural resources, infrastructure, LULC; to obtain clearly the participant perception of the environment.	For discussing environmental aspects and social issues in a geographically explicit manner; to take advantage of the use of maps, that synthesize complex information through visualization and interpretation.
Venn diagram	To get to know the different formal or informal stakeholders and groups and their participation on the evaluated topic.	For monitoring and evaluation phases; enables to examine the possibilities of participation and acting of each one of the actors and institutions.
Crosswalks	To explore the spatial characteristics of the study area; the work team and participants walk through the area to get to know the soils, production systems, vegetation, infrastructure, water resources, and other relevant aspects.	For the investigation, monitoring and evaluation phases; allows the generation of detailed environmental profiles; important for the discussion and promotion of reflexive activities on the conservation and use of the natural and sociocultural assets.
Seasonal calendar	To broaden the knowledge on the variation of environmental phenomena during the year (rains, floods), on the utilization of natural resources (hunting, fishing, vegetable extractivism); on the plant cultivation (planting and harvesting); on the cultural ceremonies (popular parties, religious ceremonies) and other local life´s aspects.	For the investigation and monitoring phases; allows generating information on the seasonal variation of the constraints and opportunities.
Clock of activities	To clarify the performance of the day to day tasks; the differences among men and women's routine; the differences among different social classes routine; the time availability for performing other tasks.	For the investigation and monitoring phases; used to understand the activities routine relevant in processes of searching economic alternatives as a means for improving life quality and for reducing pressure on natural resources.
Historic diagram	To understand the temporal shifts concerning the land use, population, pollution levels, vegetation cover, natural resources availability, land tenure, etc.	Indicated for the investigation and monitoring phases; it helps in the understanding of the present situation through the knowledge of the community history and of the causes that might have led to the situation in the present.
Matrix	To stimulate the reasoning on the importance of the topics and themes according to a sequence.	For the investigation, planning, monitoring, and evaluation phases; allows organizing priorities and criteria according to its importance.
Flux diagrams	To assess the interrelations among the various elements for the identification of the problems´ effects and causes, as well as of the potential solutions and actions.	For the investigation, systematization, planning and monitoring phases; allows the construction of cause and effect problem-oriented diagram constituting a simple and easy-to-use tool.
Line of ideas	To present and discuss the results of a project in a systematic way.	For the systematization and problems organization; for the discussion of the positive and negative aspects of an issue.
SWOT analysis	To systematize people´s opinion on the strengthens and opportunities, as well as on the weakness and threats of a topic.	For the investigation, planning, monitoring and evaluation phases; it is a powerful instrument for monitoring and evaluating implemented actions, for the identification of new projects to be implemented and for the work performance evaluation.

Figure 1. Conceptual framework for the Belo Horizonte´s vacant lots ecosystem services assessment



cover which is one the greatest determinants of the type and amount of ecosystem services (Burkhard et al., 2012). The physical, LULC factors or biophysical attributes are then coupled with the utilization of a spatially explicit multicriteria analysis, through the features overlapping.

The cooperation of the stakeholders starts with the generation of the vacant lots potential ecosystem services map. Before that, it will be verified all the groups and actors to participate. Then, plenary sessions will occur, aiming at the building of the scenarios with vacant lots ecosystem services. Maps discussion and (re)construction will take place during the plenary meetings and workshops. Scenario workshops are indicated to interdisciplinary and social issues, involving choices on different situations and exchanges

among professionals and locals. The urban sustainability is, therefore, a perfect subject for using the scenarios approach, given its transdisciplinary nature and various stakeholders involved (Street, 1997).

The vacant lots ecosystem services scenarios generated will be incorporated next into questionnaires to be utilized in the surveys and interviews to assess the individual's preferences over the city ecosystem services scenarios. This phase comprises, besides the semi-structured questionnaires building and ethics license acquisition, information gathering over the city populations characteristics, statistics for participants number definition, as well as segmentation of the population into categories regarding gender, age, education, income, and origin.

At the later stage, after conducting the interviews, it will be used ecological, economic valuation methods, but not for the monetary valuation of the ecosystem services itself, but rather for understanding what is there beyond the people´s preferences and choices. For that, the choice modeling approach, from the ecological economics revealed preferences methods, will be utilized. This approach agrees with Martín-López et al. (2012) that highlighted the need of addressing ecosystem services from the perspective of human outlooks and values to understand the implicit motivations for the social preferences on ecosystem services.

The choices will be confronted with the socioeconomic contexts of the respondents for checking if there is a correlation between those characteristics and the people´s preferences.

The generated information will be made available in the political dimension domain to be incorporated in the planning process, normalization and placed into financial mechanisms, to work as a landscape and ecosystem instrument, for the incorporation of those considered needed interventions for the vacant lots. Those interventions aim at ecosystem services improvements and ecosystem conservation, that can, in turn, be converted in human well-being.

It is important to emphasize that the scenarios developed during the process will have a spatial representation, be open to changes and modifications. Thus, the results generated are not intended to be definitive, but to provide a basis for discussions and orientations on how things might be.

Case Study 1: Vacant Lots and Ecosystem Services in Belo Horizonte, Brazil—People´s Opinion in Two Distinct Income´s Context

Introduction

Socioeconomic factors are important determinants of urban ecosystems conservation (Swan, Pickett, Szlavecz, Warren, & Willey, 2011). Economic components such as family income can influence issues related to that, such as plant diversity patterns in urban landscapes, that may respond positively to income´s increase (Hope et al., 2003).

The income factor is usually used in the economic literature as a representation of human well-being, considering that it increases the ability to consume goods and services (Vemuri, Grove, Wilson, & Burch Jr., 2011). Beyond that, human well-being is composed by elements such as security, basic material for a good life, health, good social relations, freedom, and choice, that expresses not only what a person values, but also a collective experience (McMichael et al., 2005).

The human well-being components rely on a great extent on ES and the links among them bring about concerns regarding the inequity of their distribution in space, which calls for the adoption of approaches that integrate the ecological, social, and economic aspects. The incorporation of the ES interests and

benefits of the groups affected can offer insights into the options in the present and those that will be accessible to future generations (McMichael et al., 2005).

In the present study case, it was verified the variations of people´s views on vacant lots, their characteristics regarding land cover, ES associated and multiple uses, in two different economic contexts.

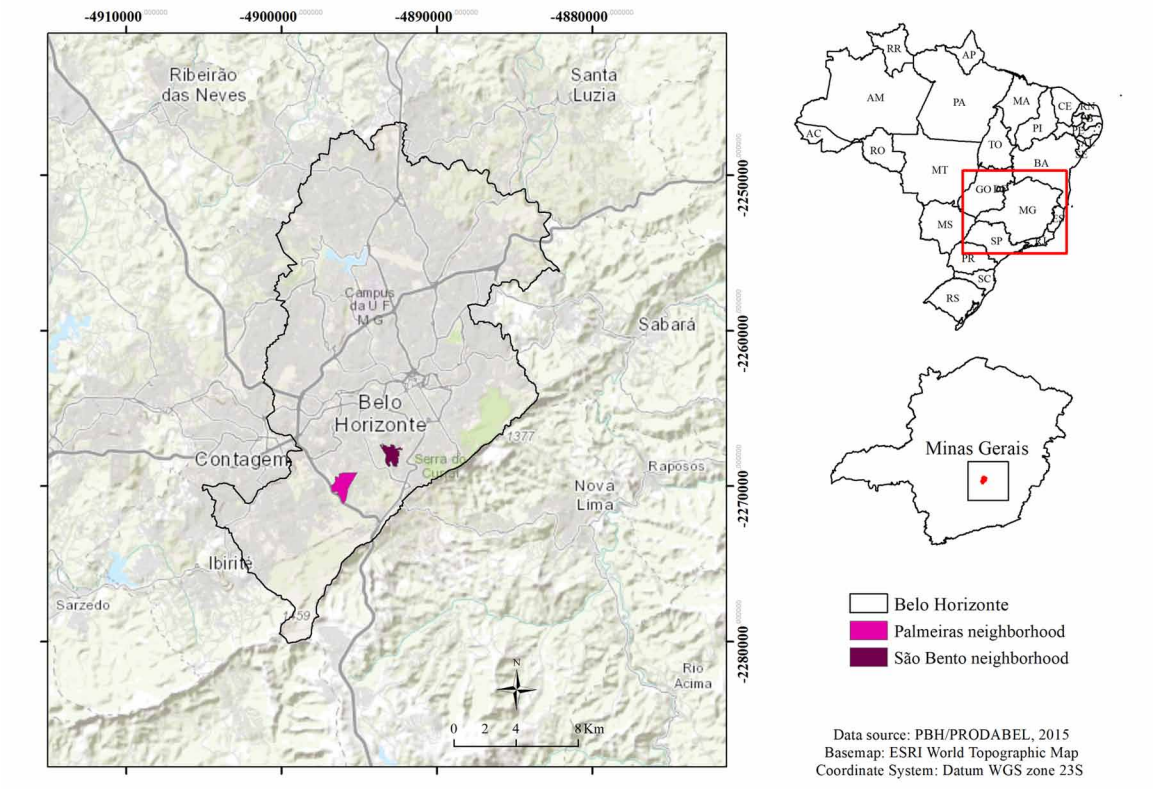
Methodology

The two neighborhoods evaluated - Palmeiras and São Bento - are located in Belo Horizonte county (Figure 2) where it is evidenced, as in other Brazilian cities, socio-spatial inequalities with segregated spaces for the poor and rich (Costa & Mendonça, 2010).

The São Bento is an upper-middle-class neighborhood comprised of 3947 inhabitants, and the average family income is around 1000 euros, according to the last Brazilian official census, in the year 2010 (Instituto Brasileiro de Geografia e Estatística, 2010). Palmeiras is a popular middle-class neighborhood comprising around 5339 people and family income about 220 euros; the census year is 2010. Both are composed predominantly of houses, instead of buildings with apartments, and were founded during the 1960 – 1970´s decades.

The methodological approach used for assessing peoples' opinion on vacant lots and ES comprised face to face interviews applied to local dwellers, using a semi-structured questionnaire. A total of 80 interviews equally distributed among the two neighborhoods were undertaken.

Figure 2. Study area location



The questionnaire was structured into three topics concerning the following themes: a) vacant lots definitions and associations; b) land cover types preferences for a hypothetical vacant lot neighbor; c) the reasons for preferences on land cover types of neighbor's vacant lot; d) multiple uses and ES options for the vacant lots.

In the case of the land cover types preferences, images of the vacant lots situation in the neighborhoods were used, comprising the three more common land covers types in both areas: trees/woods; grasses/ low vegetation and bare soil (Figures 3 and 4).

