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STUDYING CULTURAL ECOSYSTEM SERVICES IN A PORTUGUESE CITY: VALUING PEOPLE'S PERCEPTION IN LOCAL POLICY MAKING

ESTUDO DOS SERVIÇOS DE ECOSSISTEMAS CULTURAIS: VALORIZAÇÃO DA PERCEPÇÃO DA POPULAÇÃO EM DECISÕES POLÍTICAS

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MAPEAMENTO DOS SERVIÇOS DE ECOSSISTEMAS CULTURAIS: VALORIZAÇÃO DA PERCEPÇÃO DA POPULAÇÃO EM DECISÕES POLÍTICAS

Dissertação apresentada à Universidade de Aveiro para cumprimento dos requisitos necessários à obtenção do grau de Mestre em Ciência Política, realizada sob a orientação científica da Doutora Sara Moreno Pires, investigadora do Departamento de Ciências Sociais, Políticas e do Território da Universidade de Aveiro e do Doutor André Mascarenhas, investigador da Universidade de Humboldt, Lab of Landscape Ecology, em Berlim.

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palavras-chave

Serviços culturais de ecossistema, espaços verdes e azuis urbanos, mapeamento, planeamento urbano, avaliação.

resumo

Este trabalho é focado no estudo dos serviços de ecossistema culturais (SEC) e na avaliação dos mesmos no município português de Almada com o objetivo de perceber a sua relevância para o planeamento urbano e os processos de políticas públicas de ambiente no município. SEC são os benefícios não materiais que as pessoas obtêm dos ecossistemas através de enriquecimento espiritual, desenvolvimento cognitivo, reflexão, lazer, e experiências estéticas. Os SEC por vezes são mais importantes para a sociedade do que os benefícios materiais que deles retiramos, sendo as características de intangibilidade e subjetividade o que os torna indispensáveis para as estruturas e funções que o ser humano precisa e quer. Alguns benefícios dos SEC são a redução do stress da população, o desenvolvimento da concentração e capacidade cognitiva, o favorecimento da atividade física, e a contribuição para o bem-estar social e para a saúde da população. Compreender e avaliar os SEC de uma cidade beneficia o planeamento, o design e a gestão urbana. Este estudo pretende avaliar os SEC e os diferentes tipos de usos e características negativas dos espaços verdes e azuis urbanos (EVU) deste município. As principais objetivos são: o mapeamento da perceção dos cidadãos sobre os SEC que usufruem em Almada e dos diferentes usos que disfrutam dos espaços verdes e azuis urbanos, e a compreensão de como os serviços de ecossistemas são considerados no planeamento urbano e nas políticas públicas em Almada de forma a contribuir para encontrar oportunidades para melhorar o planeamento e as políticas locais que valorizem os SEC a nível local. O mapeamento foi feito a partir do método de avaliação social (abordagem participativa) com o uso de um inquérito online GIS – método PPGIS aplicado aos residentes de Almada. Mapas de hotspots e análise de correlações foram feitas através de testes estatísticos e de mapas de calor com o software QGIS para compreender melhor a localização e tipologia dos SEC, os usos dos espaços verdes e azuis urbanos, assim como as correlações entre os SEC e os tipos de usos. Esta investigação permitiu dar nova informação ao município de Almada sobre os seus EVU e propor algumas recomendações para fortalecer o processo de planeamento e de políticas públicas do território. Esta investigação pode ser replicada noutros municípios com interesse em melhorar a gestão e o planeamento dos seus EVU.

keywords Cultural ecosystem services, UGS, mapping, urban planning, questionnaire survey, valuation.

Abstract

This work is focused on studying cultural ecosystem services (CES) and mapping them in the Portuguese municipality of Almada in order to understand how to incorporate this knowledge in urban planning and environmental policy-making processes. Cultural ecosystem services are the "nonmaterial benefits people obtain from ecosystems through spiritual enrichment, cognitive development, reflection, recreation, and aesthetic experiences" (Millennium Ecosystem Assessment, 2005). CES sometimes can be more important to society when compared to material benefits, being their intangible and subjective features indispensable to human well-being and part of the structures and functions humans need and want. Some benefits of CES are the reduction of urban population stress, the development of concentration and cognitive capacities, the increase of physical activity, and the boost of social and health benefits for the population. CES studies benefit urban planning, design and management. This research aims to further assess the type of uses and the negative characteristics of urban green spaces (UGS) in this municipality. The main research objectives are to map the perception of citizens about the role of CES in Almada; to understand the different uses of CES in the urban green and blues spaces; and finally to understand how ecosystems services are considered in the spatial planning instruments and local public policies of the municipality in order to find opportunities for improvement and for strengthening the valorization of CES at the local level. The mapping was done through a social valuation method (participatory approach) with the use of a GIS online survey – PPGIS method to Almada's residents. Hotspots maps and correlations analyses were done through statistical tests and QGIS heatmaps to understand better were CES, type of UGS uses and negative characteristics are located, correlations between CES and uses, and frequency of them. This research work allows to give new information to Almada municipality about their UGS and to provide some recommendations on how to improve planning and management of the municipality territory. Also, this research can be replicated in other municipalities with interests to improve their UGS management and planning.

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1. Introduction

Urban population growth is making pressure on urban green space (UGS) and on the ecosystem services (ES) that people can obtain from them (Rall, et al., 2017). The importance of urban green spaces was only recognized in the 19th century, because until that time even with the lack of green spaces in cities, most people lived in rural areas (Branquinho et al., 2015; Swanwick, et al., 2003). Cities are distinguished by their "unique spatial arrangements of buildings, streets, places, walls, and parks", also they are "symbols of cultural identity, political power, religious beliefs, wealth, socioeconomic disparity, work, leisure, production, consumption, and waste management" (Moavenadeh et al., 2002:p-18).

Nowadays, world population living in urban areas is increasing through the years and in 2016 54% of the population was already urban. By 2050, it is supposed to be living in cities 67% of 9 billion expected population (Baabou, et al., 2017; World Bank, 2018). Ecosystem services, the perks that human-being can get from the ecosystems directly and indirectly, are suffering a huge loss throughout the last decades and the perspectives towards the next 50 years are even worse (Millennium Ecosystem Assessment, 2005; p-39). Human-beings are using ecosystem services in a way that is unsustainable and are critically destroying them at a fast pace (Millennium Ecosystem Assessment, 2005). The degradation of ES in urban areas increases the economic costs of future problems and directly affects short and medium term social, cultural and insurance values (Stoeglehner and Narodoslawsky, 2008). However, even with increasing urbanization, planning and management policies and instruments can promote more sustainable options within the urban space (Pearson, 2013).

Cities do not have only negative aspects, they also bring environmental benefits, opportunities for encounter human needs, and have valuables and pleasing places to live (Moavenadeh et al., 2002). Also, cities provide "jobs, housing and services, such as public transportation, education, and garbage collection/sanitation" (Moavenadeh et al., 2002:p-2). The relationship between urban growth and the environment can be positive, since urbanization can increase their capacity to reach human needs instead of only increase their physical size (Moavenadeh et al., 2002). Because, usually cities with a low-density population spent the double energy per capita as high-density population in cities, once cities are becoming more decentralizing and increasing their physical size, instead of population density (Moavenadeh et al., 2002). Cities can be a huge challenge when it comes to the future of global sustainability or an opportunity (Galli et al., 2020; Pearson, 2013). Sustainability is a complex trans-disciplinary that a cannot be solve by applying an one unique metric, it requires an abundance of information, data and indicators, for decision-makers being able to face this challenge (Galli et al., 2020).

Several indicators and assessment tools have been arising in the last decades, to allow us to better understand our impact on the Planet. The Ecological Footprint (EF) is one of those approaches (Stoeglehner and Narodoslawsky, 2008). It is a "biomass-based resource accounting tool, which aims to track human demand for, and nature's supply of key resource provisioning and one critical regulating ecosystem service" (Baabou et al., 2017:p-94). On the one side, it accounts for the pressure of human activities on natural resources (Ecological Footprint) and on the other side, it accounts for the supply side of this scale through the accounting of Biocapacity. Biocapacity "tracks the ecological assets available in countries, regions or at that global level and their capacity to produce renewable resources and ecological services" (Galli, et al, 2014:p-122) it represents all useful ecosystems services that natural ecological assets are able to produce each year (Mancini et al., 2017). For an "ecological balance", the values of EF and biocapacity can be compared between the environment provision of, and humans search for, that is ecosystem services (Mancini et al., 2018:p-230). This balance is one of the biggest outputs of the National Footprint Accounts (NFAs) (Mancini et al., 2018), which are national scale-assessments done by Global Footprint Network on a yearly basis (Baabou et al., 2017), and that tracks the EF and biocapacity in over 200 countries (Mancini et al., 2018). There can be a positive balance (EF < BC) or a negative (EF > BC), a positive the country/city "runs an ecological remainder or surplus", a negative the country/city "runs an ecological deficit" (Mancini et al., 2018).

The EF is important to understand better the dynamics of the ecological systems and the excessive use of ecosystems services by humankind and the follow overshoot (Mancini et al., 2017). Overshoots happens when there is the ecological deficit, means the demand for ecosystems services and natural resources is bigger than the ecological systems can regenerate (Mancini et al., 2017) Even though, initially, the EF was more used as an education tool, and now the focus has shift to target a decision-making tool (Stoeglehner and Narodoslawsky, 2008; Wood and Lenzen, 2003). Over the years, the original model of the EF suffered methodological improvements to consider, for instance, the carbon cycle (Eder and Narodoslawsky, 1999).

The ecosystem services concept allows to understand the type of benefits humans can have from them and therefore enables the development of assessment tools to better map those services, as well as, it allows the improvement of decision-making processes for their valorization and protection (Satz et al., 2013). The gap between ecology and economics until the present days has been somehow fulfilled by the ES as a framework (Chan, et al., 2012). A conceptual framework was created for the Millennium Ecosystem Assessment (MA) to assist decision-makers and analysts in better choices when it comes to preserve ecosystems and human well-being. The several services that ecosystems offer, how they affect human well-being and what can change those services were analyzed by the MEA framework (Millennium Ecosystem Assessment, 2003). The MEA definition of ecosystem services is resultant from two other definitions:

- "Ecosystem services are the conditions and processes through which natural ecosystems, and the species that make them up, sustain and fulfill human life. They maintain biodiversity and the production of ecosystem goods, such as seafood, forage timber, biomass fuels, natural fiber, and many pharmaceuticals, industrial products, and their precursors." (Daily, 1997:p-3)
- "Ecosystem goods (such as food) and services (such as waste assimilation) represent the benefits human populations derive, directly or indirectly, from ecosystem functions." (Costanza et al, 1997:p-253)

The term "services" in the MEA definition reflects the tangible and intangible benefits that people can get from ecosystems. The origin of ecosystem services through natural and human-modified ecosystems derived from Costanza and his colleagues (Millennium Ecosystem Assessment, 2003). Throughout the years not only the Millennium Ecosystem Assessment studied the interactions between people and the environment and their effects on human wellbeing, but several other studies were also carried on (TEEB, 2010). However, the concept of ecosystem services is quite recent: the first time it was used was in the end of the 1960s (Helliwell, 1969; King, 1966). The terms "goods", "services" and "cultural services" were often treated distinctly, however the MEA decided to set them together as part of the same concept of "ecosystem services". This happened because it was hard to distinguish sometimes between "goods" and "services", as well as "cultural services" were occasionally forgotten (Millennium Ecosystem Assessment, 2003).

Based in other studies, the Millennium Ecosystem Assessment (2005) perceived four types of ecosystem services (TEEB, 2010), summarized in Figure 1: i) *provisioning services*, meaning the products people can acquire from ecosystems (food, fiber, genetic resources, biochemicals, natural medicines, pharmaceuticals and fresh water); ii) *regulating services*, corresponding to the services that manage the ecosystem processes (air quality, climate, water, disease, pest, erosion and natural hazard regulation, water purification and waste treatment and pollination); iii) *cultural services*, which refer to the "nonmaterial benefits people obtain from ecosystems through spiritual enrichment, cognitive development, reflection, recreation, and aesthetic experiences" (Millennium Ecosystem Assessment, 2005; p-40) (e.g. cultural diversity, spiritual and religious values, knowledge systems, educational values, inspiration, aesthetic values, social relations, sense of place, cultural heritage values and recreation and ecotourism); and, iv) *supporting services*, that are the basic services that support and allow all the other ecosystem services to function; people indirectly benefit from them unlike the other ecosystem services that are directly obtained by people (soil formation, photosynthesis, primary production, nutrient and water cycling) (de Groot et al., 2010a; Millennium Ecosystem Assessment, 2005; p-40).

With the fast grow rate of cities, it is important that city planners and political decision-makers comprehend and value urban ecosystem services and the ecosystems that supply them (Bolund and Hunhammar, 1999). A city with a structure and design that allow a better resource efficient could be possible with an ecosystem services growing awareness, and areas that are not explored can be manage or developed with a better knowledge of ecosystem services (Bolund and Hunhammar, 1999). Urban ecosystem services usually are vital and the only way to deal with some local problems, such as traffic, and increase urban life quality (Bolund and Hunhammar, 1999). Even though urban citizens are still depending on global ecosystem services, some ecosystems services that improve the life quality in cities, such as, air quality and noise levels, can only be improved by local generated ecosystem services (Bolund and Hunhammar, 1999).

Cities have a stressful environment for the residents with frenetic ways of living and few opportunities to rest and to enjoy (Bolund and Hunhammar, 1999), however green urban spaces provide many benefits: “opportunities for activity for older people; supervised child-care; health improvement and fitness motivation; education in sport, environment and other endeavors; and individual personal development” (Maller et al., 2009:p-65). Urban ecosystems recreational aspects are probably the most valuable ecosystem services, once all ecosystems supply cultural and aesthetics values to cities (Bolund and Hunhammar, 1999). According to Botkin and Beveridge (1997), for a great city and quality life for people, vegetation is a necessaire element.

Some studies show that a just few hours in green spaces can contribute with major benefits for human health and increase the economic productivity of society (Bowler, et al., 2010; Hartig, et al., 2003; Henderson and Bialeschki, 2005; Karmanov and Hamel, 2008). Also, the direct contact with nature is important specially to people that live in urban areas where this contact is more reduced (Daniel et al., 2012). However, there is a lack of studies about *cultural services* of ecosystems (CES) in cities, most of the studies are in the rural areas and in primarily national forests (Rall et al., 2017). Also, most of CES studies do not evaluate people’s perception and are only done by using proxy-based indicators, such as the use of land cover by green spaces and population data (Larondelle & Haase, 2013; Lautenbach, et al., 2011; Rall et al., 2017). The few studies that exist about people’s perception, focus only in one place, making hard to compare different valuations of CES (Rall et al., 2017). The fact that CES are intangible is another explanation for the lack of studies about them, because they are very difficult to measure. Nevertheless, there should be a boost in future researches about the topic (Milcu, et al., 2013). CES have brought attention in several publications and academic disciplines, however they are still not the target in research projects, being just considered as part of a broad analysis (Milcu et al., 2013).

Nevertheless, studies of CES are critical, since they help local decision-makers to better understand how to plan and manage urban green spaces, once cities are suffering huge pressure on their ecosystems and in municipality budgets (Rall et al., 2017). The lack of knowledge on CES makes it hard to give suggestions for UGS planning and management (Rall et al., 2017). Even though the

complexity on measuring CES perceptions, uses and values it is still possible to found patterns and relationships that helps urban management and planning and information for UGS planning (Rall et al., 2017).

The purpose of this study is to focus on the *cultural services* of ecosystems (CES) and to understand their role for people wellbeing in cities and how can sustainability and environmental policies be promoted at the city level to incorporate them. This study aims to understand people's perceptions of CES in one municipality in Portugal that has long been active in environmental policies. The research question therefore is: In which way citizens perception about CES can be a tool to improve the urban planning instruments?

The main objectives are: to map the perception of citizens about the role of CES in their city; to understand the different uses of CES in the urban green and blues spaces; and finally to understand how ecosystems services are considered in the spatial planning instruments and local public policies of that municipality in order to find opportunities for improvement and for strengthening the valorization of CES at the local level.

Focusing on a municipality that has long been pioneering in the assessment of provisioning, regulating and supporting services of their ecosystems is key to introduce this new element (the assessment of cultural ecosystems services) to address a gap that has so far not been tackle in this municipality and that is also underexplored in the literature. The use of a municipality with long tradition in environmental and sustainability policies can support the development of several guidelines for other municipalities that aim to foster the integration of people's perception of the non-material values of green spaces into urban planning and policies. Planning a better urban green infrastructure is as we have seen critical for climate change mitigation and human wellbeing.

2. Cities, Urban Green Spaces and Cultural Ecosystem Services

Cities are responsible for direct and indirect impacts on the planet in terms of energy use, land use, climate and continue grow of resource consumption, since they are predominant places where humans live (Burger, et al., 2019; Burger, et al., 2017; Galli et al., 2020; Moore, et al., 2013; Pearson, 2013). On the other side, cities are known as generators of innovation, wealth creation, human social interaction, participatory governance processes, economic development, more efficient resource management and more sustainable planning and policies (Bettencourt et al. , 2007; Galli et al., 2020; Lehtonen, et al. , 2016; Moavenadeh et al.,2002; Moore et al., 2013; Pearson, 2013). Human beings need cities that are able to supply multiple functions and the existence of green and blue spaces with an acceptable quality are fundamental parts to support or interrelate those functions (Byrd et al., 2017).

Urban green and blue spaces (UGS) are essential for cities to better function and to increase their quality of life once they may: i) provide recreation and health to the citizens; ii) improve the biodiversity and its conservation; iii) provide cultural identity; iv) improve and maintain urban environmental quality; v) are an important element of the city structure; and vi) allow the resolution of city problems through the nature (Branquinho et al., 2015; Sandström, 2002). They also provide multiple ecosystem services that are important for human wellbeing, such as i) air pollution reduction; ii) urban heat island effect reduction; iii) health benefits, like asthma or reduced mortality caused by health problems; iv) increased knowledge of ecology and more awareness of sustainability (Haase et al., 2014). The relation between ecosystem services and human well-being is on represented on figure 1. UGS can be used for physical activities such as sports, playing with kids or walk the dog; to relax; for painting; meeting other people; to enjoy nature; and help to reinforce social interaction between the residents as a meeting place (Kabisch and Haase, 2014). However, UGS can also have negative effects on urban residents, for example, some studies show that unmanaged and denser UGS provoke a feeling of insecurity on the population (Kabisch and Haase, 2014).

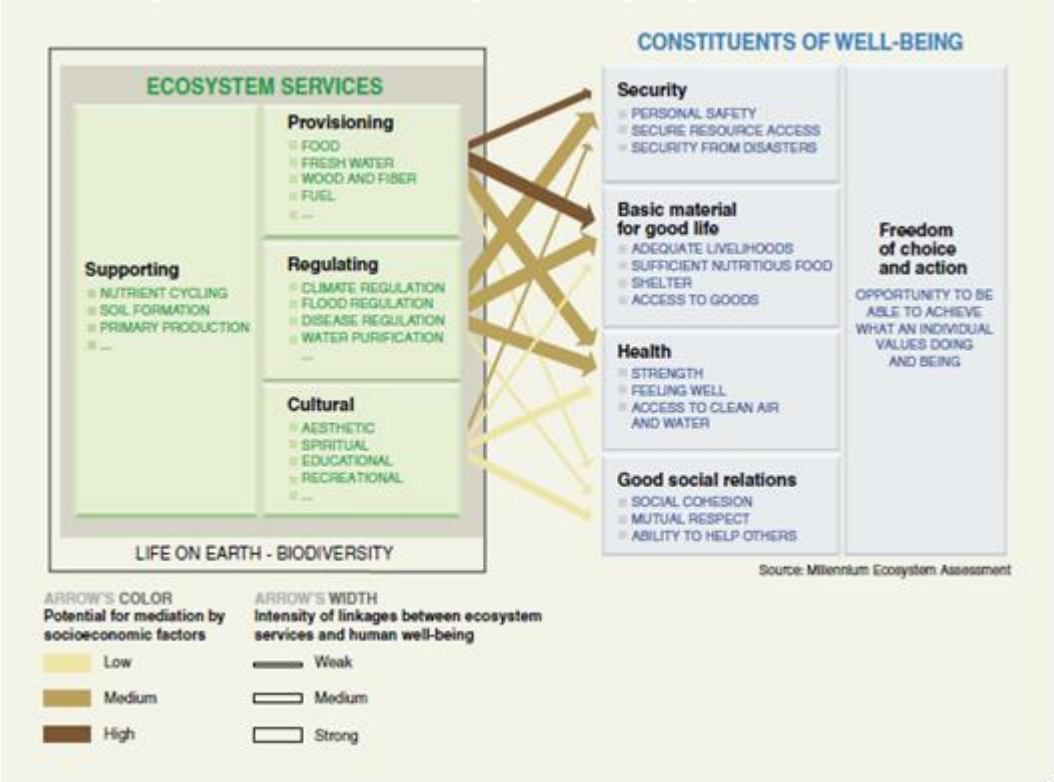


Figure 1 - Linkages between Ecosystem Services and Human Well-being.

Source: Millennium Ecosystem Assessment, 2005; Fig. A, p - iv.

According to Reil (2017:p-1) urban green are diverse and essentially, they can include "all vegetation found in a city – in parks, urban forests, roadside green and community gardens or on green roofs or walls." Urban green and blue spaces when they are linked, they are converted into urban green infrastructures (UGI) (Byrd et al., 2017). UGI can "also include blue spaces such as rivers, lakes or ponds" (Reil, 2017:p-1). There are several types of urban green and blue spaces (UGS) that are already considered in urban planning (e.g. mostly in public spaces) , but some do not receive so much attention , especially private green spaces such as gardens and urban farmlands (Hansen et al., 2017). Frequently, the contribution of different green places for UGI network is not well understood and because of this knowledge gap, a new green space typology was developed by the GREEN SURGE project (Hansen et al., 2017). This project made up a green space typology – Figure 2 - of 44 elements, divided in eight groups, and "linking them to scientific evidence on their corresponding ecosystem services" (Hansen et al., 2017:p-6). This typology made it possible to better understand the connections between green and blue spaces and the buildings around them (Hansen et al., 2017).

Figure 2 - Green Space Typology, made up of 44 green space types clustered in eight groups.

Source: Hansen et al. (2017:p-6).

UGI planning allow the development of green and blue spaces networks in urban areas which provide ecosystem services and other benefits. According to Byrd et al. (2017) some of those services and benefits can be:

- **Biodiversity protection:** Climate change has been increasing the loss of biodiversity, however since the release of the United Nation's Convention on Biological Diversity in 1992 that biodiversity protection has gotten more support. New initiatives emerged more recently, such as "UN's Strategic Plan for Biodiversity 2011-2020 and its Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Service, the EU's Biodiversity Strategy to 2020, and hundreds of plans at the local and regional level" (Byrd et al., 2017:p-6). Usually when urbanization is debated the impacts of cities on biodiversity are emphasized and some positive perspectives are often not so visible: cities can have a considerable number of species and habitat types, being placed in biodiversity hotspots and considered and protected in urban planning, and they can have

heterogeneous landscapes, which can make them more rich in biodiversity. Urban green infrastructures that are structured in planning and promote bigger ecological integrity can have lower management costs and less efforts. They are in fact key infrastructures for ecosystem resilience, higher biodiversity and ecological integrity.

- **Climate change adaptation:** It is urgent for cities to mitigate and adapt t to climate change, because cities are the center of direct risks caused by climate change, such as coastal erosion, flooding from heavy rainfall, heat extremes, effects on human health, bigger demand for heating and cooling, a decrease of water and food availability, or drought. Strategies to prepare cities for these possible negative effects are needed and UGI have a key role on those climate change adaptation and mitigation processes, once they are a source of ecosystem services.

- **Green economy support:** The existence of a global economic crisis with so many environmental challenges, enforces the need for an economy that strengths environmental sustainability instead of destroying it. Green economy intends to develop a better urban environment quality, decrease resource consumption, and create "opportunities for people to engage with each other and with their environment" (Byrd et al., 2017:p-6). UGI planning can leverage green economy efforts, since good urban green spaces may attract new residents, businesses, tourists, generate income (e.g. food and services industries, through leisure activities and events). Also, in terms of business, green spaces reduce stress for shoppers and increase foot traffic, which increase sales and staff motivation. It increases local food production and consequently sales at local markets and avoid costs once it generates healthier communities and reduces natural disasters.

- **Increase of social cohesion:** The existence of UGI, principally public spaces such as parks, allow the increase of social cohesion and provide the provision of meeting places for people to interact with each other and share interests. For that happen, it is necessary to create spaces, especially green public spaces, prepared to receive people with different backgrounds and give all the same opportunities and services access. The risk of social exclusion from these places is bigger when it comes to minorities, "whether through income level, ethnicity, nationality, language, religion, age or health status or who are otherwise vulnerable" (Byrd et al., 2017:p-6,7). For different reasons people tend to spend time in the places they most feel comfortable and have more easily access, so proximity and quality of neighborhoods are vital. Also, for people that have lower income it is important to have free green public spaces for them to be able to enjoy them, independently of their income. For example, urban areas with malls and pedestrian zones in commercial regions, should have those free green public spaces, since not all population can or want to spend money in shopping. With these examples we can

understand that UGI are important to combat social exclusion and to increase social cohesion, as a provider of free and accessible green public spaces for social interaction.

According to Byrd et al. (2017) and Hansen et al. (2017), a proposed framework for better UGI planning in order to improve social and ecological well-being of urban environments should consider four core principles:

i) **green-grey integration** - combination between green and grey infrastructure and the integration of infrastructures that have multi-functions solutions and several benefits (e.g. “tree lined streets can improve aesthetics and reduce noise and air pollution”) (Byrd et al., 2017:p-7). An example of a possible combination of green and grey infrastructures is the existence of public parks, where human constructions such as transportation routes, benches, public lavatories, and outdoor gyms can coexist with nature;

ii) **connectivity** - construction of green public space networks. Networks that are important to “support and protect processes, functions and benefits and individual green space cannot be provided alone” (Byrd et al., 2017:p-7). Connectivity prevents biodiversity fragmentation and guarantee the flow of services and benefits from UGI to people. There are two dimensions of connectivity, the “structural” dimension and the “functional” dimension. The “structural” dimension of connectivity is physical and there are physical changes that can be seen, for example, the “spatial structure of a landscape”, “physical connections between green spaces”, such as a road that crosses a nature reserve (Byrd et al., 2017:p-7). The “functional” dimension focus on the “perceptional and behavioral” aspects of various actors, humans or not, focus on the “social and ecological effects” (Byrd et al., 2017:p-7).

iii) **multifunctionality** – UGI capacity to supply various ecological, socio-cultural and economic benefits at the same time. UGI elements to not lose their capacity over time and are able to keep their functions. They should be assessed and accounted, once some conflicts and some trade-offs can happen between their functions. An example of that is the excessive use of a park for recreation or tourism, which can conflict with species protection. All functions and their beneficiaries must be considered to avoid incompatible functions, and “not only functions themselves and the associations between them that are important, but also their spatial and temporal dimensions” (Byrd et al., 2017:p-8). For example, to allow recreation and protect the species the park at the same time, a visitor management or agreements with the users, or zoning can be planned;

iv) **social inclusion and justice** - collaborative and participatory planning. UGI components have different characteristics and have different values for local authorities, active citizens, organizations or businesses. The governance model applied changes the benefits that UGI can give, therefore public and non-public actors should have a collaborative part on decision-making processes. Also, individuals and communities have different needs, and governance processes should be able to fulfill them and promote social inclusion through UGI.

Besides the main four core principles, other supporting principles must also be considered, which are: i) multi-scale – UGI planning pretend to link distinct spatial levels, from individual locations to metropolitan regions; ii) multi-object – despite property rights, urban green and blue spaces should all be part of a green infrastructure network; iii) inter- and transdisciplinary – UGI planning intends to unite disciplines, along with science, policy and practice, and can be better developed if involving local authorities and other stakeholders, and combining different types of knowledge, such as landscape ecology, urban and regional planning and landscape architecture (Hansen et al., 2017).

Cities are not only consumers of urban ecosystem services but also producers as observed on Bolund and Hunhammar (1999) study. Even though the promising social-ecological system have been studied in the past years to better understand how ecosystems and green infrastructures help to control climate changes effects, there is still a huge knowledge gap on this matter, especially on their impacts on quality of life for residents (Branquinho et al., 2015). Ecosystems services supplied by urban green spaces, as we have seen, can increase mental and physical health and well-being of urban citizens (Branquinho et al., 2015). In Branquinho et al. (2015) study, an empirical evidence of the functional links between UGS and cultural services, based on GREEN SURGE typology, was done (see Table 1).

Table 1 - Empirical evidence for the connection between UGS and cultural services.

Category	Green Space element	Recreation and mental and physical health	Tourism	Aesthetic appreciation and inspiration for culture, art and design	Spiritual experience and sense of place
Building greens	Balcony green				
	Ground based green wall				
	Façade-bound green wall				
	Extensive green roof	enhance overall human well-being		enhance the aesthetic environment	
	Intensive green roof				
	Atrium				
Private, commercial, industrial, institutional UGS and UGS connected to grey infrastructure	Bioswale				
	Tree alley and street tree, hedge				
	Street green and green verge				
	House garden	provide stress relief		are shaped by aesthetic desires	Positive memories of childhood are often linked to gardens and provide strong sense of place
	Railroad bank				
	Green playground, school ground				
Riverbank green	riverbank green	Structurally rich riverbanks are associated with psychological well-being			
Parks and recreation	Large urban park	contribute to the physical and psychological well-being			
	Historical park/garden				
	Pocket park	are used primarily for rest and restitution and socializing			
	Botanical garden/arboreta				
	Zoological garden				
	Neighborhood green space				
	Institutional green space				
	Cemetery and churchyard				
	Green sport facility				
	Camping area				
Allotments and community gardens	Allotment				
	Community garden	is associated with health benefits			enhance social capital
Agricultural land	Arable land				
	Grassland				
	Tree meadow/orchard				
	Biofuel production/agroforestry				
	Horticultures				
Natural, semi-natural and feral areas	Urban forests (remnant woodland, managed forests, mixed forms)	provide recreational opportunities, and have a positive impact on psychological wellbeing	are important for tourism.		can improve home and work environments and may have a strong cultural and historical value
	Shrubland				
	Abandoned, ruderal and derelict area				
	Rocks				
	Sand dunes				
	Sand pit, quarry, open Cast mine				
	Wetland, bog, fen, marsh				
Blue spaces	Lake, pond	Recreational opportunities are provided especially by water ecosystems			
	River, stream				
	Dry riverbed, rambla				
	Canal	Recreational opportunities are provided especially by water ecosystems			
	Estuary				
	Delta				
	Sea cost				

Source: Adapted from Branquinho et al. (2015:p-42-45).

It is important to “understand social cultural needs for services and identify locations where needs are unmet”, and not only to focus on the identification of the services available (Haase et al., 2014:p-420). Information about cultural ecosystem services such as reasons for use, perceptions, values, and physical or phycological wellbeing, are mostly obtained from the city population itself or urban green parks users (Haase et al., 2014). They are the critical sources to collect such subjective data.

The intangible and subjective features of CES are indispensable to human well-being and are part of the structures and functions humans need and want, and as such it is qualified as an ecosystem service (Millennium Ecosystem Assessment, 2005). As several studies prove, CES help to reduce the stress of urban population (Grahn and Stigsdotter, 2003; Ulrich, 1986; Ward Thompson et al., 2012), help to develop concentration and cognitive capacities (Gidlow et al., 2016; Kuo, 2001; Taylor and Kuo, 2008) enhance circumstances for physical activity (Coombes, et al., 2010; De Vries and Goossen, 2002) and boost social health (Kim and Kaplan, 2004; Kweon, et al., 1998).The identification, assessment and management of the different categories of cultural ecosystem services (CES) is therefore a challenge (Daniel et al., 2012).

The Millennium Ecosystem Assessment (2005) defined ten categories for cultural ecosystem services, namely: cultural diversity; spiritual and religious values; knowledge systems; educational values; inspiration; aesthetic values; sense of place; cultural heritage value; social relations and recreation and ecotourism. A summary of those categories is provided in Table 2 and we will explore them in more detail in the text.

Table 2 - Categories of cultural ecosystem services and their definition.

Categories	Operational definition
Cultural diversity	“The existence of a variety of cultural or ethnic groups within a society.”
Aesthetic values	“Enjoyment of scenery, sights.”
Spiritual and religious values	“Value related to sacred, religious, or spiritual aspects of natural places, where one might feel reverence for nature.”
Knowledge systems	“a body of propositions actually adhered to, whether formal or otherwise, which are routinely used to claim truth”
Educational values	“Enjoyment of opportunities to learn about, observe and experience nature”
Inspiration	“Value related to inspirational aspects of nature, where one might be stimulated with new thoughts, ideas or creative impulses.”
Sense of place	“the meanings and attachments an individual or group have about a certain place.”
Cultural heritage	“Value related to local history and culture as well as the identity a place creates.”
Social	“Value related to a site’s role as a meeting point for friends and family.”
Recreation and ecotourism	“Enjoyment of outdoor recreational uses such as biking, walking, running, swimming, fishing, playing sports, dog-walking, collecting wild herbs & fruits, or just getting away from it all.”