The answers from the questionnaires were organized and grouped into frequencies classes. The statistical Z-test was performed for verifying the significance of the differences in the answers frequencies for the land cover types preferences.

To contextualize the vacant lots in terms of distribution and size, maps made available by the municipal administration (PBH/PRODABEL) were processed in the GIS environment.

Figure 3. Sights used to illustrate for people´s selection of the three vacant lots land cover types in the São Bento's neighborhood: left - trees/woods; center - grasses/low vegetation and right - bare soil (Source: Google Earth Image – 2016)

Figure 4. Sights used to illustrate for people´s selection of the three vacant lots land cover types in the Palmeira's neighborhood: left - trees/woods; center - grasses/low vegetation and right - bare soil (Source: Google Earth Image – 2016)

Results and Discussion

In general, both neighborhoods have similar characteristics about the quantity and size of the vacant lots (Table 2). The São Bento neighborhood congregated 148 vacant lots and the Palmeiras area 88 plots. São Bento presented the largest vacant lot (11250m^2) and a higher average and medium size. The bigger plot of land found in the Palmeiras area totalized 5863m^2.

The São Bento neighborhood is one of the most recent populated in the city. The settlement began from 1960 to 1970, when the rural aspects of the regions changed by the creation of big avenues. The recent foundation may explain the occurrence of large vacant lots in that neighborhood. The Palmeiras area was also occupied from the 1970s when it still had rural characteristics. The pressure from the surroundings has determined a fast growing of the neighborhood and the reduction of the vacant lots (Arreguy & Ribeiro, 2008).

The São Bento territory comprises a total area of 0,97 km^2. Most vacant lots (113) are distributed in the size class ranging from 407m^2 to 545m^2. The distribution of the plots among the other classes consists: 322-407 (11); 545-900 (21); 900-2040 (2); 2040-11250 (1) (Figure 5).

The Palmeiras region sums up around 1,4 km^2 presenting vacant lots majority (43) distributed in the size class ranging from 442m^2 to 609m^2. The other size distribution classes are: 312-442 (19); 609-1461 (23); 1461-3156 (1); 3156-5863 (2) (Figure 6).

In both neighborhoods, the respondents defined the vacant lots first as a place without construction (Figure 7). The abandonment was also highlighted as an important feature, expressed through the carelessness, compounding those plots commonly a wasteland. Related to that, dirtiness was pointed out as a usual component of those plots. Some people reported their frequent conversion in places for waste disposal. The lack of use was also referred as a means of definition of those landscape elements.

Insecurity generated by the presence of outsiders (marginals, drug addicts, and thieves) in the vacant lots was mentioned more often by the respondents from the São Bento area. The presence of bush and animals (insects, rats, etc.) was cited a little more by the Palmeiras dwellers. The referred bush vegetation is mainly comprised of an invasive tall grass species (*Panicum maximum*).

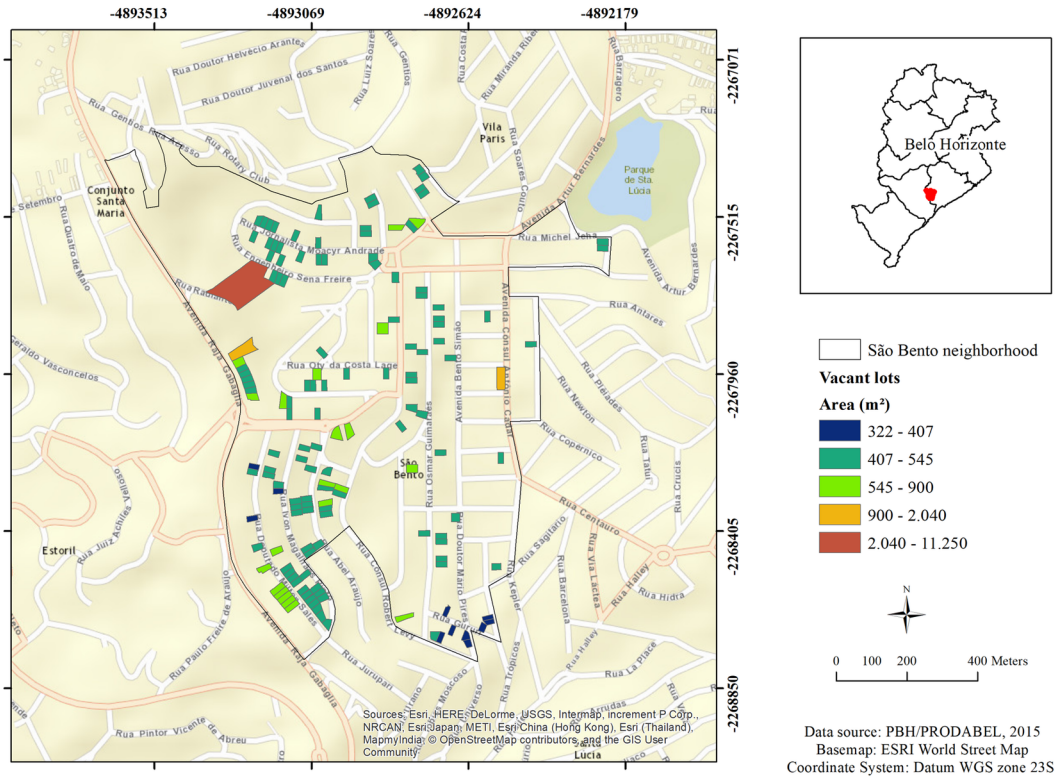
The association of the vacant lots with diseases relates mainly to the dengue and chikungunya fevers recent epidemics, functioning the plots as diseases outbreaks.

Some people from São Bento associated the vacant lots with investment (business opportunity or sells) and inheritance process (which keeps the plot idle while the process is in progress). Divestment was stated by a few people of Palmeiras region. For them, in some cases the plots´ owners refuse to sell,

Table 2. Vacant lots general characteristics in the São Bento and Palmeiras neighborhoods.

São Bento Neighborhood		**Palmeiras Neighborhood**	
Number of vacant lots	148	Number of vacant lots	88
Mean Area (m^2)	571	Mean Area (m^2)	686
Median Area (m^2)	457	Median Area (m^2)	512
Standard Deviation (m^2)	896	Standard Deviation (m^2)	780
Minimum Area (m^2)	322	Minimum Area (m^2)	312
Maximum Area (m^2)	11250	Maximum Area (m^2)	5863

Figure 5. Vacant lots distribution according to size, in the São Bento area (Source: PBH/PRODABEL, 2015)



to construct or to give it a proper use, considering their wealth and their condition of living outside the neighborhood.

Some people associated the vacant lots with the presence of a physical delimitation (walls, fences), a most common condition currently, whereas others with its absence, a situation prevalent in the past.

The respondent's preferences on the land cover types of a hypothetical vacant lot neighbor to their house were significant different for the trees/woods cover (60% of the people preferred this cover type in São Bento neighborhood and 40% in the Palmeiras area) and for the bare soil cover (17,5% of the people preferred this cover type in the São Bento area and 35,0% in Palmeiras neighborhood). Grasses/ low vegetation cover had similar preferences frequencies for the two neighborhoods (Table 3).

The reasons pointed out for the preferences on the land cover type trees/woods revealed the people´s knowledge, concerns, and appreciation of a cluster of ES. A great emphasis was placed, in both neighborhoods, on the regulation service of air purification (Figures 8 and 9).

For the São Bento area heat alleviation, another regulation ecosystem service, and aesthetic beauty, an immaterial cultural benefit from the ecosystems, were indicated as major reasons for having woods nearby (Figure 8). Another regulation service associated with the trees/woods land cover for the São Bento´s was the soil protection provided by the vegetation. Ecosystems services of support and habitat were also mentioned such as fauna habitat and bird's attraction.

Figure 6. Vacant lots distribution according to size, in the Palmeiras´ area (Source: PBH/PRODABEL, 2015)

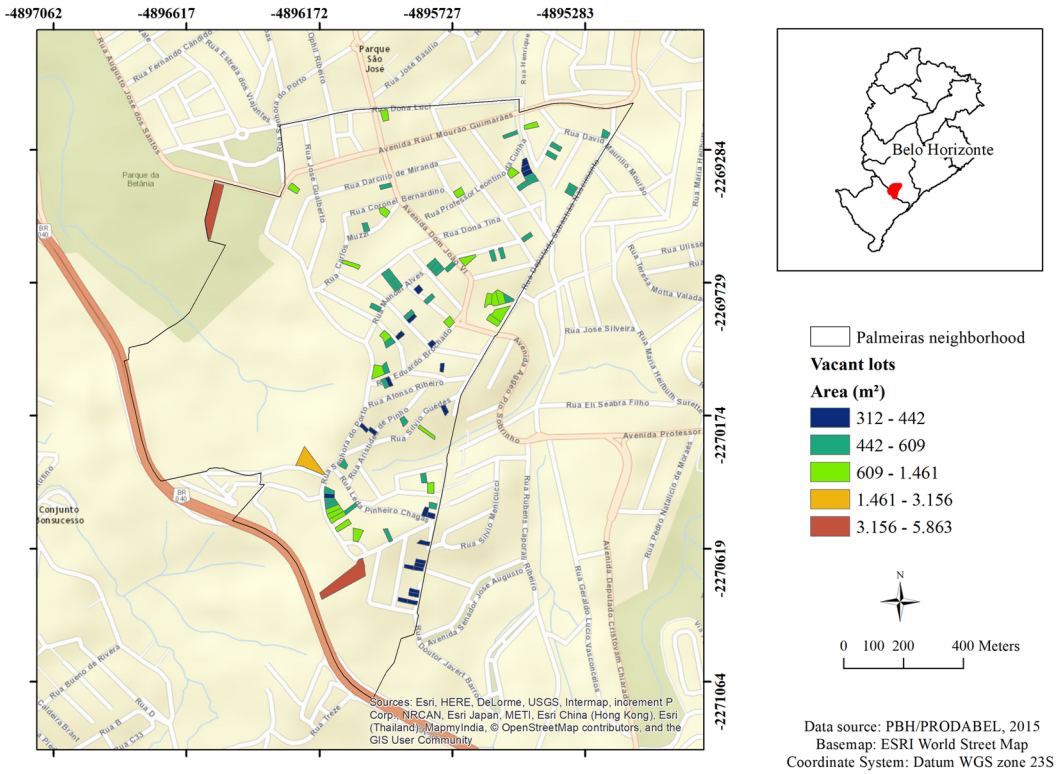


Figure 7. Vacant lots definition according to the people´s opinion in the two neighborhoods