Source: Adapted from Rall et al. (2017), Plieninger et al. (2013), Oxford dictionary, Masterson et al. (2017) and Ericksen et al. (2005).

Cultural diversity in the Oxford dictionary is “the existence of a variety of cultural or ethnic groups within a society”. According to UNESCO (2002) in *Universal Declaration on Cultural Diversity*, cultural diversity is as mandatory for humanity as biodiversity is to the environment, and the humankind heritage should be recognized and preserved for the present and future generations welfare. Culture can have many shapes through time and space, and this diversity happens because of “uniqueness and plurality” of different groups and societies that exist in the world (UNESCO, 2002:article 1 of the declaration). With the existence of so many different societies it is important to have peaceful interactions between people and groups with distinct cultural identities for them to be able to live together (UNESCO, 2002). Social cohesion is important and for that happens, policies for the inclusion and participation of all citizens should exist (UNESCO, 2002). Human rights guarantee cultural diversity, and there cannot exist cultural diversity without the respect for human dignity and the protection of the minorities and indigenous people. Cultural diversity is possible when there is “freedom of expression, media pluralism, multilingualism, equal access to art and to scientific and technological knowledge, including in digital form, and the possibility for all cultures to have access to the means of expression and dissemination” (UNESCO, 2002:article 6 of the declaration). Cultural diversity is also on the base of development patterns, not only economic development, but also the intellectual, emotional, moral and spiritual (UNESCO, 2002).

Spiritual and religious values have different meanings. According to Walsh (2016) *religion* refers to “an organized institutionalized faith system with shared traditions, doctrine, moral values, and practices, a community of followers, and a belief in God or a higher power” (p-57). Spirituality according to Tanyi (2002:p-506), is “a personal search for meaning and purpose in life, which may or may not be related to religion”. It requires a linkage to “self-chosen and or religious beliefs, values”, and practices that provide signification to life, by that encourage people to accomplish their best self (Tanyi, 2002:p-506). Religion is more at a social-level experience and spirituality is more at an individual-level (Sirswal, 2016). The two concepts may not overlap, the fact that someone is spiritual does not mean it has to be religious, or that if someone is religious, they may not be spiritual (Dyson et al, 1997; Long, 1997; Oldnall, 1996; Tanyi, 2002). An example of how these two concepts, religion and spirituality, could not overlap is spirituality for an atheist (someone who does not believe in God) and for an agnostic (someone that is dubious about God’s existence), here spirituality is based on self-chosen values and goals and it is not based on their belief in God (Tanyi, 2002). An example on how these concepts overlap is in the case for Muslims and Christians, where spirituality is associated with religion (Rassool, 2000). People can be spiritual and be “religion free, culture free, bias free representation, which rests (sometime quietly) within the being, the self or the essence of each and every one of us as unique individuals” (Long, 1997:p-497). To non-religion and religion people there are still other belief systems: individuals might do their choices based in what they believe, believing or not in God, and that can be, for example their job or relationships with other people (Dyson et al., 1997). In terms of religion and spirituality in ecosystems, “many religions attach there spiritual and religious values to ecosystems and their components” (Millennium Ecosystem Assessment, 2005:p-

40). An example of that are the sacred areas that are marked with religious symbols, like flags (Daniel et al., 2012). This sacred areas and totems are used to create protection areas in forests, caves, rivers, lakes or springs by controlling the use and management of this places and their resources and biodiversity (Schaaf, 1999; Wild and McLeod, 2008).

Knowledge systems is according to Feyerabend (1987), on the book - Farewell to reason – "a body of propositions actually adhered to, whether formal or otherwise, which are routinely used to claim truth" (Ericksen et al., 2005:p-89). Knowledge is a "construction of a group's perceived reality" that group members use to orientate their actions between them and the world around them. Knowledge systems have a social context and where environmental knowledge is sometimes meaningful for a group identity (Ericksen et al., 2005:p-89). Science can be a systematized knowledge that can be duplicated and corroborated through academic review in a community of experts that belong to research institutions (Ericksen et al., 2005) and it is considered a formal knowledge (Hassan et al., 2005). There is also other knowledge systems which are influenced by ecosystems that are the traditional knowledge: *indigenous knowledge*, *traditional ecological knowledge*, and *local knowledge* (Ericksen et al., 2005). *Indigenous knowledge* is the local knowledge that indigenous people have or the local knowledge that is specific to a certain culture or society (Ericksen et al., 2005); *traditional ecological knowledge* is "a cumulative body of knowledge, practice, and belief, evolving by adaptive processes and handed down through generations by cultural transmission, about the relationship of living beings (including humans) with one another and with their environment" (Berkes, 2008, p-7)*; local knowledge* is the place-based experiential knowledge for some scholars, this term is "used to express knowledge that is acquired by formal education or book-learning" (Ericksen et al., 2005, p-90). Knowledge systems and how people use knowledge is important when it comes to decision-making processes, managing resources, interpreting and implementation a national policy at the local scale, etc., once they bring information to decision-makers, being a tool for them (Ericksen et al., 2005).

Educational values in several societies are obtained through "ecosystems and their components and processes" (Millennium Ecosystem Assessment, 2005:p-40). According to Mocior and Kruse (2016, p-138), "educational values are understood as both biotic and abiotic features of the natural environment (ecosystems or landscapes) which can be potentially used to acquire knowledge about the structure and functioning of the current and paste natural environment". Mocior and Kruse (2016) defined two concepts related to educational values and ecosystem that were missing in the literature, which are "landscape educational values" and "educational ecosystem service". *Landscape educational values* as "the potentials of landscapes and ecosystems which they provide to the education service (i.e., opportunities for formal and informal environmental education)", and *educational ecosystem service* that is the opposite of the landscape education values, once it is the "real usage of landscape values for educational purposes" (Mocior and Kruse, 2016:p-138). People can learn through nature by observing a landscape on a touristic or recreational activity, for example hiking or groups with a teacher or tour guide visiting certain ecosystems for learning aim (Mocior and

Kruse, 2016). Landscape educational values assessments should be done in areas that require educational ecosystem services, and there are advantageous for land-use planning principally in places with educational infrastructures (Mocior and Kruse, 2016).

Ecosystems also provide *Inspiration* for art, folklore, national symbols, architecture, and advertising (Millennium Ecosystem Assessment, 2005). In the Oxford Dictionary, inspiration is "the process of being mentally stimulated to do or feel something, especially to do something creative", this definition is used by Coscieme (2015) to describe inspirational values. An example of inspiration provided by ecosystems is the study of Coscieme (2015:p-122,123) about inspirational value of ecosystems in popular music that concluded that music industry "benefits from nature as a source of inspiration" and that ecosystems were responsible for "0,6 billion dollars to the music industry from 2003 to 2014", being lakes and tropical forest the ecosystems with the bigger inspirational values.

Aesthetics are often considered as CES (Millennium Ecosystem Assessment, 2003, 2005), but there is a lack of operational definitions to orientate assessments (Daniel et al., 2012). According to different authors, urban parks, green spaces, scenic drives, housing location, esteem of natural scenery and the land use and cover of forested or agricultural open spaces are related with aesthetics value, being the visual landscape aesthetics the highlight, mainly the scenic beauty (Daniel et al., 2012; de Groot, et al., 2010b; Gobster, et al., 2007; Millennium Ecosystem Assessment, 2003).

Sense of place is described by Tuan (1977) as the meanings and attachments an individual or group have about a certain place (Masterson et al., 2017). Sense of place valued by most people is connected to the characteristics of the environment and aspects of the ecosystems (Millennium Ecosystem Assessment, 2005). The place attachment that is part of the sense of place is the normally positive emotional bond that people or groups of people have about their environment that can be separated in two domains: dependence and identity (Altman and Low, 1992; Masterson et al., 2017). Place dependence is the connection between people and a place, and the capacity of a place to promote a goal achievement and to please people's needs, and place identity are the individual's dimensions that allow an individual personal identity regarding to nature (Masterson et al., 2017). Place meaning is the opposite of attachment, meanings can be: 1) "are descriptive statements (cognitions, in social psychological terms) about what a place is, what it is like, and the kinds of images it conveys"; 2) a set of adjectives, i.e., "answers to what kind of a place a setting is: polluted, lonely, warm" or less "descriptive" and more "interpretive or symbolic", i.e., "what symbolically, does a place mean: Home? Escape?"; 3) a place character, a "given setting can be a tourist place, or a wilderness, for example" (Masterson et al., 2017:p-48). Sense of place is used in cultural assessments of ecosystem services and their management for a better planning and an indicator of well-being that derive from ecosystems (Masterson et al., 2017). An example is the identification of priority areas to people for environmental conservation and management (Raymond et al., 2009) and advise planning of land-use (Brown and Raymond, 2007).

Cultural heritage according to Czepczynski (2008, p-54) is “the legacy of physical and mental artefacts and intangible attributes of a group or society that are inherited from past generations, maintained in the present and bestowed for the benefit of future generations”. Personal, familiar and collective (local, regional, national) meanings are usually linked with powerful emotional values that are supported by cultural landscape (Czepczynski, 2008). Cultural landscapes are containers of cultural values which contributes to communities’ identity and are defined by the relation between places and human influences (e.g. property distribution, cultivation, nature conservation) (Daniel et al., 2012). Even modified ecosystems can obtain cultural significance, for example the “classic pastoral landscapes of England, terraced landscapes in Portugal, Alps, heath lands in Northern Europe, and orchard meadow in the temperate regions of Central Europe” (Daniel et al., 2012:p-8814). Preserving cultural heritage helps to preserve other ecosystem services, and an example of that is the management of small scales places with traditional techniques that bring elements (e.g. trees, hedgerows, etc.) to the ecosystems, elements that increase the resilience, productivity and the landscape beauty (Daniel et al., 2012). Also, in the cultural heritage category is included both intangible and tangible features that humans can obtain from ecosystems, such as “cultural activities on the landscape (e.g. rice paddies, viticulture terraces)” as tangible features and “myths, legends and religious practices” as intangibles features (Daniel et al., 2012:p-8814).

Social relations that are settled in some cultures are influenced by ecosystems, and the existence of good social relations happens when occurs social cohesion, respect for each other, the capacity to help others and provide for children (Millennium Ecosystem Assessment, 2005). The social relations that exist in certain cultures are shaped by the ecosystems, for example fishery or agriculture societies (Millennium Ecosystem Assessment, 2005). In fishery societies the bond and the affinity to the coastal areas are part of the social network since it is passed through the generations (Kilonzi and Ota, 2019). The relation between individuals also allow the preservation and protection of the cultural heritage once there is a passage of cultural information across generations (Kilonzi and Ota, 2019).

Recreation and ecotourism are a way to link people with ecosystems, enhancing the concern for and protection of ecosystems (Daniel et al., 2012). Ecotourism definition according to Lee (2019, p. 69) based on Blamey (1997) and Donohoe and Needham (2006), is a “form of tourism that protects ecological resources and respects the ecological life and beliefs of residents; tourists are even educated about the latter”. Cultural services can be preserved through economic incentives derived from ecotourism, however if not well managed, ecotourism can degrade the ecosystems (Millennium Ecosystem Assessment, 2003). A direct way to obtain cultural benefits are recreational activities, such as camping, walking and nature study (Idem). Recreation and ecotourism can have both positive and negative effects. Positives effects such as physical exercise, aesthetic experiences, intellectual stimulation, inspiration and contributions to human well-being (Idem). Negatives impacts are, for example, wildlife disturbance, habitat fragmentation, traffic emissions and infrastructure developments for tourism, just to name a few (Daniel et al., 2012; Liddle, 1997; S. E. Reed and Merenlender, 2008).

The nature of human relationships has been shaped by factors such as ethics, religion, etc. (Hassan et al., 2005). Human relationships change according to their culture, and their cultural identity is shaped by societies interaction with the environment that surround them (Hassan et al., 2005). The fact that people are getting away of their traditions and lands, it causes degradation and overexploitation of ecosystems, which drives to poverty and loss of cultural identity (Hassan et al., 2005). Ecosystem management should be established on cultural ethos to avoid social disruption, ecological degradation and to not harm people's well-being, especially the marginalized societies (Hassan et al., 2005). It is important a reconnection between ecology, economics and ethics to ensure that human well-being and cultural identity stay connected with ecosystems (Hassan et al., 2005). Cultural ecosystem services "are as important as other services for many local communities" (Millennium Ecosystem Assessment, 2005:p-60). Nature and ecosystems has always molded humanity cultures, knowledge systems, religions, heritage values, and social synergies (Millennium Ecosystem Assessment, 2005). Two examples of the human relation with nature and the supply of cultural ecosystem services are the protection of sacred areas by local villages in India because of spiritual reasons, and the provision of cultural ecosystem services by urban parks to cities residents (Millennium Ecosystem Assessment, 2005). In order to protect ecosystems and their services there must exist an effective management of them (Millennium Ecosystem Assessment, 2005). An effective management of ecosystems needs a "place-based" knowledge, traditional knowledge and practitioners' knowledge from local citizens. These types of knowledges are rarely part of decision-making processes (Millennium Ecosystem Assessment, 2005:p-24).

Plieninger et al. (2013) and Rall et al. (2017) both mapped cultural ecosystem services through people's perceptions, however not all CES were mapped. Rall et al. (2017, p-82) did not map *sense of place* and *knowledge systems* because they adapted the typology and definitions "to be meaningful to local residents" since they considered them "too ambiguous for most urban residents". Plieninger et al. (2013, p-120) decided to exclude *cultural diversity* and *knowledge systems* once they felt "unable to translate these services into indicators or questions that would be meaningful to landscape users at local level". On the other side, negative factors that affect the benefits people can take from urban green public spaces were added by Plieninger et al. (2013, p-120), such as, unpleasantness ("sites that are neglected, abused, damaged, or unpleasant"); scariness ("sites that feel dangerous or threatening"); and noisiness ("sites that are disturbingly noisy"). Rall et al. (2017) added biodiversity as a service to check its relative importance and compare with other cultural services. The type of uses of urban green and blue public spaces by the local population was mapped in both studies (Plieninger et al., 2013; Rall et al., 2017). Rall et al. (2017) concluded that with the increase of land pressure and users of urban green public spaces it is important to provide quality in those areas for a better life quality in cities.

Even though the increasing concern and use of concept of ecosystem services on the planning and management of cities, there is still a huge lack of knowledge about CES perceptions and values, especially place-based perceptions (Rall et al., 2017). Rall et al. (2017) study helped to fulfill these gap knowledges, and they found out that cities can provide CES, as much as rural areas and they have one of the largest CES hotspots. However, more studies should be done in this area, in terms of mapping CES to benefit urban planning, design and management. The study of Plieninger et al. (2013) concluded that there should be a stronger awareness about the importance of CES to nature conservation and protection in urban areas, since these services are highly appreciated by people, being instigators for land management and conservation. CES also help to foster ecosystem services management in terms of multifunctionality and to avoid "the tendency to design incentive tools for individual ecosystem services in isolation", an unwanted side-effect of other ecosystem services (Plieninger et al., 2013:p-127).

In the next chapter, it will be discussed another approach that distinguish ecological, socio-cultural and economic benefits and values, the importance of social valuation for intangible and non-material values, ecological economics as a new discipline and its difference from environmental economics, which valuations are better for cultural ecosystem services, types of social valuation methods, and decision-making processes.

3. Valuation, Ecological Economics and Decision-making processes

The use of the concept of ecosystem services (ES) by policy makers and the business community was fomented with the Millennium Ecosystem Assessment release, yet the practical use of the concept in planning and decision-making has been slow (TEEB, 2010). The failure on the capture of ecosystem services values by markets and systems of economic analysis it is not the only reason for the slow progress on the practical use of the ES concept (TEEB, 2010). There are several other reasons, deriving from the lack of understanding in: i) the interconnection between different services, biodiversity role and the diverse ecosystem functioning components; ii) the influence of humans actions in ecosystems, changing provisioning ecosystem services; iii) potential services trade-offs; iv) "the influence of differences in temporal and spatial scales on demand and supply of services"; v) which institutions and type of governance are better to guarantee biodiversity conservation and the long-term "sustainable flow of ecosystem services" (TEEB, 2010:chapter 1, p-4).

Because of the lack of attention by the MEA on the economics of ecosystem change, a recent economic framework was created in order to contribute with more and higher quality data and "understanding of the (economic) significance of these losses and the consequences of policy inaction on halting biodiversity loss at various scales (global, regional and local)" (TEEB, 2010:chapter 1, p-5). This was called the – TEEB initiative – The Economics of Ecosystems and Biodiversity (TEEB, 2010).

Ecological, socio-cultural and economic benefits and values of ecosystems were distinguished by the TEEB framework, using the MEA approach as a base (TEEB, 2010). Figure 3 is a schematic representation of the TEEB proposition about to change the "pathway from ecosystem structure and processes to human well-being" (TEEB, 2010: chapter 1, p-11).

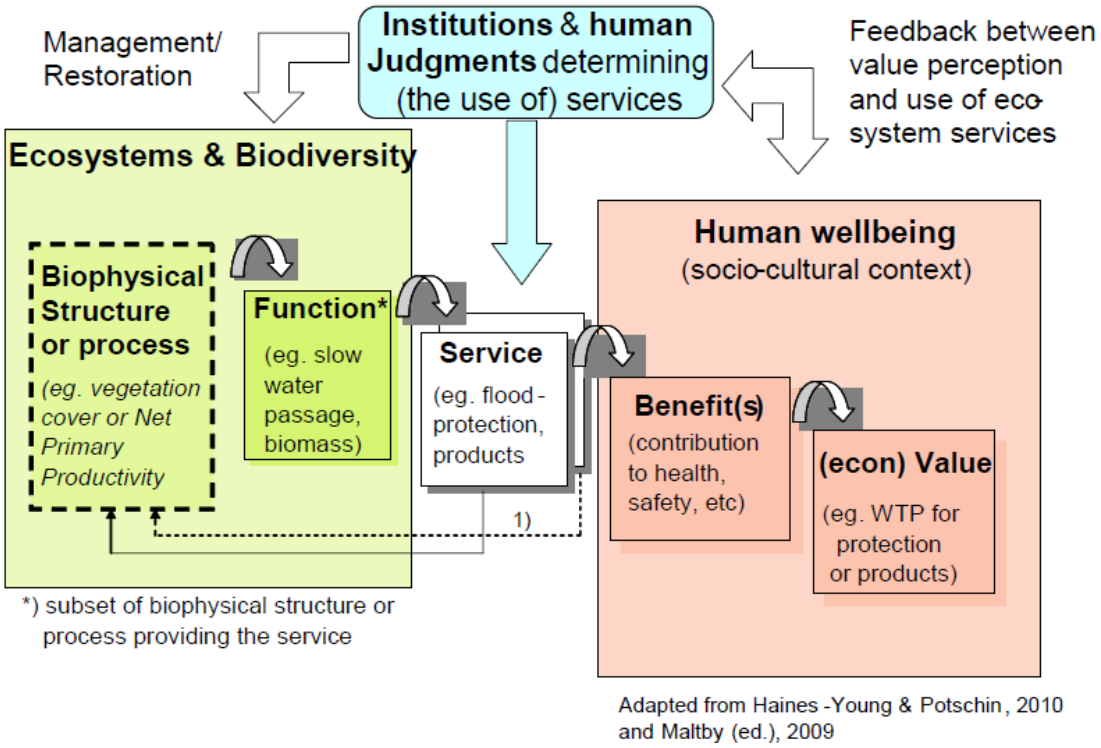


Figure 3 - "Pathway from ecosystem structure and processes to human wellbeing".

Source: TEEB (2010, p-11) adapted from Haines-Young and Potschin (2010) and Malby (ed.) (2009).

Figure 4 is the conceptual framework adopted by TEEB (2010: chapter 1, p-15), which starts with the categorization of ecosystem structure, processes and functions in the upper-left hand box. The synergies between the processes that sustain an ecosystem' capacity to supply services, and the ecosystem structure are designated as *ecosystem functions*. Those synergies "may be physical (e.g. infiltration of water, sediment movement), chemical (e.g. reduction, oxidation) or biological (e.g. photosynthesis and denitrification)". "Biodiversity" is more or less part of them all (TEEB, 2010:chapter 1, p-19). The typology proposed by TEEB based in the MEA classification, is the existence of 22 ecosystem services that are divided in 4 categories: i) provisioning; ii) regulating; iii) habitat; and iv) cultural and amenity services (TEEB, 2010). The main difference is the exclusion of the supporting services, such as nutrient cycling and food-chain dynamics that are seen in TEEB as part of the ecological processes. This service is substituted by the *Habitat Service*, which give importance to the provision of habitat by ecosystems to "migratory species (e.g. nurseries) and the gene-pool protectors (e.g. natural habitats allowing natural selection processes to maintain the vitality of the gene pool)" (TEEB, 2010:chapter 1, p-19). In TEEB (2010), there is a difference between economic, social-cultural and ecological benefits and values, and also a clear distinction between the concepts benefits and values. Benefits are the fulfilled needs that people have, (more or less) "objectively measurable" (e.g. "catching fish from the ocean give us food (health), but also more associated with cultural identity (as a fisherman/-woman) and income") (TEEB, 2010:chapter 1, p-22). Values of those benefits are

subjective for example, some people give more value to material wealth comparing to their cultural identity, others it is the opposite (TEEB, 2010). Therefore, the same benefit can have different values, so for each existing benefit there are three types of values and valuation metrics which are ecological, values, socio-cultural values and economic values (TEEB, 2010).

Decision-makers must face the dilemma of how to balance all types of values at all levels: private, corporate or government levels. Therefore, all the value-components should have importance of qualitative and quantitative dimension (TEEB, 2010). “However, since TEEB is focusing on the economic, notably monetary, consequences of the loss of biodiversity, concentrates TEEB on aggregation and economic trade-off issues” (TEEB, 2010:chapter 1, p-24). “The role of ecosystems services in environmental-economic accounting” should also be mentioned “to inform economic decisions”; and for last the importance of the decisions by producers and consumers, as so their “awareness raising and positive incentives” (TEEB, 2010:chapter 1, p-24,26) .

The last box in the figure 4, is the scenarios and drivers of change. All efforts to change human behavior to protect ecosystems and the biodiversity must take into consideration that ecosystems are not static and are affected by the changeable environments (TEEB, 2010). There are both direct and indirect drivers of ecosystem change. Indirect drivers can be demographic shifts, technology innovations, economic development, legal and institutional frameworks (policy instruments), loss of traditional knowledge, cultural diversity, etc. Direct drivers are divided in negative (e.g. habitat destruction, over-use of resources, pollution), neutral (e.g. land use change, that can have “positive and negative consequence for ecosystems and biodiversity”) and positive (“enhancing natural capital that include ecosystem conservation and restoration, development of sustainable management regimes and use of environmental-friendly technologies”) categories (TEEB, 2010:chapter 1, p-27).

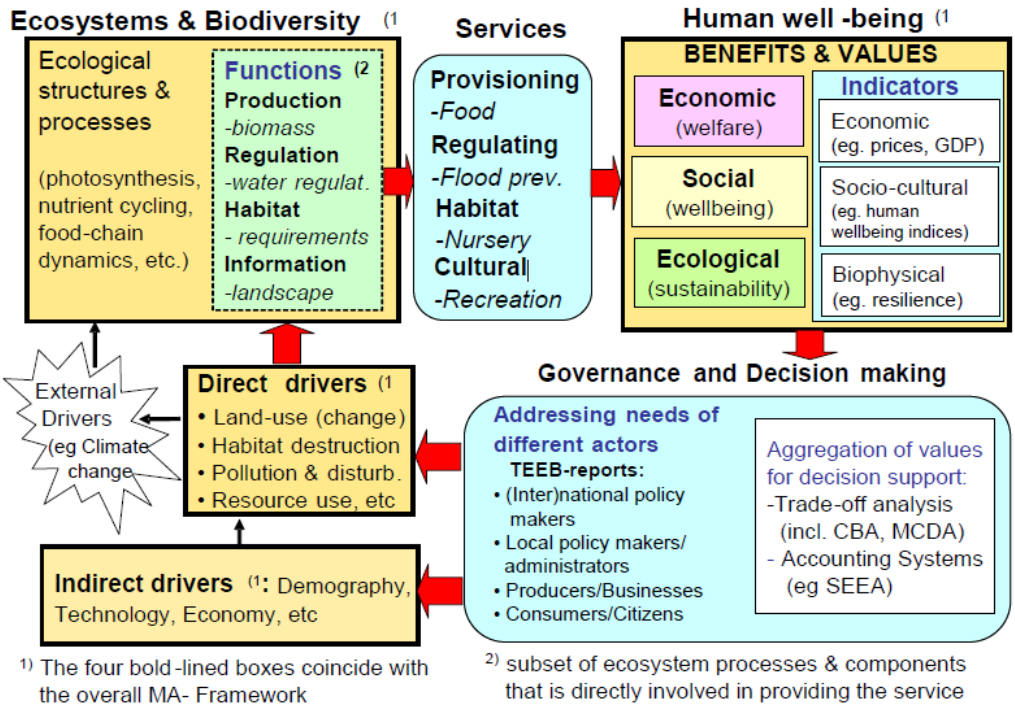


Figure 4 - Conceptual Framework of TEEB for linking ecosystems and human wellbeing.

Source: TEEB (2010:p-15).

According to TEEB (2010), even when economic valuation covers intangible values, such as the ones enumerated before, this valuation it is not enough to capture all socio-cultural and non-material values. New metrics have been developed to measure the socio-cultural benefits and values to support decision-makers, such as the Human Wellbeing Index (HWBI) that can be used at all levels: national, regional or local level (Summers et al., 2014; TEEB, 2010). The HWBI was developed by the US Environmental Protection Agency (EPA) to characterize human wellbeing at multiple scales (Summers et al., 2014). This index evaluates "the influence of social, economic and environmental service flows on components of human well-being in an integrated fashion based on eight domains (the domains are: 1) connection to nature; 2) cultural fulfillment, 3) education, 4) health, 5) leisure time, 6) living standards, 7) safety and security, and 8) social cohesion) of well-being", through different measures (Summers et al., 2014:p-3916). The HWBI helps decision-makers to understand how alternative polices and actions can affect sustainability, and how they use human health, socio-economic, environmental, and ecological factors to foment sustainability in natural and human made environments (Summers et al., 2014). The HWBI is able to identify: i) environmental, economic, and social important tendencies that indicate changes in the environment; ii) "to the extent possible, the thresholds of sustainability for such indicators; and" iii) performance metrics that identify if the approaches to increase sustainability are working as supposed (Summers et al., 2014:p-3916).

For an efficient management of ecosystem services is vital to know their value, in order to design economic incentives to protect and support them, such as systems of payment for the ecosystem services (Costanza et al, 2014; Farley and Costanza, 2010). Each time a decision that involves trade-offs of ecosystems and their services are made, they are being valued (Costanza, Sutton, et al., 2014). Valuation is intended to give importance to diverse items, to attribute a rank of importance to the items, to show the trade-offs between different options (objects, scenarios, policies, etc.) and to inform decision-making processes (Kronenberg et al., 2017).

The problem is that decisions usually have the valuation implicit but not exposed, and an effort to make valuation of ES more transparent and explicit can allow better decisions (Costanza, Sutton, et al., 2014). For example, contingent valuation surveys, that is one of the techniques of the stated preferences approach (that "simulate a market and demand for ecosystem services by means of surveys on hypothetical changes in the provision of ecosystem services" and are used for ecosystem services valuation (TEEB, 2010:chapter 5, p-20)), uses surveys to "ask people how much they are willing to pay to preserve or improve the environment (willingness to pay) or how much monetary compensation a person is willing to accept for loss of environmental amenity (willingness to sell)" (Beder, 2011: p-142). However, usually surveyed people are not aware of all the information about the decision they have to take, such as, the real ecological value of wetland area that people may think is unattractive or worthless (Beder, 2011).

Valuation methods that try to find a price for the environment, as contingent valuation, are anthropocentric and do not consider other species (Beder, 2011). For environmentalists, principally ecologists, this is "unacceptable and arrogant" (Beder, 2011: p-142). The realization that "improvements in environmental policy and management and protecting the well-being of futures generations" were needed lead to the creation of the International Society for Ecological Economics (ISEE), in 1987, and to the launch the *Ecological Economics* journal, in 1989 (Costanza, Cumberland, et al., 2014: p-56,57; Spash, 1999) that aimed to join economists and ecologists.

Ecological economics (EE) represents "a commitment among economists, ecologists, and others, as academics and as practitioners, to learn from each other, to explore new patterns of thinking together, and to facilitate the derivation and implementation of new economic and environmental policies" (Costanza, Cumberland, et al., 2014: p-57). Also, EE recognizes that the Earth has physical limits, is non-growing, and that the humanity should minimize consumption levels because economy as a subset of a finite global system, in a material way, does not grow unlimitedly (Costanza, Cumberland, et al., 2014).

On the other hand, environmental economics believe that new technologies can replace ecological services and will prevent the lack of resources (Costanza, Cumberland, et al., 2014). The social and natural scientists that were the initiators of the ecological economics discipline highlighted that "nature, society and culture co-evolve and that human behavior cannot be understood only in

terms of the *economic man*" (Ropke, 2005: p-267). Valuation for socioeconomics interested in ecological economics became an essential topic (Ropke, 2005).

Environmental valuation can be subdivided into different values that are related to ecosystem services. The basis of these values that are part of the environmental valuation are subjective (Table 3) (Hejnowicz and Rudd, 2017).

Table 3 - Ecosystem Service Value Classification

Value focus	Value category	Definition	Value type	Definition
Nature	Non-Anthropogenic—Intrinsic	Value is "non-derivative" and subjective, arising because it has been attributed value based purely for its own sake (e.g., in the words of either a "non-negotiable transcendental", an "identity value" or an attribution to "moral subjects").	Intrinsic (non-use)	The inherent value of a naturally existing environment or life form irrespective of its market worth.
Good Quality of Life	Anthropocentric—Relational	Based on moral/ethical precepts—held values.	Existence	Value attached to the knowledge that ecosystem services (including biodiversity and environments) exist irrespective of whether they are utilized.
			Bequest	Follows the sustainability criteria of the Bruntland commission, in that it concerns the willingness to pay to maintain the good condition of the environment for present and future generations.
			Altruistic	Value associated with the present generation benefiting from biodiversity and ecosystems.
			Transcendental	Relates to end states and behaviors above and beyond specific situations and contexts.
			Societal and Cultural	Based on common concepts of hared ideals, virtues and principles in relation to meaning and worthiness. Grounded within and developed through a cultural context and lens, related to social institutions and generally shared and held society wide. Includes lower level variations such as communal and group values.
Nature's Contribution	Anthropocentric—Instrumental	Value is derived from an object's capacity to achieve a given purpose—to be functional. Instrumental values are not	Market	The value of a commodity/good or service garnered in an open market. So-called "exchange" value. To be exchanged goods

to People		absolute as values can change depending upon on how an object is used in each context. The use value of an object is therefore subject to moral precepts (e.g., deontological, consequentialist, utilitarian).		must be regarded as scarce and considered useful. Value is derived from transactions, thus market price reflects utility. Exchange value provides a measure of the utility of a flow of goods from a stock, so-called marginal utility, not the utility of a stock of goods.
			Direct Use Value	The value attached to products and services provided by nature for direct consumptive (e.g., timber and food) or non-consumptive use (e.g., recreation and aesthetic experiences).
			Indirect Use Value	The value attached to indirect utilization of ecosystem services, through the positive externalities that ecosystems provide (e.g., flood protection and carbon sequestration).
	Anthropocentric —Inherent	Value is linked to the utility of objects (e.g., species, ecosystems etc.) that derives from a good not being substitutable, having a value for its own sake, but also providing end values.	Intrinsic (use)	Commodity values with little market recognition, but still recognized as having use-value.
			Meta-physical/ Option	Value based on the present willingness to pay for the utilization of a particular asset in the future, current likelihood of using it is highly unlikely.

Source: Hejnowicz and Rudd (2017:p-4), adapted from other studies.

There are different value dimensions, such as monetary, ecological and social, even though values usually are more associated with money and economics in the general discourse. As such, there are multidimensional frameworks for debating the value of nature, like resilience, sustainability and biocultural value (Kronenberg et al., 2017). Monetary valuations are criticized because they do not take into account the less tangible, non-material and non-use values (Kronenberg et al., 2017). Some *CES* are hard to value in economic terms, such as spiritual values, culture identity, social cohesion and heritage values. Therefore, they are not being used on most of ES planning and management (Chan, Guerry, et al., 2012).