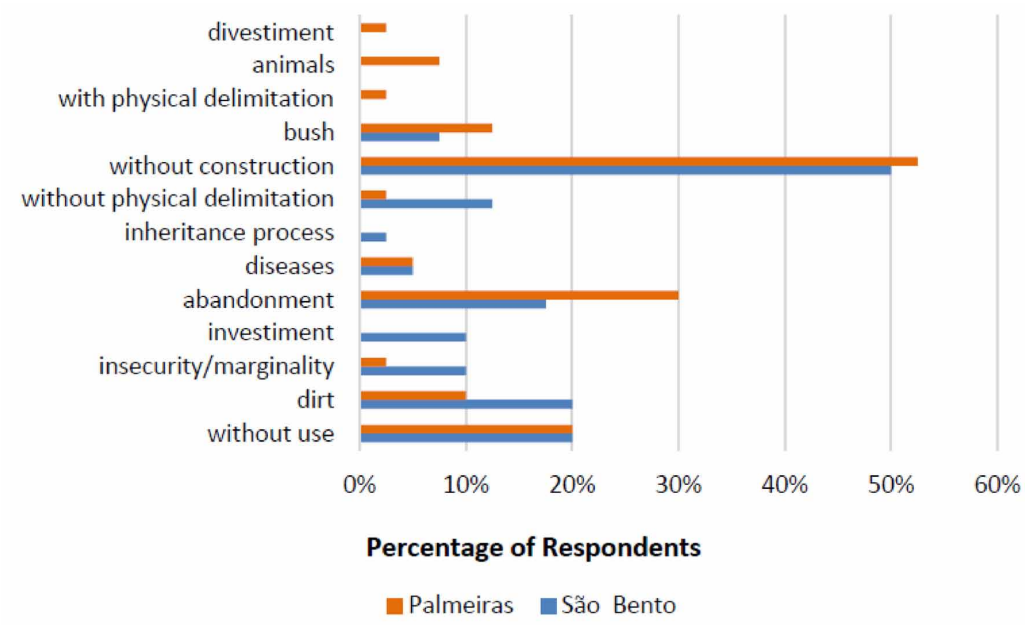
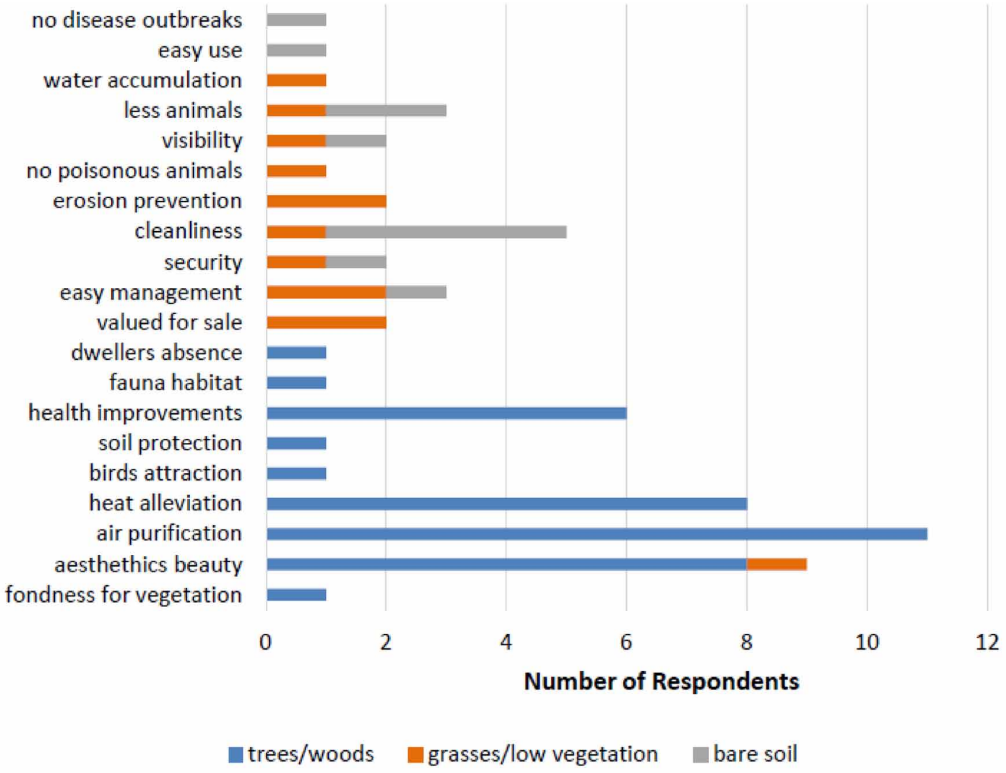


*Table 3. People´s preferences on land cover types of neighbor's vacant lot, in the São Bento and Palmeiras areas (*Z˃1,282 significant at p = 0,10; Z˃ 1,960 significant at p = 0,05)*

Land cover types	São Bento	Palmeiras	Z test
Trees/woods	60,0	40,0	**1,83***
Grasses/low vegetation	22,5	25,0	0,26
Bare soil	17,5	35,0	**1,81***
Total	100,0	100,0	-

Figure 8. People´s reasons for preferences on land cover types of neighbor's vacant lot, in the São Bento area



Other positive features and appreciation associated with the trees/woods cover for the São Bento´s were: health improvements, dwellers absence, and fondness for vegetation.

The land cover type grasses/low vegetation was given preference by some respondents in São Bento mainly due to its easy management and all the facilities to care and to maintain. Erosion prevention was a regulation ES associated with this cover type. The plots with grasses/low vegetation were also considered most valuable to sell since they are probably more attractive for having lower costs for removing the plot´s vegetation, for example. Security was also a positive feature pointed out for this cover considering that it offers fewer conditions for hiding criminals. The visibility, another reason for the respondent's choices on this cover favors, according to them, not only the security against fringe but also from animals.

Other positive characteristics pointed out by the respondents comprised: cleanliness, fewer animals, no poisonous animals, less water accumulation, aesthetic beauty.

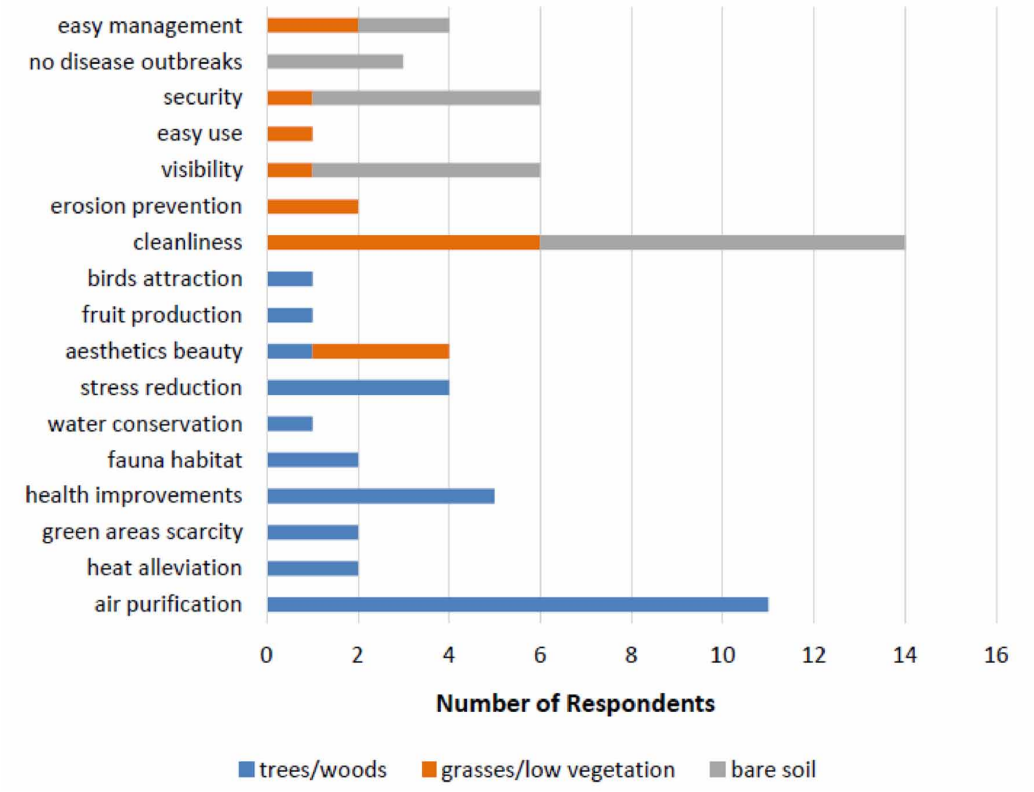
The bare soil land cover type was considered as a better choice for a neighbor for fewer informants in São Bento´s mostly for its cleanliness, providing more security, visibility, fewer animals, easy use, easy management and no disease outbreaks.

For the Palmeiras neighborhood besides air purification, the land cover type trees/woods was selected as a choice for neighbor given the possibility of bringing stress reduction from the city pace as well as health improvements (Figure 9). Other ES related by the informants to this land cover type were: heat alleviation, fauna habitat, bird's attraction, water conservation, and fruit production. The increasing scarcity of green areas in the neighborhood was also considered for some as a reason for having this cover close by.

The main reason for the choice of the land cover type grasses/low vegetation in Palmeiras was the cleanliness, in contrast with the bush vegetation (tall grasses) that is usually seen as dirt. The other characteristics pointed out were similar to São Bento´s including easy management, erosion prevention, visibility, security and easy use. The cultural ecosystem benefit aesthetics beauty was higher for this land cover than for the tree/woods one, in Palmeiras area.

Just like the São Bento area, the reasons for choosing the bare soil land cover type in Palmeiras neighborhood was mostly related to its cleanliness, security, visibility, easy management and no disease outbreaks.

Figure 9. People´s reasons for preferences on land cover types of neighbor's vacant lot, in the Palmeiras area



Relatively to the selection of options for the vacant lots multiple uses and functions, the four uses indicated primarily for the first, second and third options in the two neighborhoods were very resembling (Figure 10).

The most mentioned preferences for the vacant lots use in the two neighborhoods were to preserve a green area, construct a house, build a backyard orchard, build a vegetable garden, plant a garden and build something commercial. The choices to preserve a green area and to build a backyard orchard appeared among the most selected in both areas for the first, second and third options (Tables 4 and 5).

In the São Bento area, the first options comprised mainly: preserve a green area (GA), a preference for 32,5% of the people; construct house (CH), a better choice for 32,5% of the respondents; build a backyard orchard (BO) with 7,5% of the preferences and build a vegetable garden (VG), also with 7,5% of the answers (Table 4).

For the Palmeiras neighborhood the highlights from the first options were: preserve a green area (GA), congregating 27,5% of the respondents; construct house (CH), totaling 22,5% of the answers; build a backyard orchard (BO), with 15,0% of the preferences and build something commercial (BC), with 12,5% of the selection (Table 5).

About the definition of the vacant lots it is important to mention that there is not only one and different plots characteristics may include: open or closed spaces, undisturbed sites, abandoned land, plots contaminated, with bare soil, undeveloped land, abandoned sites with construction and infrastructure traces, land with physical limitation for development, areas utilized for parking, and others (Kremer, Hamstead, & MacPhearson, 2013; McPhearson, Kremer, & Hamstead, 2013; Pagano & Bowman, 2011). The plots are usually seen as a social, economic, environmental or aesthetical problem being symbols of decadence, degradation, and negligence (Kim, 2016)

Figure 10. People´s options for the vacant lots multiple uses and ecosystem services in the two neighborhoods. Abbreviations: CA- construct apartment building; CH - construct house; BC - build something commercial; GA - preserve a green area; HE - heat alleviation; FS - favor shading; BO - build a backyard orchard; VG - build a vegetable garden; RR - rainwater retention; BP - build a parking; BPG - build a backyard with pool and grill; PR - air pollution reduction; SE - prevent soil erosion; PG - plant a garden; DN - donation

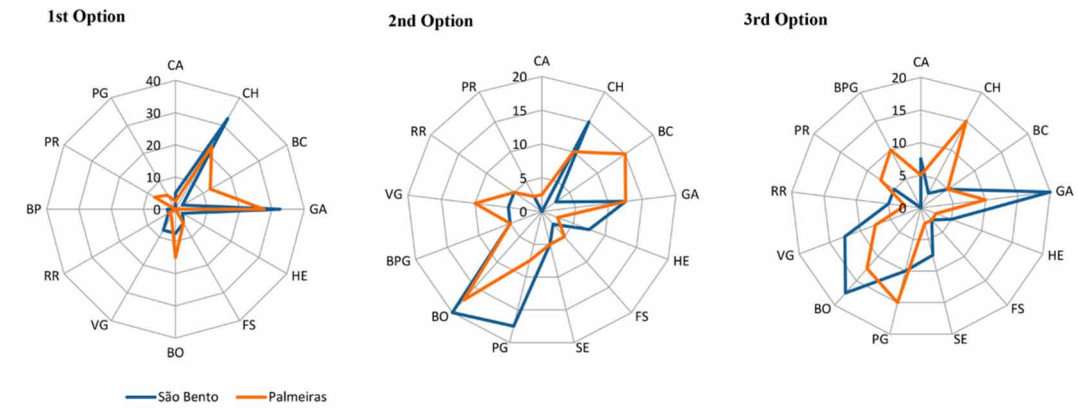


Table 4. People´s preferences percentages for the multiple uses and ecosystem services in the São Bento neighborhood.

First options		Second options		Third options	
Uses	**Pref (%)**	**Uses**	**Pref (%)**	**Uses**	**Pref (%)**
preserve a green area	32,5	build a backyard orchard	20,0	preserve a green area	20,0
construct house	32,5	plant a garden	17,5	build a backyard orchard	17,5
build a backyard orchard	7,5	construct house	15,0	build a vegetable garden	12,5
build a vegetable garden	7,5	preserve a green area	12,5	plant a garden	10,0
construct apartment building	5,0	heat alleviation	7,5	construct apartment building	7,5
favor shading	5,0	prevent soil erosion	5,0	prevent soil erosion	7,5
build a parking	2,5	build a backyard with pool and grill	5,0	build something commercial	5,0
build something commercial	2,5	build a vegetable garden	5,0	heat alleviation	5,0
heat alleviation	2,5	rainwater retention	5,0	rainwater retention	5,0
rainwater retention	2,5	build something commercial	2,5	air pollution reduction	5,0
-	-	favor shading	2,5	construct house	2,5
-	-	air pollution reduction	2,5	favor shading	2,5
Total	100,0	-	100,0	-	100,0

Table 5. People´s preferences percentages for the multiple uses and ecosystem services in the Palmeiras neighborhood.

First options		Second options		Third options	
Uses	**Pref (%)**	**Uses**	**Pref (%)**	**Uses**	**Pref (%)**
preserve a green area	27,5	build a backyard orchard	17,5	construct house	15,0
construct house	22,5	build something commercial	15,0	plant a garden	15,0
build a backyard orchard	15,0	preserve a green area	12,5	build a backyard orchard	12,5
build something commercial	12,5	construct house	10,0	preserve a green area	10,0
air pollution reduction	7,5	build a vegetable garden	10,0	build a backyard with pool and grill	10,0
plant a garden	5,0	plant a garden	7,5	build a vegetable garden	7,5
construct apartment building	2,5	favor shading	5,0	air pollution reduction	7,5
favor shading	2,5	prevent soil erosion	5,0	construct apartment building	5,0
build a vegetable garden	2,5	build a backyard with pool and grill	5,0	build something commercial	5,0
rainwater retention	2,5	rainwater retention	5,0	heat alleviation	2,5
-	-	construct apartment building	2,5	favor shading	2,5
-	-	heat alleviation	2,5	prevent soil erosion	2,5
-	-	air pollution reduction	2,5	rainwater retention	2,5
-	-	-	-	donation	2,5
Total	100,0	-	100,0	-	100,0

The answers provided by the respondents from the São Bento and Palmeiras neighborhoods broaden the definitions above adding some peculiarities to the already known characteristics of the vacant lots, although most of them associated with unfavorable images of those landscape components.

In general, there were more similarities then contradictions among the answers and opinions of the respondents of the two neighborhoods, but some distinctions are feasible to present. For the assessment undertaken there was a greater preference in São Bento for the land cover type trees/woods that provides a greater spectrum of ES. The land cover bare soil was most preferred in Palmeiras area.

In the Palmeiras neighborhood, there seems to be an interest in the immediate use of the vacant lots which may explain the preference on bare soil as a land cover type, that is ready to be built without expenses on taking off the vegetation.

The fact that the choice "build something commercial" appeared among the first preferred ones for the first and second uses options coupled with "construct house" that came out in all the options can corroborate to that. In São Bento, more ecological uses replaced those choices in the first positions, such as "build a vegetable garden" or "plant a garden." Considering that Palmeiras is a neighborhood with the lower income it is reasonable to think that there is an interest in producing and improving this condition through investing in something commercial.

The option for constructing apartments building was not selected among the primary ones in both areas though in São Bento neighborhood it has shown closer to the first choices. As mentioned previously both neighborhoods are dominated by houses what seems to please the dwellers, although in Palmeiras the buildings from the neighbor Buritis area are increasingly close.

Some authors argued that despite income, environmental quality issues are concerns for both wealthy, popular or poor urban residents (Pickett at al., 2008). In the present study case, the fact that many respondents from both areas could point out some ES provided by the trees/woods cover reveals the dweller´s knowledge and appreciation of ecological features. The most recognized ecosystem services in the studied urban areas comprised: air purification, aesthetic beauty, heat alleviation, health improvements, stress reduction, fauna habitat, birds attraction, water conservation, soil protection and fruit production.

ASSESSING ECOSYSTEM SERVICES AND GOVERNANCE IN URBAN GARDENS

Allotment gardens are recognized for their contribution to provisioning and regulating ecosystem services (ES) (Borysiak, Mizgajski, & Speak, 2016; Speak, Mizgajski, & Borysiak, 2015). Community gardens, on the other hand, are often recognized for providing several cultural services (Rall & Haase, 2011). This opposition is rarely compared in studies (Cabral, Costa, Bonn, & Weiland, 2017; Cabral & Weiland, 2016). A comparative study of this nature can support governance strategies, by setting out how each garden complements the other one functions. In fact, allotment gardens are primarily top-down initiatives, and community gardens are bottom-up ones, promoting therefore different levels of governance (Cabral & Weiland, 2016). The assessment of Leipzig`s urban gardens presented next (Case Study 2) intends to appraise the allotment and community gardens ES contribution as well as people´s ecological knowledge on them, in a city that has one of the highest ratio of gardening area per capita in Europe, as well as a very high number of urban voids, turned into community gardens. As for Lisbon (Case Study 3), the assessment is primarily based on a sociological approach, although the city has promoted urban gardens to increase ES in a compact city, according to the Green Plan Strategy of 2010.

Case Study 2: Assessment of Urban Gardens in Leipzig, Germany

Introduction

Leipzig has been an important trade city in central Europe for several centuries. For 40 years it was also part of German Democratic Republic (GDR). The city is located in a floodplain and features an extensive forest in the heart of the city (Figure 11) which has been a source of wood and hunting species for more than 500 years (Strohbach, Haase, & Kabisch, 2009)

Currently, the city has around 570.000 inhabitants. From 1930 to 2010, Leipzig lost almost one-third of its population due to several economic crises and political changes (Strohbach et al., 2009). After 2010, the economic recovery has resulted in demographic regrowth, while Leipzig still has to cope with large urban voids.

The city is the birthplace of the *Schrebergärten* movement since the first allotment gardens or *Schrebergärten* were created during the Industrial Revolution as a means to mitigate poverty, malnutrition and health problems among kids and factory workers. These *Shrebergärten* estates (now called *Kleingärten*-KG) are usually larger than one hectare and include more than 100 plots or parcels (Figure 12a). The estate usually provides space for a children playground (Figure 12b) and a clubhouse. Each *Kleingärten*

Figure 11. Location of study area (credit: Christian Langer)