Cultural nonmaterial or intangible dimensions sometimes can be more important to society when compared to material benefits (for example money or shelter). An example of that situation is fishing, that besides providing food also provide a way of life that have ethical, political and/or spiritual features (Chan, Guerry, et al., 2012). Using the fishing example, a decision cannot be taken using only monetary valuation once it does not properly represent all CES (Chan, Guerry, et al., 2012). Therefore, the lack of a good valuation framework for CES weakens the entire ES framework (Chan, Guerry, et al., 2012).

Monetary valuations methods can be direct or indirect (Kronenberg et al., 2017). The intent of direct valuation methods is to use questionnaires to obtain values through questions with hypothetical scenarios, where surveyed people inform their willingness to pay for the different options, so, their preferences. An example of a direct monetary method is the – Choice Experiment. This method is an improved type of contingent valuation (Kronenberg et al., 2017). Choice experiments "make it possible to disaggregate willingness to pay for a good into willingness to pay for its attributes" (Kronenberg et al., 2017:p-16). They are used in conservation activities, for cost-benefit analyses that are concentrated on the exiting trade-offs among environmental conservation and infrastructural or other projects (Kronenberg et al., 2017). In urban contexts, a typical application of the choice experiment method is asking people which designs or amenities they would be willing to pay for an urban green public space (Kronenberg et al., 2017).

Indirect valuation methods use secondary data from the market and analyze these data (Kronenberg et al., 2017). An example of an indirect monetary method is Hedonic Pricing. This method demonstrates to "what extent real estate prices result from the different attributes of the relevant properties" based on a vast sample of real estate data and econometric analysis (Kronenberg et al., 2017:p-14). It can be applied in any product/service and then be separated in different characteristics, as long as the characteristics represent the environment, from mineral water to real estate (Kronenberg et al., 2017). The value is connected with "people's willingness to pay for selected amenities", as well as environmental characteristics, for instance closeness to green spaces near where they live (Kronenberg et al., 2017:p-14). The data is collected through the reflection of real state buyers' predilections, for example by looking at the surrogate market instead of asking people preferences, and an example of a typical application of this method is the analysis of which influence green public spaces have in the prices of the real estate (Kronenberg et al., 2017).

Non-monetary ecological valuation method is an "evaluation of the degree to which an ecosystem component contributes to an objective or condition, such as an ecosystem service" (Farber, et al., 2002; Kronenberg et al., 2017:p-23). The importance of biophysical indicators for political processes is recognized since they inform the policy process and overcome "the duality between neglected biodiversity as a policy issue" and an optimistic economic discussion (Spash and Aslaksen, 2015:p-251). However, traditional ecological approaches by themselves are not prepared to deal with social and economic features, being necessaire a social economic approach that can perceive what is causing the biodiversity loss and ecosystems destruction, such as: "political systems failure (despotism, corruption, regulatory capture), greed, the industrial – military complex, political and economic power of multinational corporations, poverty, pressures on land use, and population growth" (Spash and Aslaksen, 2015:p-251). Ecological valuation methods are normally called as "assessments" instead of "valuations" once they "only include a quantification and no inherent preference" (Kronenberg et al., 2017:p-23).

Therefore, ecological assessment methods include “field surveys and monitoring” and are associated with environmental management or policy, once they are adopted to “inform environmental objectives and targets, or compliance with environmental legislation, at local, national or international levels” (Kronenberg et al., 2017:p-23). An example of an ecological assessment method is Species Richness (Kronenberg et al., 2017). This method is a biodiversity survey that is used to build a better knowledge of ecological character a quality of different places (Kronenberg et al., 2017). It allows to know how many species exist in a location and to compare with others, and can also be calculated to any taxon, all type of biodiversity at any ecological level (not just species), and the data can be used for other analysis (Kronenberg et al., 2017). Data is obtained through field surveys and monitoring, demanding an expert to identify the species and a typical application is the specie richness of birds in a park or a garden (Kronenberg et al., 2017).

According to Kronenberg et al. (2017), social valuation methods are inferred as non-monetary approaches that apprehend people’s predilections, making possible to describe how people understand and rank diverse options, objects or actions. They are useful for cultural benefits that people obtain from ecosystems (Chan, Guerry, Balvanera, Klain, Satterfield, Basurto, et al., 2012). “Social values can be individual or shared” and usually they “can reflect the public good value of nature” (Walz et al., 2017:p-4) Being also more inclusive comparing to monetary valuations in terms of obtaining people preferences and more easy to apply (Kronenberg et al., 2017). In countries where data about ecosystem services is deficient, social valuation methods are a significant support comparing to more resource-intensive valuations (Christie et al, 2012; Pandeya et al., 2016). “Social valuation methods can be based on the collection and analysis of primary data, e.g. through various questionnaires, observations, discussions and deliberative processes, but also on the analysis of secondary data, e.g. through document analysis” (Kronenberg et al., 2017: p. 35). According to Walz et al. (2017:p-4), social or social-cultural values of ecosystem services or ecosystems can be utilitarian and experiential – “how much people like to use or actively enjoy the ecosystem” - or can be intangible and related to transcendental or principle based value - “how much people appreciate the existence of the ecosystem” and if future generation can use and appreciate them.

The importance of social valuation is that it can make “people’s opinions, beliefs and preferences visible in the decision-making processes” (Walz et al., 2017). Also, to find good solutions in terms of collective (local, regional, national) planning, natural resource management and nature conservation; participatory and consultation processes are a good method (Reed, 2008; Walz et al., 2017). Social valuation processes should involve several stakeholders (landowners, environmental managers, NGOs, organized interest groups, decision-makers, experts or the affected public) (Idem). A huge potential of social valuation is the ability to identify and measure non-material ecosystems services, once that knowledge can be essential for the creation of solutions in environmental planning (Walz et al., 2017).

Besides the benefits for direct findings, social valuation assessments also benefits indirect ones, such as: a profound understanding of the existing local ecosystem services and to fill individual's knowledge gaps (Walz et al., 2017). These benefits increase ecosystem appreciation and awareness because of individual level, also participatory approaches are a platform for "collective discussions and mutual learning processes" (Walz et al., 2017:p-6) The participatory approaches hence "have the potential to capture existing collective transcendental meanings and values and overcome the designation of merely individual values" (Walz et al., 2017:p-6).

One of the main goals of the concept of ecosystem services is the identification of social predilection and beliefs that are linked to a certain ecosystem and the combination of the economic and ecological aspects with the people reality (Walz et al., 2017). Therefore, social valuation have huge importance as an assessment of ecosystem services, but only represents "one part of the entire puzzle" since bio-physical aspects cannot still be discarded (Walz et al., 2017:p-6).

There are several social valuation methods, according to Kronenberg et al. (2017) that are: i) PPGIS (Public Geographic Information Systems); ii) Photo Elicitation; iii) Content Analysis of Social Media Profiles; iv) Health-Based Methods; and v) Surveys Featuring Rankings. A brief analysis of all methods, based on the study of Kronenberg et al. (2017), is done, below:

- **PPGIS – Public Participation Geographic Information Systems –** is one method that has been used in urban contexts "for plan development related to parks and recreation or general urban development" and, "at larger scales, it has also been used to identify recreational uses and conservation preferences" (Kronenberg et al., 2017:p-35). This method allows the respondents to choose specifics locations in maps and quantify "public meanings and preferences" through their answers (Kronenberg et al., 2017:p-35). The data can be collected through digitally or analogue maps and a typical application of PPGIS method is an online survey to a local community about theirs parks and open spaces to create or prepare a park plan.

- **Photo elicitation –** is a method that allows the communication of "intangible and more abstract aspects" of human-nature synergies (e.g. "memories, spiritual or transcendental meaning, feelings") and allows the discover of different meanings about places (Kronenberg et al., 2017:p-36). This method is a useful instrument when: 1) values are more "intangible or contested" (has to be "explored and incited") and/or 2) there is the need to include immigrants or children' opinions with limited language aptitudes in which images are useful to communicate (Kronenberg et al., 2017:p-36). The value is associated with declarations linked to pictures of spaces and their value to people through deliberations in groups of people. In photo elicitation method data is collected through questionnaires, interviews and photographs, and a typical application is asking immigrants groups and children which changes they would like to see in a certain green space and how they interact with that space.

- **Content analysis of social media profiles –** is a method where there is a valuation of what there is in social media profiles and peoples' feedback about some subject. In urban context, this method allows to analyze the social media profiles information of people predilections in terms of uses they give to public places and their favorite places in cities. The data is obtained automatically or semi-automatically from social media and the peoples' predilections are deducted from the collected data, and an example of a typical application is the analysis of a park' geotagged posts and pictures that are employ to plan, design and maintain the park.

- **Health-based methods –** in these methods "health inequalities and social, socio-economic, and land use parameters aggregated on sub-district level using data from medical check-ups are explored" through bivariate and multivariate analysis (Kronenberg et al., 2017:p-40). An example is the "children's health determinants, outcomes and natural area" capability for an intra-urban relationship (Kronenberg et al., 2017:p-40). These methods are characterized by "the value of urban nature as health benefits from urban green and blue infrastructures" to urban citizens (Kronenberg et al., 2017:p-40). Being the value of urban green/blue spaces bigger as bigger the health benefits they provide. Range of applications of these methods can be urban green infrastructures assessments, health benefits linked to recreation potentiality, socio-environmental justice. The data can be obtained through a mix of information of green space and health statistics and a database cross reference. A typical application is valuation of parks management and design on people's health.

- **Survey featuring rankings –** value in rankings is acquired through which goods or services' characteristics people indicate that are fancied. Being used in all types of social science research and ranks can be obtained through questions where people must directly rank options or through people's answers to other questions both open and closed questions. Rankings data can be obtained through questionnaires and an example of a typical application of this method is to value land-use and management schemes.

Usually "environmental problems are complex, uncertain, multi-scale and affect multiple actors and agencies", which require more adaptability to unsteady circumstances and "transparent decision-making" that involve a variety of knowledges and values (Reed, 2008:p-2418). That can be accomplished through stakeholder's participation that has been included in environmental decision-making processes (Reed, 2008). An example of stakeholder participation is the study conducted by the United Nations Convention to Combat Desertification in three Southern African countries: Swaziland, Kalahari rangelands of Botswana, and Namibia (Stringer, et al., 2007). In this study, a mixed-method approach was applied to obtain an extent of qualitative and quantitative data. To fight and control land degradation there are two knowledge sources that are important: the first is scientists' knowledge; the second is the community's wealth of knowledge that has been acquired through informal experimentation, innovation, experience. By applying different methods and disciplines, such as focus groups, questionnaire surveys and more participatory methods is possible to obtain all the

necessary data to manage and control, or even reverse the problem of land degradation (Stringer et al., 2007). The involvement of local communities is critical when it comes to apprehend the perspectives, knowledges and values that are affected by desertification. Each location of this study showed several successes and challenges with the use of a participatory approach. One of the challenges was the lack of financial resources which limited the public participation even with the importance of local communities' participation (Stringer et al., 2007).

Biodiversity loss, ecosystems destruction and the complexity of society makes it urgent to incorporate public participation in political processes (Spash and Aslaksen, 2015). Citizen participation according to Arnstein (1969, p-216) "is a categorical term for citizen power. It is the redistribution of power that enables the have-not citizens, presently excluded from the political and economic processes, to be deliberately included in the future. It is the strategy by which the have-nots join in determining how information is shared, goals and policies are set, tax resources are allocated, programs are operated, and benefits like contracts and patronage are parceled out. In short, it is the means by which they can induce significant social reform which enables them to share in the benefits of the affluent society". With participatory and consultation processes there is the possibility to decrease conflicts and rise acceptance and achievement of environmental planning, natural resource management and nature conservation (Reed, 2008; Walz et al., 2017). This knowledge from citizen participation makes it possible to create pilot projects, projects that allow decision-makers to test new approaches on urban planning and refining them before being extended to other spaces (Hansen et al., 2017). Non-state financing such as, taxes and other regulatory instruments, partnerships, incentives, corporate social responsibility and social entrepreneurship, and monitoring are a way to ensure the use of citizens knowledge to improve and maintain UGS, and consequently UGI (Hansen et al., 2017). An example of partnerships to create new UGS was the creation of the "Lisciasta Park Residence", a house complex in the north of Lodz, Poland (Hansen et al., 2017). This residence was created through a public-private partnership between the developer and the municipality, where the developer rehabilitated the land that is still part of public ownership to compensate the removal of trees, which improved the green space (Hansen et al., 2017). Also, when it comes to UGS planning it is important to analyze all the plans, strategies and polices on an early stage to pinpoint gaps and to increase the possibility to improvement (Hansen et al., 2017).

In terms of urban policies, the Organization for Economic Co-operation and Development (OECD), created the Principles on Urban Policy and on Rural Policy (OECD Regional Development Ministerial, 2019). The principles were created to help governments creating better quality of life and well-being to their population on the dimensions of sustainable development (economic, social and environmental) (OECD Regional Development Ministerial, 2019). One of the principles about urban policies is the promotion of inclusive cities that supply opportunities for all by: promoting access to all urban citizens to drivers of social inclusion such as cultural heritage, amenities, public services, transport, etc.; policies that increase social cohesion; and development of urban identity and culture

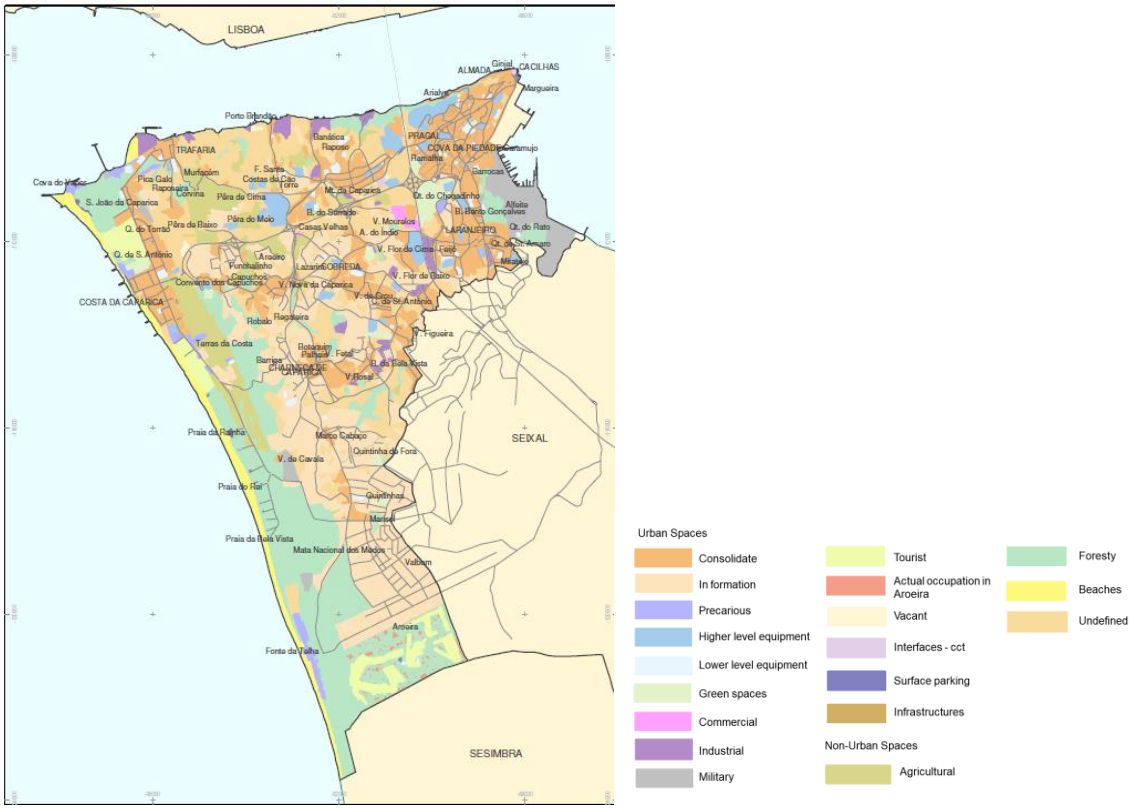
and increase of environment quality principally the most destroyed. Another principle promote the efficient land use policies that decrease social-spatial segregation, and the “designing and planning of transport policies” that improve the accessibility of urban citizens to all type of opportunities, such as economic, social and cultural (OECD Regional Development Ministerial, 2019:p-4). There are also principles that promote the engagement of citizens on urban policy design and implementation including the most vulnerable citizens, such as women, elderly, youth and children, disable, migrants and minorities; promotion of monitoring and evaluation tools; and use of geospatial data for policy making (OECD Regional Development Ministerial, 2019).

4. Methodology

4.1. Study area

The research is set in the municipality of Almada (figure 5), a Portuguese municipality that belongs to the district of Setúbal and to the Metropolitan Area of Lisbon. Located on the left side of Tejo riverbank, making border with Seixal municipality on the East side and border with the municipality of Sesimbra on the South. On the west side, Almada is surrounded by the Atlantic Ocean. The municipality of Almada has 11 parishes: Almada, Caparica, Costa da Caparica, Cova da Piedade, Trafaria, Cacilhas, Pragal, Sobreda, Charneca da Caparica, Laranjeiro and Feijó (CMA, 2018a; INE, 2011).

Figure 5 - Almada municipality map with soil occupation.



Source: CMA (2011b).

Almada has 168.987 inhabitants PORDATA (2018) website, in an area of 71km^2 (CMA, 2018a) and a density population of 2.414,9 (mean number of inhabitants per km^2) (PORDATA, 2018). The number of inhabitants of Almada in 2001 was 162.322 with an increase of the population (PORDATA, 2018) and the density population was 2.296,6 in 2001, also with an increase. The youth (0-14 years)

and elderly (+ 65) population of Almada increased from 2001 to 2018, respectively from 23584 to 25321 young people and 27765 to 39072 elderly, with a much bigger increase on the elderly population (PORDATA, 2018). The local parishes with higher younger population are: Charneca da Caparica (18,2%), Caparica (16,5%), Feijó (16,1%), Sobreda (16,0%) and Trafaria (15,7%) (INE, 2011). The parishes with higher percentage of older population are: Cacilhas (32,7%), Almada (32,5%), Cova da Piedade (27,3%) and Trafaria (22,1%) (INE, 2011).

Almada municipality in 2011 had one of the lowest number of individuals in active age for each elder individual in the Lisbon district (INE, 2011). In 2011 it was 3.2, in 2018 the number was even lower, with 2.7 (PORDATA, 2018). The employment rate in the active population of Almada, in 2011, was one of the lowest of the Lisbon district with 47,7% (INE, 2011). Also, Almada, in 2011, had the highest youth unemployment rate (ages between 15-24 years) of the Lisbon district with 34,0% (INE, 2011). The population with a higher education degree also increased from 9,1% in 2001 to 14,5% in 2011. The illiteracy rate between 2001 and 2011 decreased from 6,06% to 3,27% (INE, 2011).

Almada's location near the Tejo Estuary and the Atlantic Ocean provides a rich biodiversity with different habitats (CMA, 2018b). Different factors potentiate the huge variety of habitats in Almada, namely: the Atlantic front, with 13km of extension, dune vegetation and marine wildlife; the river front Ribeirinha, with natural nursery function; and Mata dos Medos Botanical Reserve, that belongs to the protected landscape of Arriba Fóssil da Costa da Caparica, with Mediterranean vegetation and some endemic species of Portugal (CMA, 2018c).

Almada has ten urban green parks and 41 public gardens that increase the biodiversity of the city, support environmental education, cultural, sportif and playful activities, consequently increasing the population's well-being (CMA, 2018b, 2018a). The biggest urban park, the city park, is Parque da Paz (CMA, 2018i). There are also some green spaces of the municipality that are only open for population use between certain hours of the day and others that are framed on grey infrastructures, for example roundabouts (CMA, 2018i).

4.1.1. Local policies characterization

In 1987 Almada initiated its *Master Plan* (PDM-A) after several years of work in planning (DMPAT, 2008). Master Plan (PDM - *Planos Diretores Municipais*) are municipal territorial plans that establish the municipal territorial strategy, the territorial model, the options for location and management of collective use equipment and the interdependence relations with neighboring municipalities (FCT and CMA, 2011). The elaboration and the revision of these plans are done by the municipalities (Faculdade de Ciências e Tecnologia and CMA, 2011). The actual PDM-A was approved in 1993, so the municipality decided in 2008 that it was necessary to review it (DMPAT, 2008). To contribute to a better integration of environmental considerations and sustainable objectives on PDM-A, the

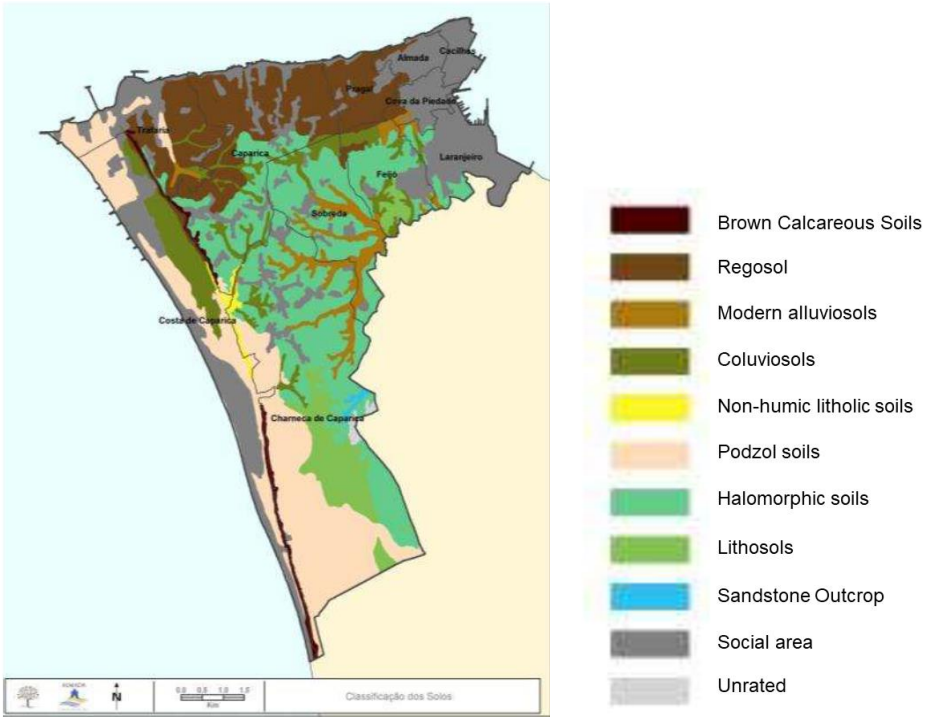
municipality decided to do a strategical environmental assessment (AAE – *Avaliação Ambiental Estratégica*) of the PDM-A (DMPAT, 2008; FCT and CMA, 2011). The main objectives of the AAE are to establish a higher level of environmental protection and contribute to the integration of the environmental considerations in the preparation and approval of plans and programs, thus promoting a sustainable development (FCT and CMA, 2011).

The revision of the PDM-A has taken into consideration other the territorial management instruments board (*Instrumentos de Gestão Territorial*) and the strategic documents of national, European and international policies in terms of land use planning, environment and sustainability (DMPAT, 2008). Five strategic objectives of development were defined, together with their main interventions domains for a better elaboration and implementation of the PDM-A: 1 - Diversification of the economic base and Modernization of the productive processes; 2 – Strengthening and Balancing of the Municipality Urban network and its role in the Region; 3 – Improvement of the Natural Environment and the Built Environment; 4 – Socio-Cultural Development and Professional training; and 5 – Development of a new municipality image and of its management (DMPAT, 2008).

After the approval of the PDM-A revision, a first report was made in 2008: evaluation report of PDM execution and identification of the main evolution factors of the municipality (DMPAT, 2008). Several other reports and books were made after this first report: characterization studies of the municipality territory divided in five books (territorial framework, environmental system, energy system, social and economic system, and urban system); report with the first phase of the AAE; report with the strategy of the land use planning for the PDM with public participation – *Quadro Prévio ao Ordenamento* (QPO); a congress – Almada "*Pensar o Futuro*"; after the congress several studies were made based on the congress ideas, including an update of the QPO; participation sessions were the QPO was presented; and more land use planning studies were developed (CMA, 2017). All reports, congress and books were compiled in a progress report made in 2017 (CMA, 2017).

One of the books created by the revision of the PDM-A was the book *Environmental System* (CMA, 2011a) which presents an environmental characterization of the municipality. In terms of soils, Figure 6 represents the soils classification of the municipality and Figure 7 represents the soil zones with high ecological value (CMA, 2011a), being soils part of the supporting ecosystem services (Millennium Ecosystem Assessment, 2005).

Figure 6 - Soils Classification in Almada.



Source: CMA (2011).

Figure 7 - Charter of soils with high ecological value.

Source: CMA (2011a).

Throughout the last decades the municipality has been investing in several other local strategies for a more sustainable development (CMA, 2018b). A local strategy based on Agenda 21

was developed as well as the National Strategy for the Sustainable Development (Câmara Municipal de Almada, 2018b). Several practices and activities in education, culture, mobility, environment, solidarity, climate change, biodiversity are part of this local strategy (CMA, 2018b). Some of the most important local strategies and practices that the municipality has been working on are:

- Creation of the association AGENEAL (Energy Municipality Agency of Almada) in 1999. This association was created with the intend to: contribute to a more sustainable development in the municipality; help to foster an energy efficiency through a rational use of energy in all sectors; use of local endogenous energetic resources to increase local economy; and a better use of technologies to reduce the environmental impact (AGENEAL, 2018).

- Creation of *Carta do Ruído do Concelho de Almada in 2004,* an instrument created to help the planning and environmental management in the municipality. This instrument allow: the identification of the noise in the municipality an main sonorous pollution sources; fastest updates of the territory; simulate scenarios for new uses of the soil and introduction of new mobility infrastructures; validate prevision impact prognostics of the territory; and facilitate the availability of noise information and public participation (CMA, 2018d).

- Creation of the Department of Strategy and Sustainable Environmental Management (DEGAS) in 2005, to support and execute environmental policies defined by the municipality local policies granting the sustainable development, economic and social increase, and dynamization of environmental education (CMA, 2018f). DEGAS has two municipality division that are: Division of Studies and Environmental Management (DEGA) and Environmental Studies and Sensibilization (DESA). DEGA has as competences: assessments, data bases, inventories, environmental studies, monitorization of the effect of the greenhouse gases, management of “Carta de Ruído do Concelho de Almada”, follow environmental management projects and environmental municipal projects, local environmental policies, etc. (CMA, 2018f). DEGAS has as competences: create several activities using different means and platforms to divulgate, inform and sensitize Almada citizens about the environment, energy and mobility (CMA, 2018f). A restructuring was done in 2018, and now DEGAS is the Department of Innovation, Environment, Weather and Sustainability (DIACS), divided in two divisions: Division of Innovation, Weather and Energy (Smart cities) (DICE), and the Division of Education and Environment Sensibilization (DESA) (Câmara Municipal de Almada, 2018h, 2019).

- Created in 2005, the European Environmental Certification System EMAS (Sistema de Ecogestão e Auditoria) was applied in the municipality and was considered an innovative project at national and international level at the time (CMA, 2018h). This ecomanagement

and audit system, created the opportunity to develop activities that reduced the waste and monetize resources and improved the municipality environmental performance (CMA, 2018h). This project was innovating, because it was the first public organization to apply in the country, when there were only 30 organization in the private sector applying it (CMA, 2018h). The Environmental Policies and the Environmental Declaration were part of the methodology created by the municipality to implement EMAS (CMA, 2018j). It was also created an EMAS team, an Eco-Consultants team and one Eco-Caretaker (CMA, 2018j). The environmental declaration was a document that explained the environmental impact of the municipality and the future plans for the municipality with the objective to give information to citizens (CMA, 2018e). To implement environmental education some specifics projects and activities were created by the municipality, such as: Children Agenda 21; Cultural Action Plan; Clean Almada campaign; Green Party; Green Week; Campaigns for the International Day of Trees; Blue Flag program; Implementation of the European Week of Mobility and European Day without cars; Christmas Market Earth friendly (CMA, 2018m). As education tools and equipment for environmental activities and projects the municipality uses: Ecological Footprint Individual Calculator available at their website; Discovery routes and guide tours; games; presentations; the virtual aquarium; Almada Ecoteca; bicycles playground; and the Center of Monitorization and Environmental Interpretation of Costa da Caparica (CMA, 2018n).A department for health, green spaces and transportation, DSEVT, was also created. In 2005to keep the city clean, improve and create green spaces (CMA, 2018g). There are four divisions in this department: health division (DS); gardens and green spaces division (DJEV). “Parque da Paz” division (DPP); and transportation and maintenance division (DTM) (CMA, 2018g).

- The municipality of Almada was one of the six pioneer cities that joined the Ecological Footprint of Portuguese Municipalities, a project developed by Global Footprint Network, the University of Aveiro and ZERO – Associação Sistema Terrestre Sustentável (Galli et al., 2020). This project used a top-down methodology “based on national Footprint data supplemented with local data” which allowed comparisons between the results of the municipality, national Footprint and biocapacity by dodging “time and costs restrictions caused by extensive local data collection and/or life cycle assessments” if done in a bottom-up process (Galli et al., 2020:p-3). The study was a starter point to sub-national analysis (Galli et al., 2020). Almada was one out of three municipalities with higher per capita Footprint comparing with Ecological Footprint of Portugal, contributing to the national Footprint with 1,7%. Also, all six cities of this study have an Ecological Footprint bigger than the world-average biocapacity available, which means that if all planet was living like these cities’ humankind would need between 1.9 and 2.4 planets to live (Galli et al., 2020). One of the conclusions of this study is that even though all the environmental

policies already applied in these municipalities those policies are still not enough to avoid the municipal and global resource consumption overshoot (Galli et al., 2020).

4.2. Data collection and sampling

This research seeks to map cultural ecosystems services of urban green or blue spaces (UGS), meaning the uses people give to UGS but also to understand why people do not use some UGS. Considering the scope of the research, a single-case study (Della Porta and Keating, 2008) and a quantitative research was done based on a survey to local citizens, which results were analyzed through regression analysis and heatmaps. Case studies allow a meticulous analysis of data in a particular context (Zainal, 2007).

The sampling technique adopted was non-probability, which is a sampling technique where the population that can be selected is not known, defining only the minimal age of 18 years old in this study and only Almada resident's (Blackstone, 2019). The chosen non-probability sampling was the convenience, where data is collected from people that are easily accessible (Blackstone, 2019). According to Charles (1998) and Mertens (1998) the sampling size should be based on the type of investigation, however, there are some rules of thumb to decide the right size of the sampling. For example, Coutinho's (2011:p-93) proposes that the minimum ideal number for sampling size is 30, as less than 30 samples can compromise the distribution traces of a population and the results of an investigation.

To collect data from the case study, a questionnaire survey was conducted, targeting the population of Almada municipality, in Portugal (see Section 4.1). Surveys are used to interpret trends or characteristics of big groups and contribute to planning (Blackstone, 2019).The questions chosen for the survey questionnaire were based on ten categories of ES (cultural diversity; spiritual and religious values; knowledge systems; educational values; inspiration; aesthetic values; sense of place; cultural heritage value; social relations and recreation and ecotourism) (see chapter 2 – table 2), used by Millennium Ecosystem Assessment (2005) and other authors (Plieninger, et al., 2013; Rall et al., 2017). The categories "sense of place", "cultural diversity" and "knowledge systems" were excluded, under the assumption that they were not easily understood by the survey participants (Plieninger et al., 2013; Rall et al., 2017). Similarly, to Rall et al. (2017), biodiversity was also included to assess its given importance in the mapped locations and the correlation with the other CES. "Sports" was also added as a separated category to discover the importance given to sports on UGS, instead of considering it within the category of recreation. Negative characteristics associated with green or blue public spaces such as, sense of fear, noisiness, unpleasantness, lack of public transportation to the area, lack of accessibility to the area and poor quality of the air were also included in the survey.

The questionnaire survey was designed using the softGIS online survey tool Emotional Maps© (https://www.pocitovemapy.cz/index-en.html), which allows the combination of survey questions with an online mapping interface.

The survey questionnaire (see Appendix 1 for a print screen of the survey) was divided in four main sections and started with an introduction explaining the study purpose, research team and time estimation to complete the questionnaire. The first section had three questions. The first tried to find out what people thought about the benefits that the natural environment brings to them (closed question) and the second about the type of benefits they can get from it (open question). The third group of questions asked citizens about their agreement or disagreement on the need to be close to nature and the local conditions to promote the access to nature and the role of Almada's local government.