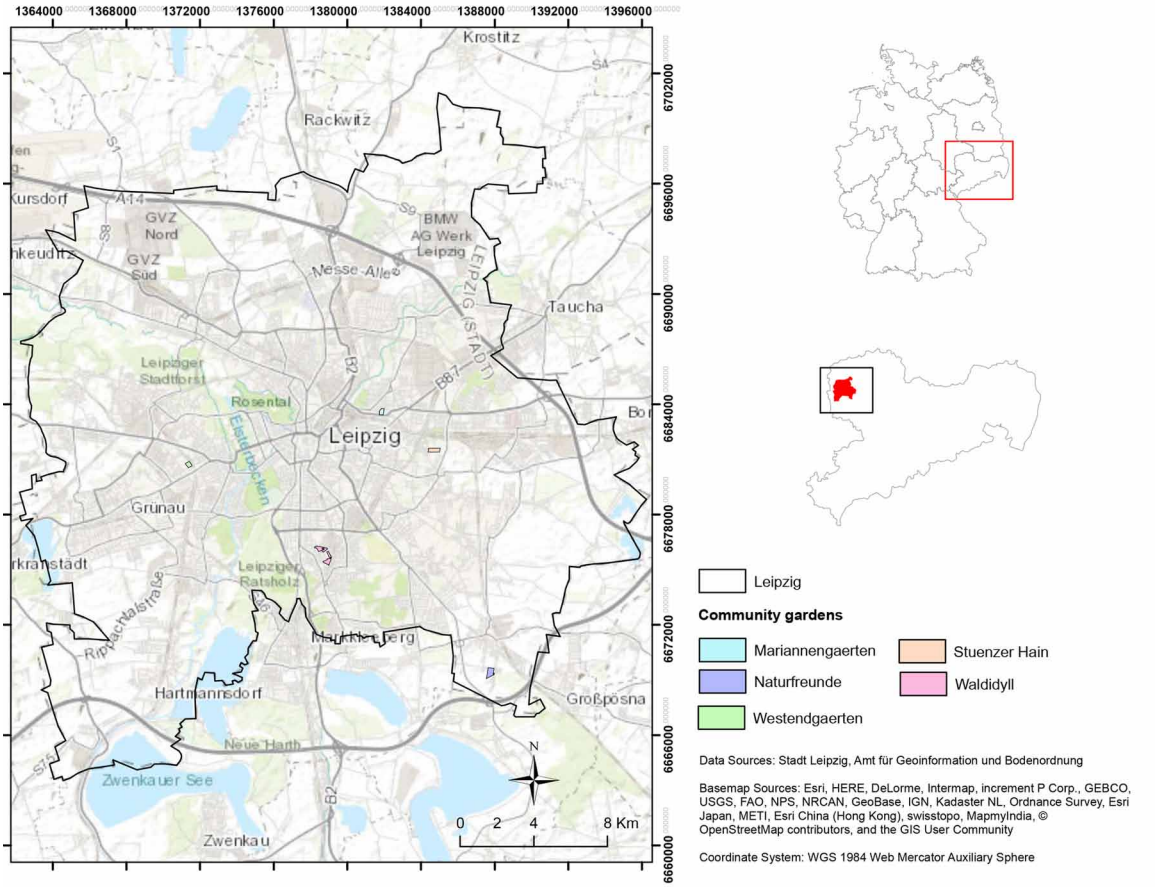


Figure 12. Allotment gardens, Leipzig
a) Suburban allotment garden with an area of 6 ha and 120 plots (adapted from Google maps).
b) Mapping of mature trees (above 5m) showed a total of 181 trees. Evergreen trees are shown as full-circles, deciduous trees as circumference, common playground as a circle.
c) An aerial view of a plot showing vegetation in infra-red light (credit: Roland Krämer).

(allotment garden) club or association enforces the regional/national code or open laws (*Kleingärtengesetzes*), which establishes that each plot is divided into three parts allocated to three types of land use: 1/3 ornamental species, 1/3 edible species, 1/3 lawn or build-up area (Figure 12 c).

Those code or open laws promote homogeneity and aesthetics along the aisles (Figure 13), enforce weeding in common areas and recommend weeding in private areas, as well as forbid large mature trees within the plots because these tend to block the sun in the adjacent plots. Historically, the allotment gardens in Leipzig have provided food and recreation. Three of the oldest ones, dated to the 19th century, are classified as heritage: the KG *Johannistal* estate since 1832, the KG *Südvorstadt* estate since 1874, and the KG Dr. Schreber estate since 1864. The city is proud of its pioneering role and hosts the only *Kleingärten* museum in Europe (*Deutsches Kleingärtnermuseum*) which is located within Dr. *Schreber* estate.

There is a large number of allotments in Leipzig partially because the city has only recently started facing real-estate pressure. In total there are 276 allotment gardens covering 1229 ha (Bürgerservice und Verwaltung, 2015) resulting in 23 m^2 of gardening area per inhabitant, which is one of the highest ratios among European cities (Cabral et al., 2017).

More recently, due to urban shrinkage, the municipality decided to initiate a program that allowed the interim-use of its urban voids by local initiatives of community gardeners (Rall & Haase, 2011). These spaces prime goal is recreational since they promote social meetings and sometimes pedagogic actions for school children (Figure 14). In 2016 the city accounted for 11 community gardens, scattered all over the city (see map on https://garten-findet-stadt.de/en/about-us/allotment-and-community-gardens-in-leipzig/).

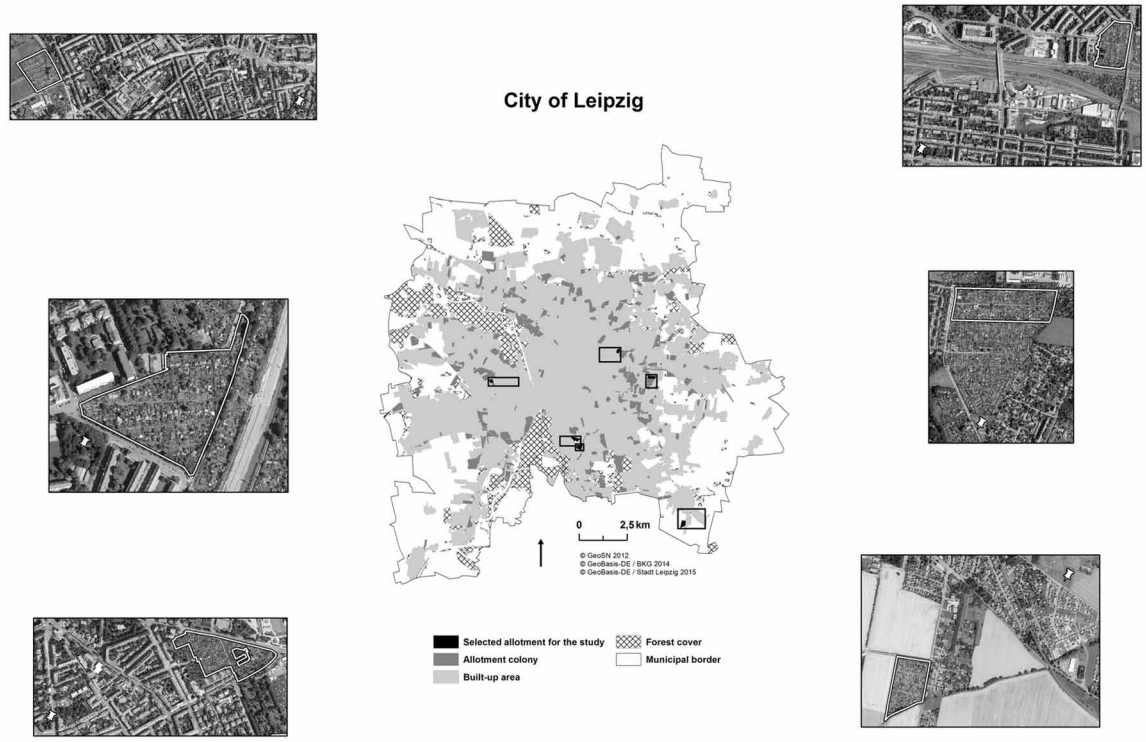
Figure 13. Allotment garden aisles bordered by fences and by hedges (Credit: Inês Cabral)

Figure 14. Stadtgarten Connewitz (run by NGO Ökolöwe) has several types of insect hotels on display and an adobe oven for pedagogic activities (Credit: Inês Cabral)

Allotments in Leipzig have traditionally provided food during the two world wars as well as during the communist times. Nowadays allotment gardens in Leipzig still contribute for food provisioning but are also valued for services such as local climate mitigation and water regulating. In fact, allotment estates host up to 22% of all shrubs and small trees of the built-up area and 11% of the city´s grassland (Banzhaf & Kollai, 2015). This way, allotments contribute for air cooling and air filtration. Water infiltration, on the other hand, is provided by the plots permeable area, as the code limits the buildup area to a maximum of 1/3 for each plot.

The comparative case study undertaken in Leipzig addressed the contribution of urban gardens for biodiversity and ES within 12 gardens: 6 (six) traditional allotment gardens (figure 15) and 6 (six) community gardens. It was used an urban-suburban gradient to understand the effect of proximity to the city center on ES and biodiversity. It was also employed a stratified sampling design, including allotment plots of different management intensity and community gardens along a gradient of urbanity (Figure 16).

Figure 15. Surveyed allotment gardens selected across an urban-suburban gradient (2 urban; 2 semi-urban and two suburban allotment estates)



Methodology

The methodological approach included field surveys, visual image interpretation of high resolution, multi-spectral images (aerial photos with visible light and near infrared, 3 cm resolution for LULC) collected by drone flights (senseFly Ltd`eBee drone) at an altitude of 400 m during July 2015) and interviews for assessing ecological knowledge among groups. The interviews encompassed a total of 30, with 24 of them applied in six allotments and 6 (six) undertaken in six community gardens. The indicators employed to assess each ES category and type are presented in Table 6.

Results and Discussion

Supporting services such as biodiversity, based on on-site botanical surveys and interviews, showed species richness distribution patterns as a bimodal relationship of overall vascular plant species richness varying with management intensity, with highest species richness in medium intensity managed plots. This result is related to the fact that the plots managed in medium intensity provide space for both cultivated, edible and ornamental species as well as native and spontaneous species (Cabral et al., 2017).

The analysis, based on remote sensing, provided information on habitat provisioning represented by the number of pools or ponds per garden, among other features. It demonstrated that suburban allotments

Figure 16. Diagram showing management intensity across plots in Mariannengarten and plots selection according to distance to vacant plot.(V- Vacant plots; M1- Medium managed plots; H1- High managed plots; High-intensity plots are shown in dark grey; Medium-intensity plots are shown in light grey)

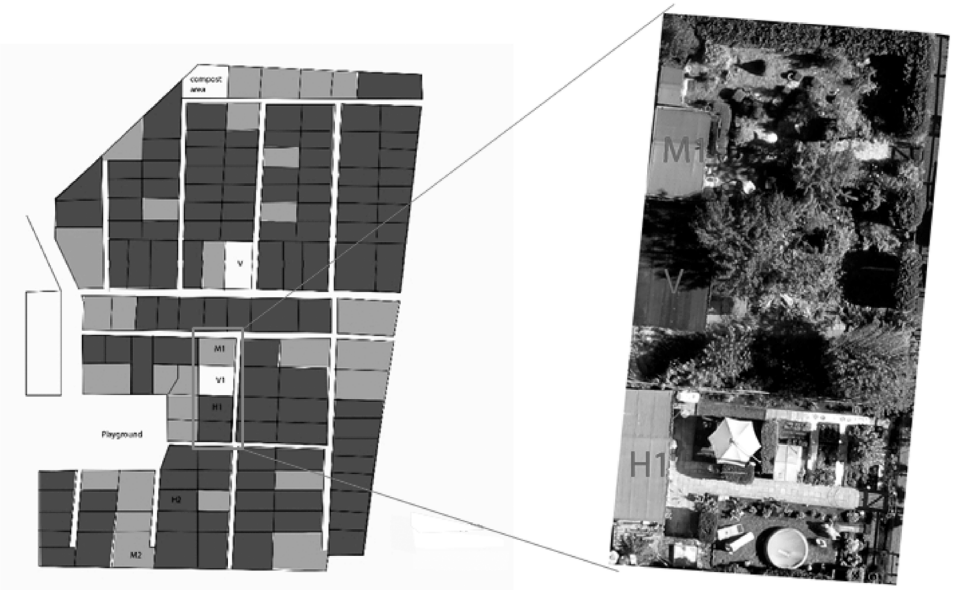


Table 6. Indicators employed to assess the various ecosystem services (Adapted from Cabral et al., 2017)

Ecosystem services categories	Ecosystem services	Indicators
Supporting services	Habitat provision	Land cover and manmade structures, such as ponds, rainwater deposits, stumps, beehives, insect hotels and bird houses.
	Biodiversity	Species richness and distribution patterns. Willingness to provide space for spontaneous species/weeds.
Provisioning services	Food provision	Species composition and proportional land cover of edible plant species patches.
Regulating services	Climate regulation	Above-ground carbon storage in trees.
	Water regulation	Permeable surface cover as a proxy for water infiltration potential.
Cultural services		Interviews on gardening motifs and ecological awareness.

have more man-made habitats than urban allotments and that community gardens host components not found in the allotments such as livestock shelters, beehives and stone walls.