In the second section, participants were asked to identify on the map until five green or blues places (UGS) they usually go to. After choosing those places, four groups pf questions (one open and three closed ended) popped up for each mapped area. The questions allowed to find out: the frequency time people spent on the area; which CES they think they obtain as well as the negative characteristics of that place if any, from the list of given options; the type of uses people give to them (e.g. take a walk, sports, relaxing, time with friends/family, etc.); and recommendations on possible improvements to the area (open question).

The third section asked participants to identify on the map until three places they would like to go but they are not doing it. After choosing those places, two closed-ended questions popped up for each mapped area. This section allowed to discover the reasons why the surveyed people do not use the mapped area and the uses they would like to give them. Finally, the fourth section had ten socio-demography questions, such as age, gender, education level (if higher education, which course), local parish they live, the type of area (urban, mix or rural) they live, their profession, and asked if respondents have always lived in the municipality and for how long (years).

The application of the survey was done using digital devises with internet access, namely by using a smartphone and a tablet. Citizens were randomly selected on the streets to respond to the survey (71 responses). Furthermore, the municipality of Almada was contacted to help with the research and they supported the application of the survey by putting the survey on their website (20 responses) and by allowing the researcher to participate on two activities with citizens developed by the municipality (11 responses). One of the activities organized by the municipal environment department, for environmental education goals, was on the beach of Costa da Caparica (19/07/2019) and the other was on Parque da Paz (22/07/2019). The survey ran for one month on the streets, during July 2019, and it was available online during July, August and the beginning of September 2019.

4.3. Data analysis

The data analysis was done by using R (version 3.6.1), R Studio Desktop (version 1.2.5019) and the open-source software QGIS. Frequency distributions and descriptive statistics were done to summarize respondents' characteristics, general questions about the municipality's UGS, importance of CES and uses, time on mapped UGS, negative characteristics of the used UGS and UGS people would like to use and the use they would like to give.

A Pearson correlation test was done to analyze possible bundles between individual CES with one another and correlations between CES and uses. A phi coefficient for 2×2 tables test was done to analyze possible correlations between individual uses with one another. CES and negative characteristics variables were on a Likert scale - Strongly disagree, disagree, neutral, agree, and strongly disagree. Spatial patterns of individual CES (n=10), use (n=11), and negative characteristics (n=5) were analyzed by using the heatmap method available on QGIS software, a symbology/visualization method for point features (Gandhi, 2019). The points (UGS) selected by respondents were extracted from the main dataset. The adopted heatmaps settings were: Color ramp - transparent to red, Radius 7mm, Maximum value = automatic. The data for the municipality map was obtained through the Geographic Data Services Catalogue of the Portuguese Directorate General for Territory on the website: http://mapas.dgterritorio.pt/geoportal/catalogo.html.

5 Results

5.1. Survey responses

There was a total of 102 respondents to the survey all living in the municipality. which 100 citizens reported their use of UGS (2 respondents did not identify any) and 51 respondents answered the question regarding green or blue spaces they do not use but they would like to. The total number of mapped UGS that people use was 235 and the total number of mapped UGS that people would like to use was 74. The next sections will detail the results of and the analysis to the 102 responses.

5.2. Respondents characteristics

Regarding the 102 respondents that live in the municipality (figure 8 and 9) it was possible to concluded in terms of age: 32 respondents (31,4%) had between 18-30 years old; 48 (47,1%) had between 31-60 years old; 20 (19,6%) had between 61-80 years old; and only two (2%) are older than 81 years old (figure 8a). Being the minimum age of 18 years old and the maximum age of the respondents of 85 years old. The average age was 43,5 years old. Males made up to 51% of respondents compared 49% of females (figure 8d). All local parishes are represented as the places where the respondents live, however the most represented is Almada with 47 (46,1%) respondents, the second most represented is Cova da Piedade with 13 (12,7%) respondents from there (figure 8b). Caparica, Feijó and Sobreda had 6 (5,9%) respondents, Costa da Caparica, Charneca da Caparica, and Laranjeiro has 5 (4,9%). Cacilhas had 4 (3,9%), Pragal 3 (2,9%) and Trafaria only 2 (2%) (graphic 1b). In terms of nationality, most of correspondents are Portuguese, being 97 (95,1%) in total. Other nationalities were: one respondent from Germany, Spain, France, Cape Verde and Angola (figure 8c). 48 (47,1%) respondents always lived in the municipality and 54 (52,9%) did not lived always in the municipality. The 54 respondents that had not always lived in the municipality, 35 (64,8%) is living between 1-20 years, 10 between 21-40 years, and only 9 (16,7%) for more than 41 years (figure 9c). Being the minimum that respondents live in the municipality since they moved is 1 year and the maximum 60 years. The average number of years living in the municipality is 20,9.

Most of respondents live in an urban environment inside of the municipality, 88 (86,3%), 13 (12,7%) live in a mixed (urban-rural) area and only 1 (1%) lives in a rural area of Almada (figure 9b). In terms of the education level of respondents (figure 9a), 51% has a higher degree, 33 respondents (32,4%) have high school level, and the rest 17 (16,7%) only have the elementary or middle school.

Figure 8 - Frequencies (in percentage) of age (years), local parishes, nationality, gender.

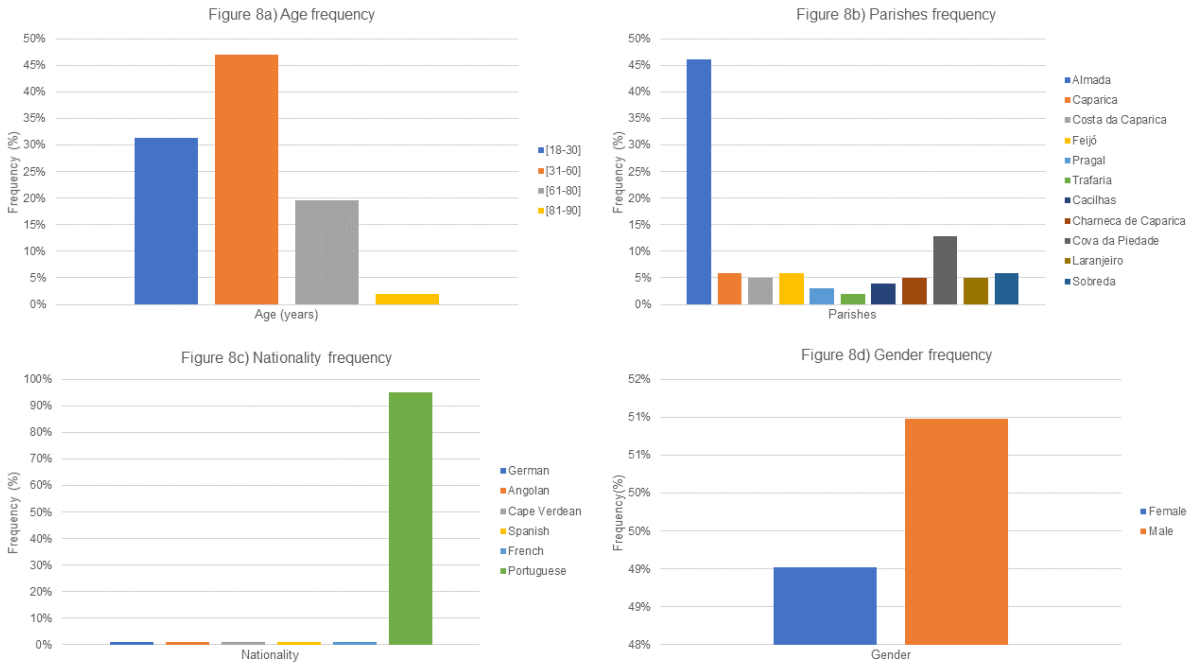
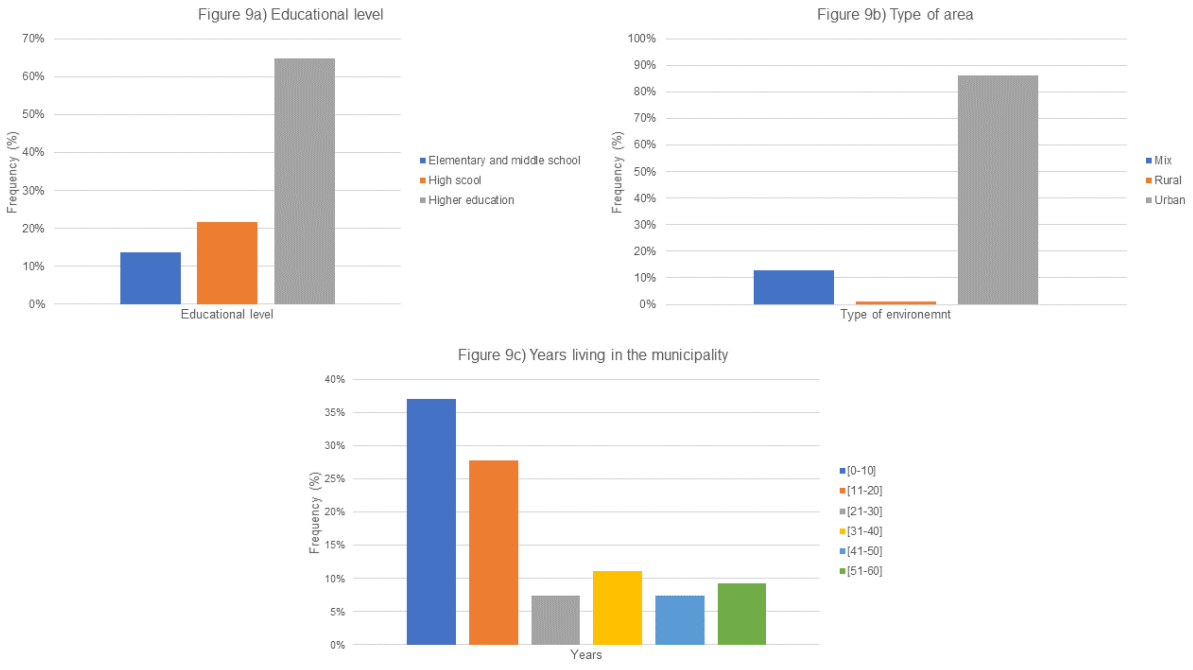


Figure 9 - Frequencies (in percentage) of educational level, type of area and years living in the municipality.



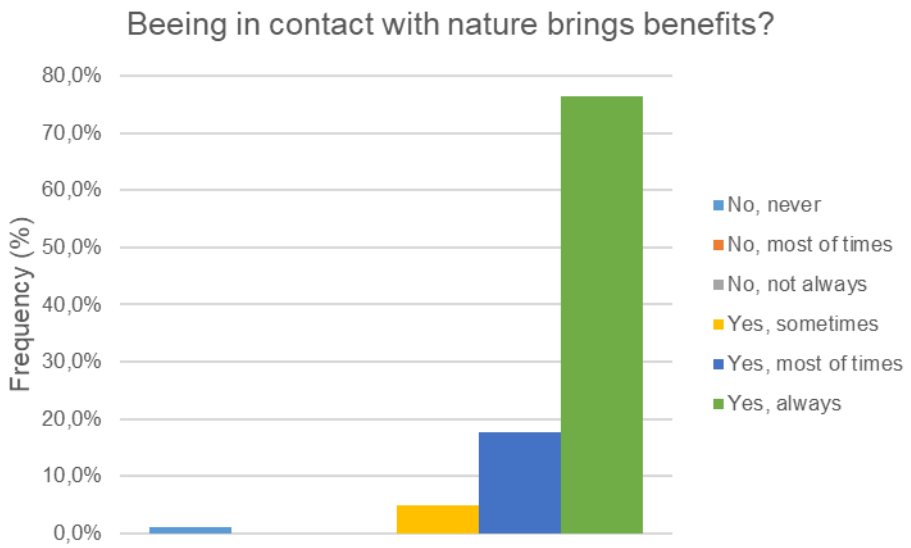
Regarding the 100 respondents that use UGS in the municipality it was possible to concluded that their age was: 31,4% had between 18-30 years old; 47,1% had between 31-60 years old; 19,6% had between 61-80 years old; and only 2% are older than 81 years old. Being the minimum age of 18 years old and the maximum age of the respondents of 85 years old. The average age was 42,9 years

old years old. Males made up to 51% of respondents compared 49% of females. All local parishes are represented as the places where the respondents live, however the most represented is Almada with 45 (45%) UGS' users, the second most represented is Cova da Piedade with 13% of UGS' users from there. Caparica, Feijó and Sobreda had 6% respondents, Costa da Caparica, Charneca da Caparica, and Laranjeiro has 5%, Cacilhas had 4%, Pragal 3% and Trafaria only 2%. In terms of nationality comparing to the total respondents of the survey, only two Portuguese do not frequent any UGS. 48% respondents always lived in the municipality and 52% did not lived always in the municipality. The 52 respondents that had not always lived in the municipality, 67,2% is living between 1-20 years, 19,2% between 21-40 years, and only 13,5% for more than 41 years. Being the minimum years, that respondents live in the municipality is 1 year and the maximum 60 years. The average number of years living in the municipality is 19,6.

Most of respondents live in an urban environment inside of the municipality (86%), 13% live in a mixed (urban-rural) area and only 1% lives in a rural area of Almada. In terms of the education level of respondents. 51% has a higher degree, 33% respondents have high school level, and the rest 16% only have the elementary or middle school.

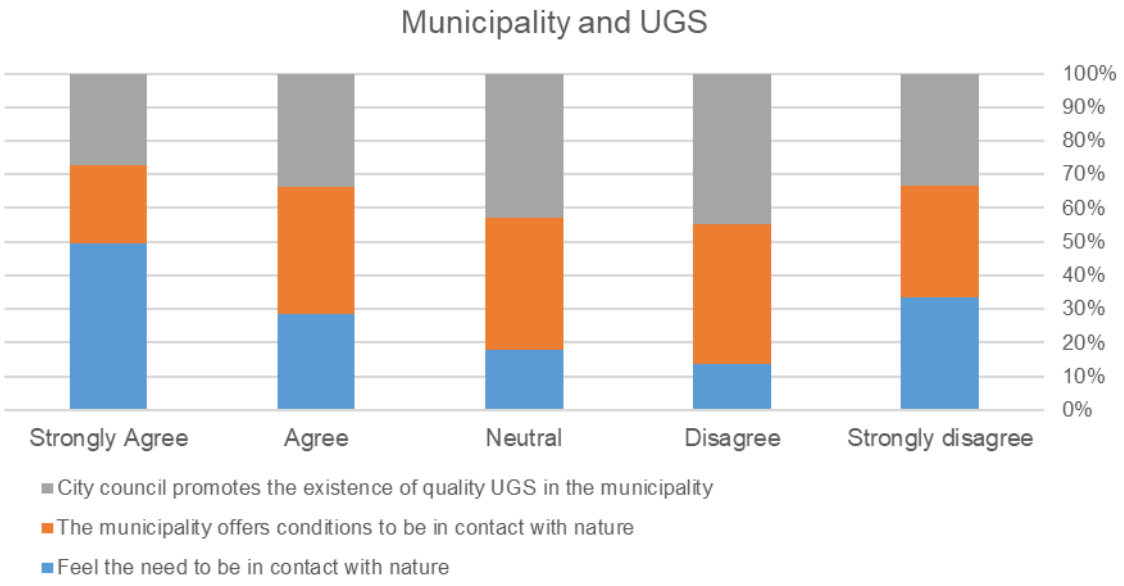
5.3. Perceived nature benefits and the role of the city council in the provision of urban green and blue spaces (UGS)

From the total respondents that answered the survey, 78 (76,5%) said that they always feel benefits when in contact with nature, 18 (17,6%) said that being in contact with nature bring benefits, 5 (4,9%) said only sometimes and 1 respondent said that never brings benefits being (graphic 1). The benefits that most referred were physic and mental benefits, also referred better air quality, reduction of stress, peace, tranquility, contemplation of nature (aesthetics), cultural knowledge, scientific knowledge, and nature experience (graphic 1). The benefits that most citizens referred in an open question were: physic (40%) and mental (40%) benefits, better air quality (24%), reduction of stress (28%), increase happiness (8%) peace (20%), tranquility (15%), contemplation of nature (aesthetics) (3%), cultural knowledge (6%), scientific knowledge (6%), and nature experience (14%), cultural (6%) and scientific (6%) knowledge, and recreation (9%).



Graphic 1 - Frequency (in percentages) if respondents think that being in contact with nature brings benefits to them.

Most of the respondents feel the need to be in contact with nature (90,2%), think that the municipality offers conditions to be in contact with nature (76,4%), and think that the city council promote the existence of UGS with quality within the municipality (74,6%) (graphic 2). Only one respondent completely disagrees with all the sentences (graphic 2).