As for food provisioning, the detailed botanical survey revealed that the number of edible species grown in allotments and community gardens was similar. Despite that, there was different species composition, i.e., allotments tended to have a higher diversity in fruit tree cultivation, while the variety of culinary and medicinal herbs tended to be higher in community gardens.

In the case of the regulating services, the comparison based on field surveys denoted that community gardens provide a higher ratio of permeable soil surface. Furthermore, calculations of above ground storage in trees based on fieldwork measurements indicated that allotments contribution for carbon stor-

age is more significant if more mature trees are present in their common playground. Furthermore, this benefit is higher on suburban estates than on urban estates (Figure 17).

The assessment of ecological knowledge among the groups resulted in a greater knowledge among community gardeners on the meaning of ES and biodiversity (Figure 18), which is correlated to its larger amount of wild/unmanaged areas (Figure 19).

Given to the fact that the sampling method included allotment and community gardens that are adjacent to each other, it was possible to assess if knowledge exchange occurred between the respective gardeners. Regular interaction within allotment gardens was confirmed mainly due to the regional gardens association network. Interaction among the surveyed community gardeners also occurred. In few cases, there was also the interaction between allotment and community gardeners. One particular interaction was due to the educational goals of a community garden (Stadtgarten Connewitz) managed by a local NGO (Ökolöwe), which provided experience and know-how to the adjacent allotment garden.

The ES assessment in Leipzig clarified the need for knowledge exchange between community and allotment gardens to improve their contribution for ES, while at the same time promote social cohesion by increasing cooperation development.

Case Study 3: Farming to Horticultural Parks— Benefits and Farmer´s View on the Regularization Process in Lisbon, Portugal

Introduction

The benefits of urban gardening for the city and its inhabitants are well reported, when it comes to its contribution for social, cultural, economic, and institutional sustainability of the communities, thus creating social capital (Barthel, Folke, & Colding, 2010; Barthel & Isendahl, 2013; Bendt, Barthel, &

Figure 17. Abundance of mature trees within six allotments according to urban gradient (U-Urban; SM- Semiurban; SU- Suburban; deciduous trees are shown in black; evergreen trees are shown in grey)

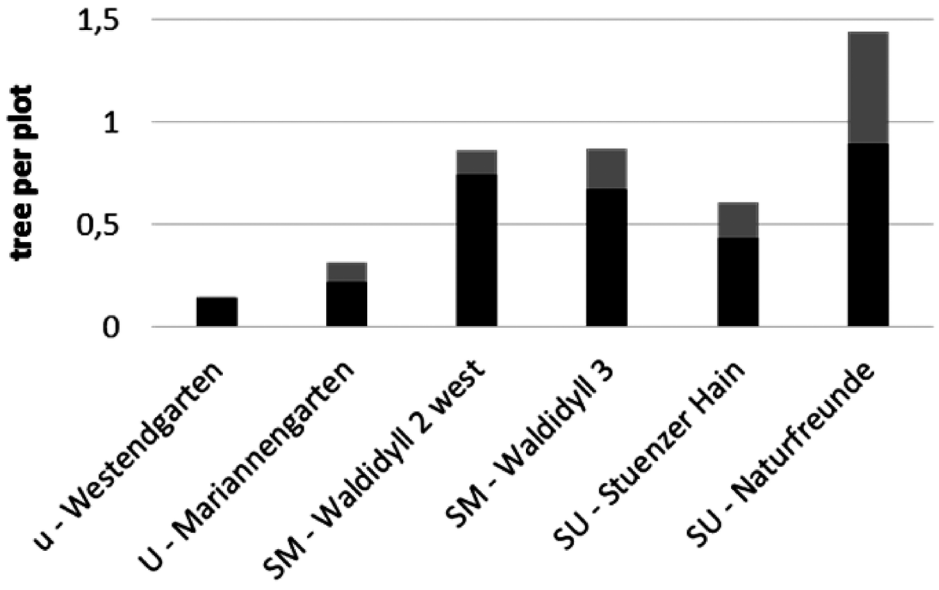


Figure 18. Are gardeners familiar with the term "Ecosystem services"?

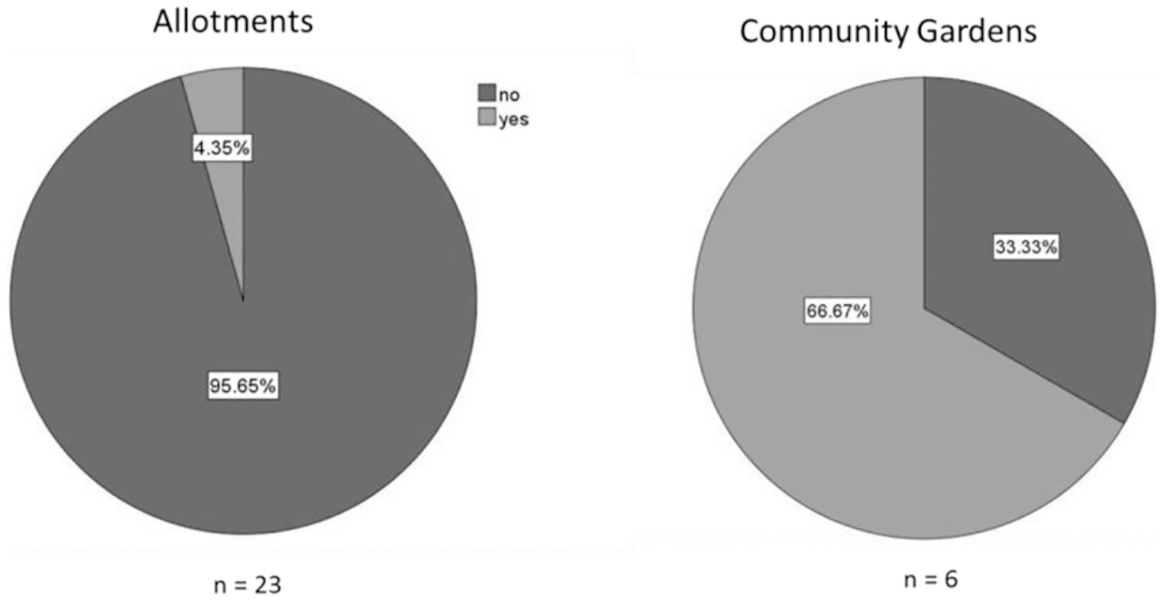
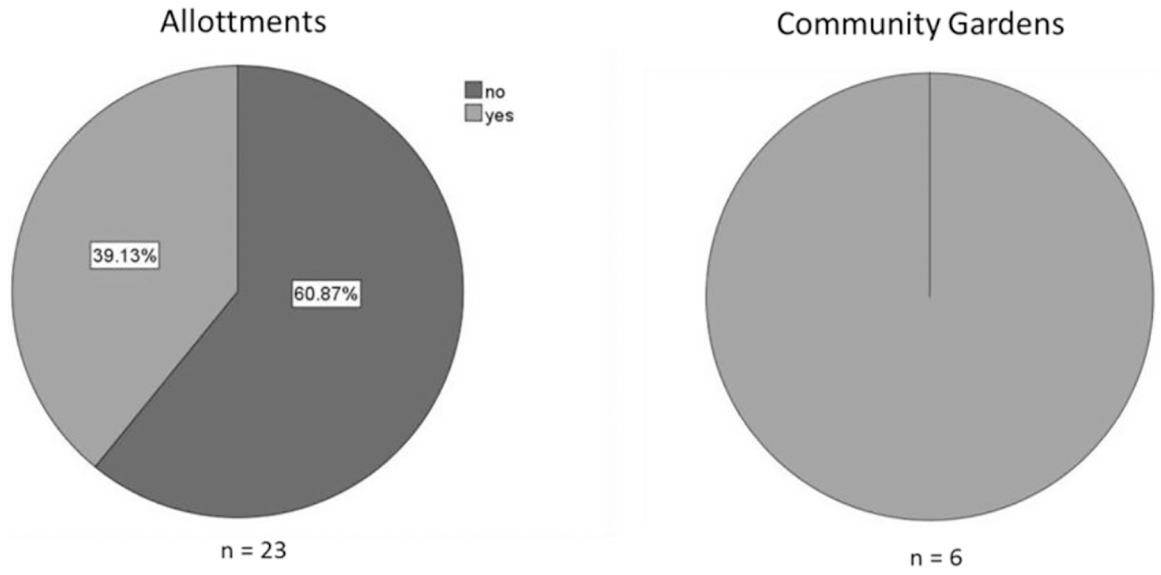


Figure 19. Do gardeners keep wild/unmanaged areas in their gardens?



Colding, 2013; Cabannes & Raposo, 2013; Firth, Mayde, & Pearson, 2011; Kingsley & Townsend, 2006; Milbourne, 2012; Ramos, 2011).

At the same time, urban gardens reportedly act as reservoirs of "socioecological memory", fighting "social amnesia" regarding our dependence on nature; contribute to biophysical ES; promote social justice and public participation; and contribute to food security and generate income for farmers (Andersson, Barthel, & Ahrné, 2007; Barthel et al., 2010; Barthel & Isendahl, 2013; Milbourne, 2012; Bendt et al.,

2013; Martins, 2012, Matos & Batista, 2013; Ramos, 2011; Roth, Frixen, Tobisch, & Scholle, 2015). All in all, it might be affirmed that urban gardening contributes to socioecological urban resilience.

Agriculture has always been present in the structure of the city of Lisbon. The geographic location of Lisbon, set in an extremely fertile depression of the Iberian Peninsula between the valleys of the river Tagus and Sado, has granted the city close productive agricultural grounds (Martins, 2012). According to Telles, the conjunction of both estuaries constitutes the largest extension of flat fertile soils in Portugal (Telles, 1997). In a morphologic perspective, Lisbon can be delimited by the territory confined by the Serra de Monsanto, the Odivelas' stream and the Trancão river (Telles, 1997). In 2003, almost half of the land of Lisbon's Metropolitan Area was used for agricultural purposes (48%) and around 39% was woodlands, natural or 'semi-natural' landscapes, only 13% was a built-up area (Martins, 2012). The increase of population in the 1950's and the related urbanization process that resulted from the industrial development and expansion of the services sector (enhanced later by the return of 600 000 people from the ex-colonies) led to the loss of most of the productive farming spaces (Martins, 2012). Some small pockets remain now dispersed in-between the urban fabric as part of leisure areas, and some of them in the form of urban parks (Bernardo, 2013; Henriques, 2009; Lima, 2012; Madaleno & Armijo, 2004; Martins, 2012; Matos & Batista, 2013). According to the Statistics National Institute, there are currently 547 773 people living in the city of Lisbon (data from 2011).

Urban voids that resulted from this process of urban expansion were occupied for decades for the practice of subsistence agriculture, especially by low-income immigrant communities, most coming from former Portuguese colonies (Cabannes & Raposo, 2013; Martins, 2012; Matos & Batista, 2013). The majority of these spontaneous gardens were located on public lands owned by the Lisbon Municipality (Câmara Municipal de Lisboa (CML)) with its tacit acceptance but without any regulation or legal status (Bernardo, 2013; Cabannes & Raposo, 2013; Madaleno, 2003; Henriques, 2009).

In 2007 Lisbon´s Green Plan, designed by the landscape architect Ribeiro Telles, became the ecologic structure of the municipality of Lisbon. The plan proposed the creation of "green corridors" that would cross the city connecting various land uses, such as urban parks, gardens, bicycle lanes and footpaths and also urban gardening. Within this framework, agriculture was assumed as an important component of the ecological structure of the city, and a Strategy for Urban Agriculture was defined (Henriques, 2009).

This Strategy for Urban Agriculture aimed at responding to several challenges among which:

- The scarcity of available green spaces in the city - green space availability: 27.8 m^2 per capita (Santos, 2015);
- The objectives of the Green Plan to link most of the green spaces through ecological corridors;
- The impact mitigation of channeling waterlines by creating water basins in strategic valleys (Telles, 1997);
- The need to reorganize allotments that were growing fast and unorganized (partly due to the economic crisis and rising unemployment);
- The increasing demand for allotments.

After the Strategy was approved, the municipality started the process of regularization of former illegal gardens on void spaces and initiated the construction of several new allotments in poorly maintained municipal green areas (http://www.cm-lisboa.pt/fileadmin/VIVER/Ambiente/Hortas_Urbanas/Parques_Horticolas_2016.pdf) (Câmara Municipal de Lisboa [CML], 2016).

In the previously informal allotments, the municipality displaced the people working there to reorganize and unify the plots, to provide infrastructures, water access, and small sheds for tools storage. The municipality also defined the rules of use to ensure that all farmers complied the organic mode of production (after technical training offered by the municipality), composting, prohibition of using chemical pesticides, herbicides, chemical fertilizers, Genetic Modified Organisms (GMO) and infesting species. It guaranteed the supervision as well.

A typology of regulated urban gardens was created including three types, according to their main objective, either social, pedagogical or recreational. Social gardens are institutional gardens that emerge as a social support project, intended to minimize social injustice and urban poverty, contributing to food security. The annual fee established by the municipality for the use of these spaces is lower than the one practiced in recreational farms in which the emphasis is given to the promotion of public health, both physical and psychological. Another distinction is the size of the plots, i.e., 50 m^2 within recreational gardens and 100 m^2 or more in the case of social gardens, where the sale of surpluses is allowed, underlining the subsistence character associated to them.

After the reorganization process, plots were redistributed to people who were already occupying the place, and the remaining was reserved for public tenders. The first public tender occurred in 2013, and the eligibility conditions were mainly based on the distance from the place of residence to the plots.

Methodology

In order to understand the motivations behind the practice of agriculture in the city of Lisbon (Figure 20) and the course of the process of integration of informal uses into the city planning, interviews were undertaken with farmers in two of the settlements where this transition occurred, namely Quinta da Granja and Vale de Chelas - Figure 21 (Krylová & Luz, 2017; Luz & Pires, 2015).

This empirical study is based on 26 qualitative interviews. Around 26 interviews were performed with farmers in both parks (eight in Quinta da Granja and 18 in Vale de Chelas) in three different periods: between March 5th and April 15th and between October 1st and 3rd, 2014, in Vale de Chelas; and between 20th and 25th May, 2015, in Quinta da Granja. From the 26 respondents 20 were men and 6 (six) were women, 5 (five) were unemployed, 12 were retired, and 7 (seven) were employed. For the remaining 2 (two) no information was obtained.

Results and Discussion

In Vale de Chelas, the gardeners were originally from 4 (four) countries (Angola, Cape Verde, India, and Portugal) while in Quinta da Granja the people interviewed were all born in Portugal. As for the practice duration, it varied from 1 (one) year (a newcomer in Quinta da Granja that occupied a vacant plot) up to 41 years (the "oldest farmer" in Quinta da Granja). As for Vale de Chelas, the "oldest farmers" are working since around 30 years and the new farmers are arriving since the end of 2013.

The Horticultural Park in Vale de Chelas is the city's largest park. The first CML project was conceived for 15 hectares of land, of which 6,5 hectares were meant for agricultural use. However, due to changes in the project budget, the area had to be reduced, and the number of plots decreased from 400 to slightly more than 200 each with 150 square meters. Part of the plots was attributed to the nearly 100 people who were already occupying the place, and the remaining reserved for a public tender that occurred in 2013.

Figure 20. Location of study area

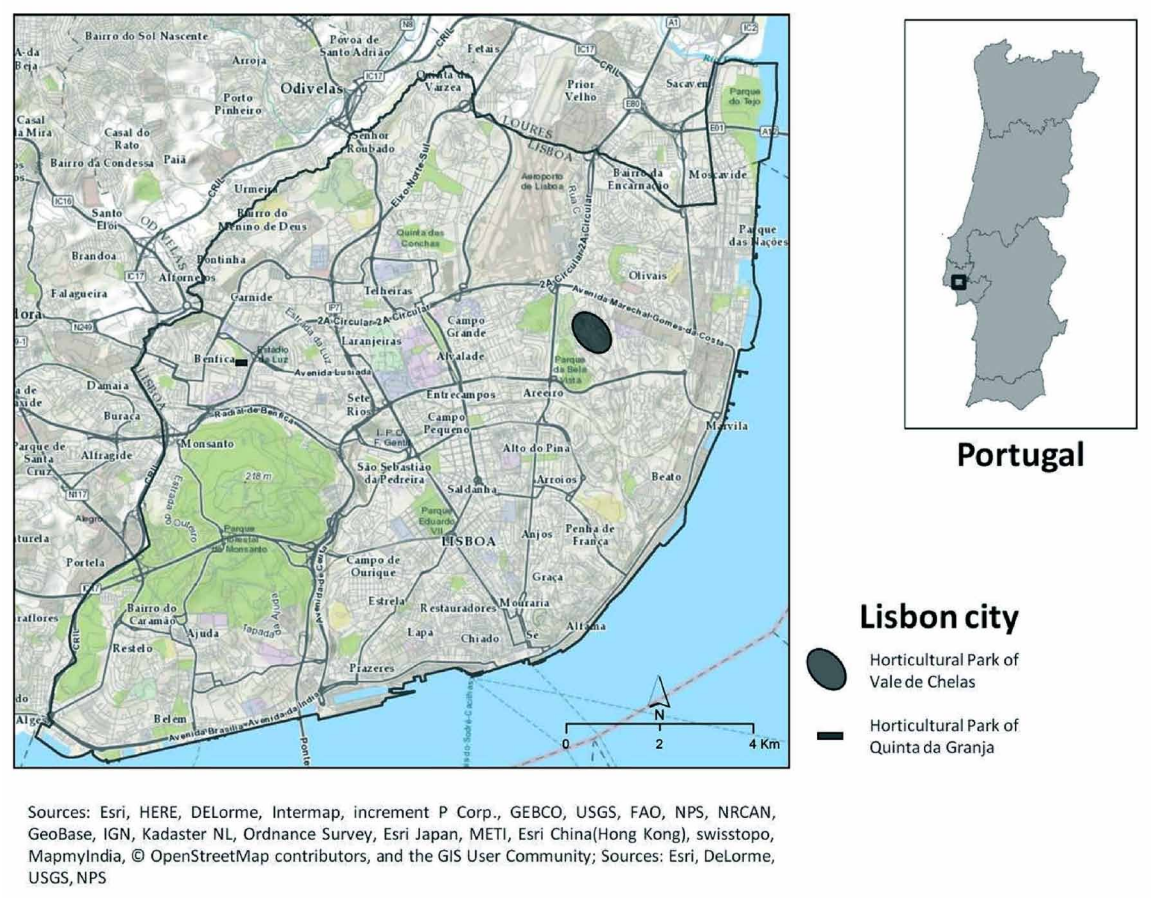


Figure 21. Quinta da Granja, a recreational horticultural park (left) and Vale de Chelas, a social horticultural park (right)

In Vale de Chelas, before farmers started to build their plots, through very challenging tasks (e.g., clear the ground, cut the grass and reeds and work the land to create a suitable soil for cultures to grow), the place was a "space leftover after planning" (Krylová & Luz, 2017). As the name indicates, they are not part of the urban planning but rather consequences of it. Later, with the people's initiative, the place gained a new meaning, with obvious social and cultural benefits. The possibility to grow their own food and products from their homeland (as part of the farmers are from tropical African countries), allowed them to continue their gastronomic traditions and practices but mostly avoid starvation.

Furthermore, they could create social bonds, through the sharing of an activity, space, and through knowledge exchange. Like some of the oldest farmers said, informally, in one interview: "F: (…) you know, at this age, instead of hanging around, I come here…; P: I don't even know how to play cards…; F: me neither…; P: nor domino…; F: here we take the chance to have a few conversations and all…". A healing effect was also mentioned, to fight stress or ease preoccupations. This is clear in this farmers' discourse: "I am unemployed, for a long time already. Then, it coincided with my mother having an AVC (…) I had done some volunteer work also, and when I became aware of the gardens I thought 'this is something I like' (…)" (personal communication, March 5, 2014).

When asked about their view on the main changes introduced by the reorganization process, interviewees reported that water supply and accessibility improvement to be the most significant changes. A farmer said, "For instance, if somebody gets hurt, first aid can easily reach us now, before it didn't happen" (personal communication, March 5, 2014). Nevertheless, the water supply was the most consensual factor. As a farmer in Vale de Chelas said "It is a good price I pay for the plot because of the water, I have as much water as I want, that is the greatest advantage, no doubt about that (…)" (personal communication, March 5, 2014). Previously, gardens in Vale de Chelas produced mainly winter crops. Water, when necessary, was collected in sewers (creating potential health problems related to the consumption of the products), in very small springs with insufficient pressure, or through the accumulation of rainwater. Presently, each cluster of four plots has access to the public city water.

Quinta da Granja was the first park being built. Part of the current area of the park was owned by a family, who allowed farmers to use the land, although without any legal compromise. Some decades ago the property was sold to the municipality, and in 2011 a project was developed for the renewal of the area. Until then people were allowed - by the CML - to continue using the land. Here farmers also had to cope with the initial conditions by themselves. Water was conducted through a system they implemented, and which is still operational today. With the implementation of the farming park, not only new farmers arrived to occupy the plots made available by the Municipality but also there was a clear change in the local uses. With the implementation of the farming park, there was a clear change in the local uses. Today, besides urban farming, there are cycling ways, walking paths, coffee shops, and kids' playgrounds, all together.

Two "types" of farmers were found in both parks: i) the ones that already farmed there informally, having a kind of a tacit agreement with the owner, and ii) the newcomers that arrived through CML's tenders. Their perspectives toward the project are different once the old farmers have prior experiences in these places. The construction of the farming parks brought new conditions, especially regarding access to water, but farmers were also submitted to limitations in their use of the land. At the same time, a fee of 80 euros per year is now required to farm in those lots.

Nevertheless, most of, many of the interviewees considered it a fair value, taking into account that the intervention greatly improved their working conditions: "Let's see, the municipality also invested, also

spent money, the infrastructures, the shelters..." (personal communication, March 5, 2014). However, two of them complained about that obligation, and one said he would stop farming in the regulated areas "I do not spend 80 euros in vegetables per year, right?" (personal communication, March 5th, 2014).

Even though it seems that there is a change of approach from the municipality toward a more bottom-up intervention – seen in the priority given to the distribution of the plots between "old farmers", giving them also the opportunity to choose the plots' location –, the municipality's will to keep control over the farms' uses emerges. Aesthetics aspects were defined by the municipality and imposed to the farmers. In that sense, the recreational and aesthetic role set by the municipality for the farming parks does not allow the simultaneous presence of seemingly incompatible activities.

The accumulation of stuff, plastics or other materials as fences are not compatible with the existence of a beautiful, ordered and attractive garden; keeping dogs and organizing gatherings collide with the possibility of contemplative silence (Krylová & Luz, 2017). As an "old" farmer in Quinta da Granja said: "Before [when the use was informal] I had a huge table, more than 10 people could sit there, we made barbecues, gathered friends and family… now, I tried to create some shadow by hanging one canvas near the storage house, but they said we can't" (personal communication, May 25th, 2015). Moreover, another farmer says, after admitting he does not follow all rules: "Who sets the rules in my land? Them? I am the boss in my land; I am paying to be here" (personal communication, May 25th, 2015).

Finally, although farmers regret the changes imposed by the new rules in the control of the uses (e.g., limitations in the size of the plot area, in social uses, in the planting of trees, etc.), farmers clearly see the benefits of this initiative. As an "old" farmer in Quinta da Granja, resumes: "well, it is a good project, after all, they could have just thrown us out, and it is more beautiful now, more organized."

DISCUSSION

On the first case presented, the vacant lots in Brazil have played a secondary role in the creation of strategies for sustainability. However, these underutilized plots of land can offer perspectives for the urban land use transformation especially in economic crisis periods. In this context, positive vacant lots shifts can contribute to the community development and ES provision, establishing a socioecological infrastructure in cities (Anderson & Minor, 2017; Kim, 2016; Kremer et al., 2013 McPhearson et al., 2013).

The studies on vacant lots in Belo Horizonte are still in a tailoring and diagnosis phase. The conceptual approach encompasses the incorporation of the social and political aspects, especially considering the importance of taking into consideration the people´s view and concerns about ecological features, nature and ecosystem services. It is expected that the research on vacant lots can bring about some insights into the problem and contribute to the policies designs and normalization, favoring ES provision.

The choice of scenarios and mapping can help on capturing the situation and on clarifying the chart of options available, providing a basis for discussions and orientations. The studies are being designed therefore to contribute to the decision-making process and to highlight the importance of the incorporation of people´s preferences on the vacant lots ES provision in the city.

Belo Horizonte is a city comprising around 2,6 million people, with 22047 vacant lots registered for the year 2015. The county has faced a center to periphery population growth in the last years, presenting a larger number of vacant lots in the administrative unity named Pampulha (5235 plots), that showed the

highest population growth in the last census (Costa & Mendonça, 2010; Instituto Brasileiro de Geografia e Estatística [IBGE], 2010), This means that the presence and amount of vacant lots in the city are not related to shrinkage but rather with the city expansion.

In Germany, on the other hand, the city of Leipzig was faced with the process of shrinkage, and the municipality decided to use its voids for more public green spaces, including leasing vacant lots for community gardens (Rall & Haase, 2011). The city hosts 276 allotment estates covering 1229 ha (Bürgerservice und Verwaltung, 2015). Overall, the county has over 23 m^2 of gardening area per inhabitant, which is one of the highest ratios among European cities. The city also hosts eight community gardens.

The city of Leipzig has experienced two types of governance regarding urban gardens: bottom-up and top-down initiatives. The assessments undertaken in Leipzig addressed a combination of ES with a spatial dimension, thus producing planning guidelines. Allotment gardens and community gardens are used by different social groups whose interaction is still very limited, requiring the use of participatory methods to develop even further the garden's contribution to ES, by exchanging knowledge.

As for Portugal, the capital city Lisbon is facing a population migration to the suburbs as tourism and financial business have taken the center. As a compact city, its green infrastructure does not provide enough ES, such as water and local climate-regulating services. As the municipality developed its green strategy, the implementation of urban gardens became a multifunctional solution potentially contributing to mitigate the economic crisis and rising unemployment rates. As such, horticultural parks were developed in either old farm estates or low-income urban parks.

In Lisbon, the urban gardens are adapting to a new normalization and governance. In fact, allotment gardens were created for ecological and social benefits. The green infrastructure of Lisbon has been growing under the Green Strategic Plan that it is solely a top-down initiative. With some exceptions, the groups of gardeners require further education, and so far, participatory methods have not been used yet.

FUTURE RESEARCH DIRECTIONS

The study, development, and use of appropriate tools and methods for assessing ecosystem services can contribute to improvements in urban sustainability, as far as it provides the generation of technical-scientific knowledge applied to the cities policies and governance. Beyond that, there is an urgent need for the democratization of the produced knowledge so that citizens and communities can make own of issues related to the planning and management of their city spaces, which are part of their lives.

This means that the researchers and city planners play an important role in the provision of guidance concerning the suitable means to reach measures and goals agreed collectively, but should avoid centralizing, contributing to the dissemination, exchange and discussion of the research results (Souza, 2010).

For the study presented here, the expectations at this point are to contribute with tools and approaches that offer insights into the importance, benefits and peoples' opinions on ecosystem services provided by nature in the cities context. It is a concern, however, that those assessments are just a starting point placed in the earlier planning phases.

For the peoples' appropriation of the ecosystem services and their benefits for themselves, cities sustainability and life quality improvements there is a need for the studies based on participatory approaches to follow up continuously through time, incorporating other methods (i.e. action participant) that facilitate people's inclusion, and the movement from a theoretical basis into action.

CONCLUSION

The chapter presented assessments of ES in three urban regions of Brazil, Germany, and Portugal that included different methodological approaches, incorporating the socio-cultural dimension, ecological features and a conceptual framework based on participatory methods.

In general, the studies demonstrated the potential benefits of utilizing ES assessments approaches on urban landscapes, especially for better understanding the interactions between people and nature, in urban gardens and vacant lots. At the same time, it provided a set of tools to improve approaches to the urban ES assessment, useful for a wider community of academics and practitioners.

For Belo Horizonte, Brazil, the conceptual framework presented aims to be used to characterize the landscape dimension and ecological attributes of the vacant lots and integrate them with the social, political and economic contexts. The study case on people's opinion on ES revealed a set of definitions associated with the plots and the inhabitants' knowledge, recognition and appreciation of ecological features. The regulating service of air purification was the most recognized by them. Other conspicuous ES reported comprised: air purification, aesthetic beauty, heat alleviation, health improvements, stress reduction, fauna habitat, bird´s attraction, water conservation, soil protection and fruit production.

In Germany, the assessment of urban gardens in Leipzig was based on a myriad of methods aiming to provide insights on governance levels and new forms to enhance it. The initiatives promoted different levels of governance, ranging from top-down on allotment gardens to bottom-up in the community gardens. Provisioning, regulating, and cultural ES are the most conspicuous provided by the gardens. It was found a greater knowledge among community gardeners from Leipzig on the meaning of ES and biodiversity, correlated to its larger amount of wild and unmanaged areas. Governance on the studied area could be improved by creating synergies between allotment gardeners and community gardens.

The study in Lisbon, Portugal, demonstrated that although regulating ES are an important motif for the city to implement new and re-organized allotments, the interviews performed in the largest and poorest horticultural parks, resulted in provisioning services (food production) being the most significant service for the users. It also revealed the existence of a social conflict between the gardeners and the existing policies, which needs to be addressed in the future, probably through a participatory process.

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KEY TERMS AND DEFINITIONS

Biophysical Attributes: Characteristics that combine biological and physical features such as vegetation, hydrography, relief, climate, among others.

Ecosystem: An assemblage composed of the interactions among biological components (such as plants, animals, microorganisms) and abiotic components (chemical and physical elements like water, air, soil, minerals).

Land Cover: The biophysical land type that comprehends the features that cover the earth´s surface.

Land Use: The function associated with the features that cover the earth´s surface, through its use by people.

Plenary Sessions: Meetings to be attended by all the members' parties and stakeholders defined, aiming at presentations and panel discussions.

Socioecology: The study of systems composed of the interactions between people and nature, with the human component seen as part of nature.

Urban Sustainability: An expected state of urban circumstances that continues in time, including: evaluations on the resource consumption practice, made at the expense of the loss of ecosystems; sound use of resources allowing a generational equity; conservation of the natural environment; low use of non-renewable resources; economic solidarity and diversity; community autonomy; people wellbeing; basic human needs fulfillment.