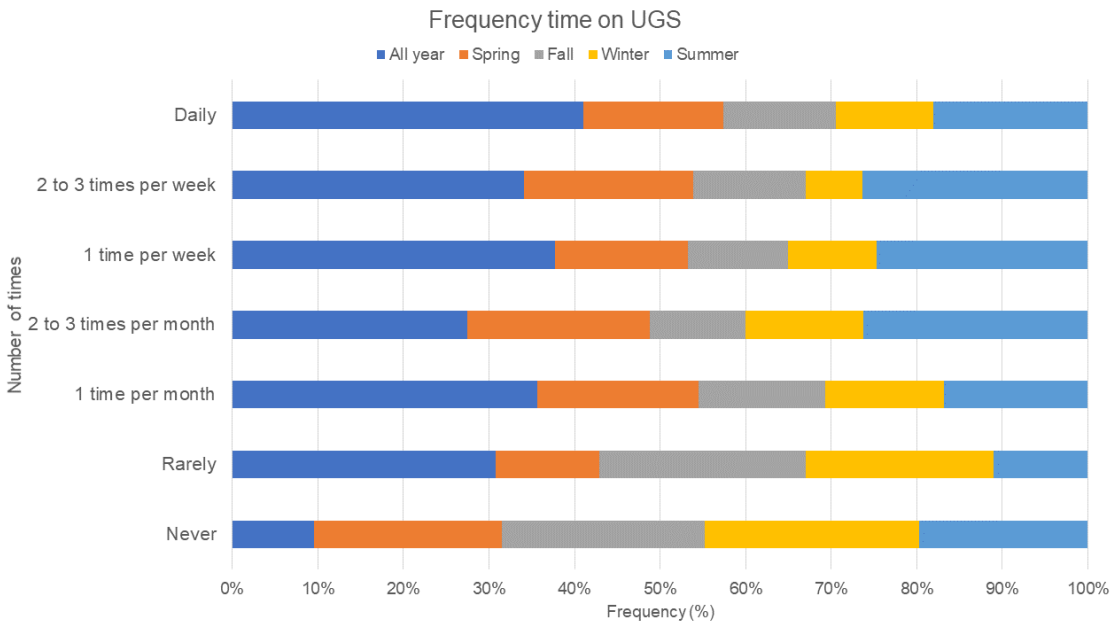


Graphic 2 - Likert scale between completely agree to complete disagree in percentages. Questions: 1 - Respondents feel the need to be frequently in contact with nature. 2 - The municipality offers conditions to be in contact with nature. 3 - Town hall promotes the existence of quality green/blue spaces in the municipality.

5.4. Mapping of CES, type of uses and negative characteristics in UGS

Respondents spent more time in the UGS during the warmer seasons. The number of respondents that go to UGS during all year is small, only 10,6% go to UGS every day, 25,5% go between 1-3 times during the week, 24,7% go between 1-3 times per month and 11,9% rarely go. A small percentage of respondents do not use UGS during all year, 27,3% (graphic 3). On Winter respondents go less to UGS (71,9% that never go), being the Summer the season where the percentage of people that never go lower, with 56,6%.

In terms of seasons, on Spring only 4,3% go every day to the UGS, 12,8% go between 1-3 times per week, 15,3% go 1-3 times per week, 16,1% go 1-3 times per month, and 4,3% rarely go. Lower frequency of UGS can be seen in coldest seasons: On Fall only 3% go daily to UGS, 8,9% go 1-3 time per week, 10,2% go 1-3 times per month, and 9,4% rarely go; on Winter the same 3% go every day to UGS, only 6% go 1-3 times per week, 10,7% go 1-3 times per month, and 8,5% rarely go (graphic 3).

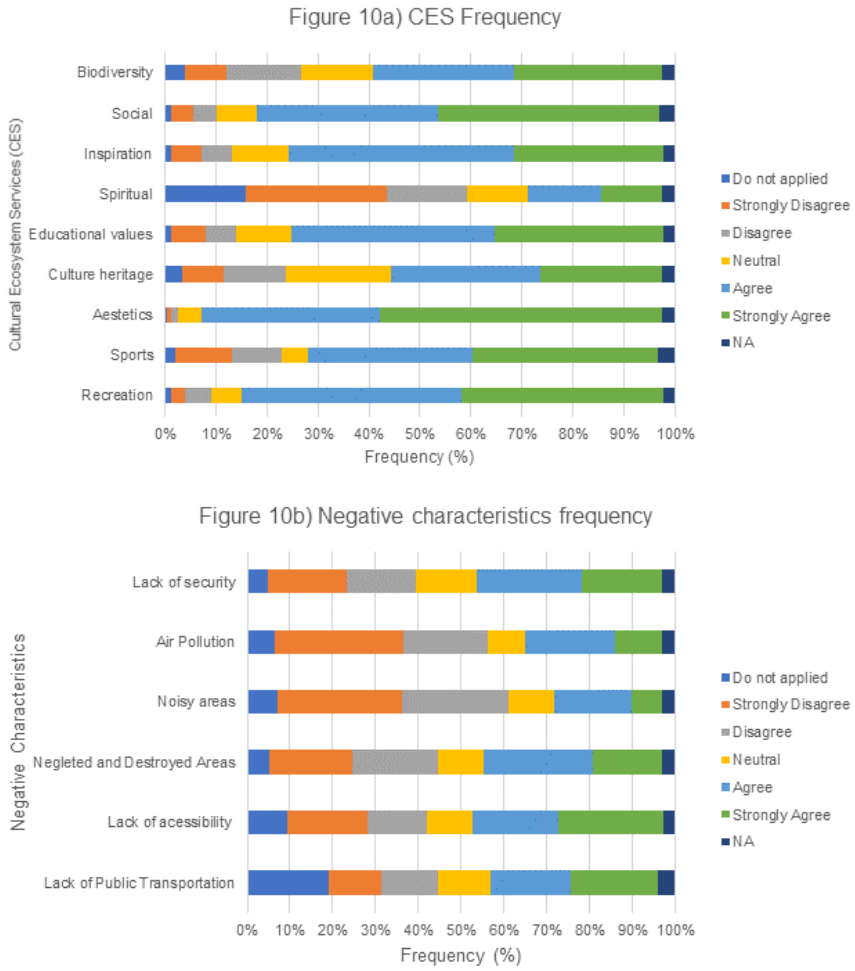


Graphic 3 - Likert scale between daily use and no use. Time spent in the UGS during all year or seasons (spring, summer, fall and winter), in percentage (%).

Regarding the Cultural Ecosystem Services (CES) that people mentioned in their answers (from nine possible close options and one open question). the highest values for people that strongly agree and agree with some CES were: aesthetics (90,2%), recreation (83%), social (79,1%), inspiration (73,6%), and educational values (73,3%), sports (68,5%), biodiversity (56,6%) and cultural heritage (53,2%). The lowest one was spiritual with only 26,4% (figure 10).

When asked about the negative characteristics on the same UGS the characteristics that citizens valued higher (strongly agree and agree) were the lack of accessibility (44,7%), lack of security (43,4%) and neglected and destroyed areas (41,7%), lack of public transportation (39,1%), air pollution (31,9%) and noise(25,1%) (figure 10).

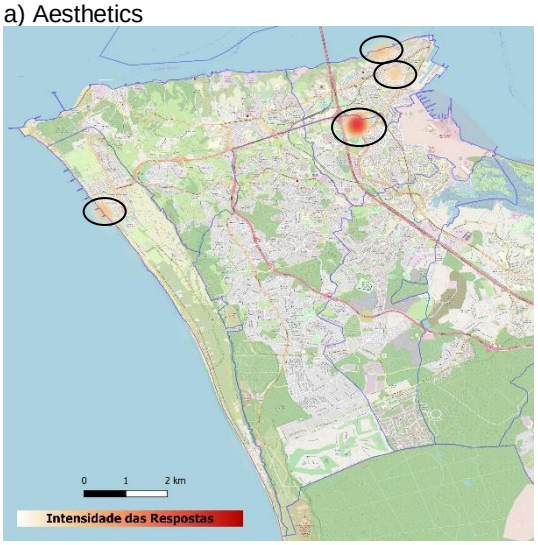
Figure 10 - Frequency (in percentage) of CES and of Negative Characteristics mapped on Almada UGS.



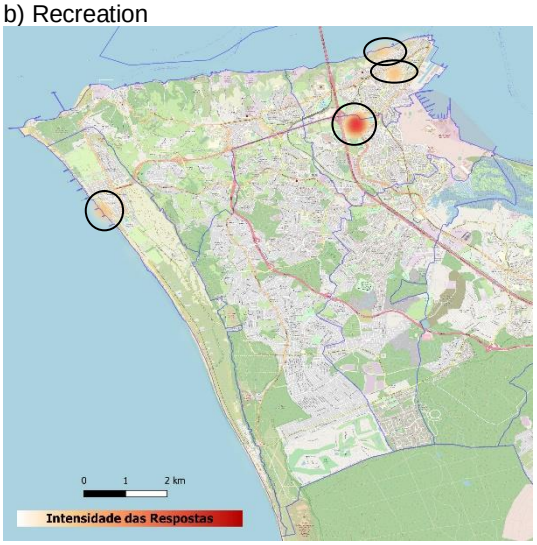
In terms of the hotspots of individual CES, we can see that Parque da Paz is the UGS where all CES exist (figure 11). Coastal areas and the area called Ginjal, near Rio Tejo also have some relevance (Map 1).

Figure 11 - Hotspots maps of individual CES (n=9) (red indicate hotspots).

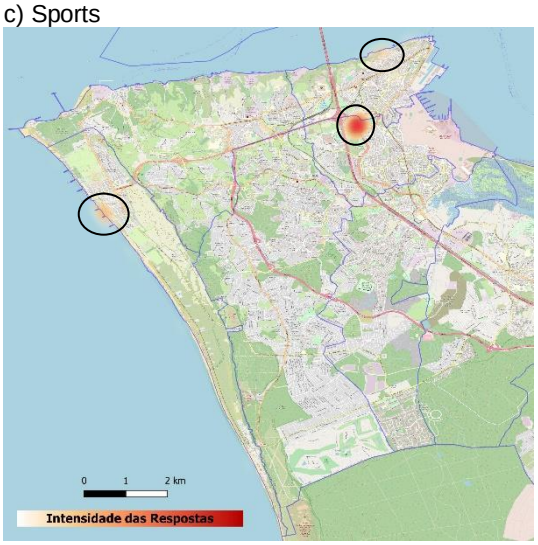
a) Aesthetics



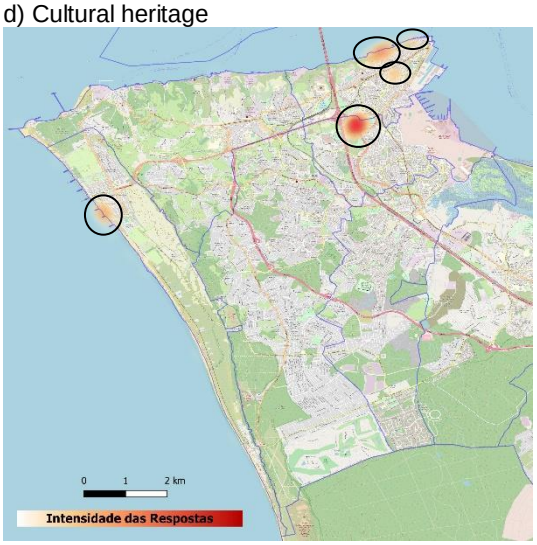
b) Recreation



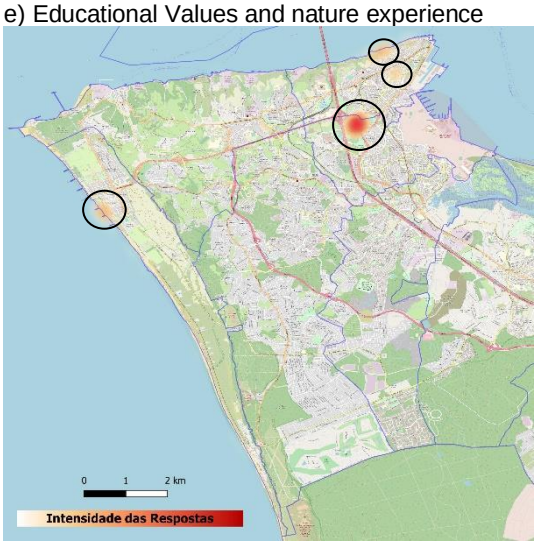
c) Sports



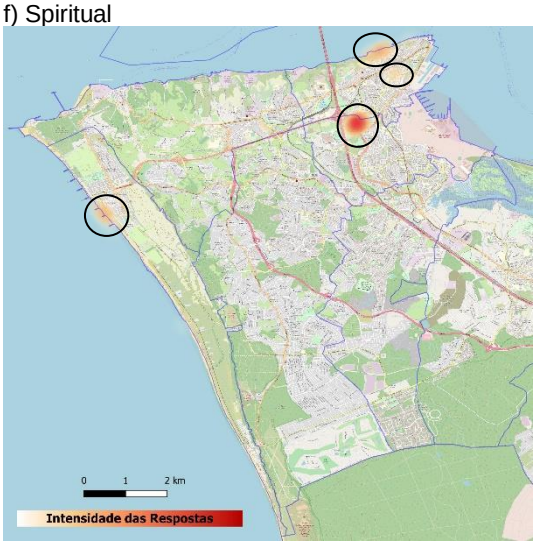
d) Cultural heritage



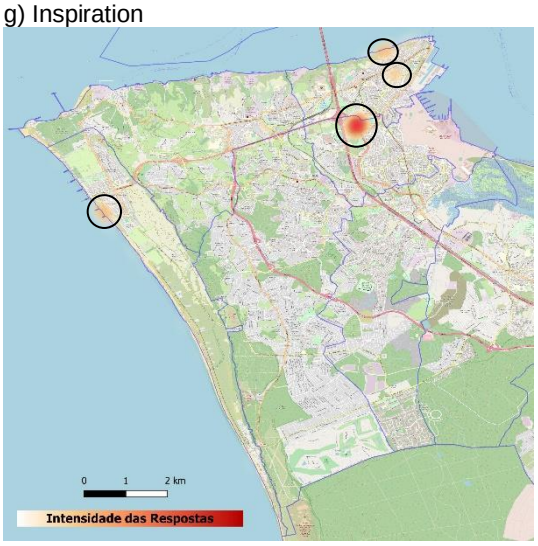
e) Educational Values and nature experience



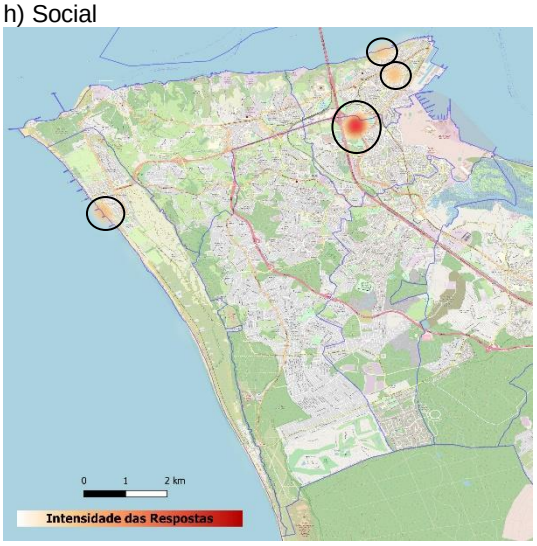
f) Spiritual



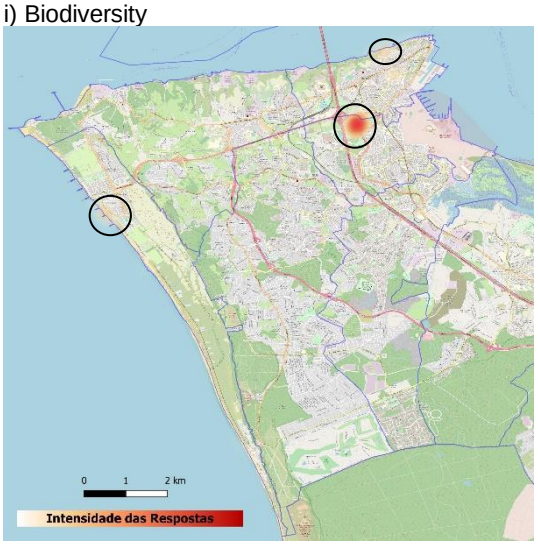
g) Inspiration



h) Social



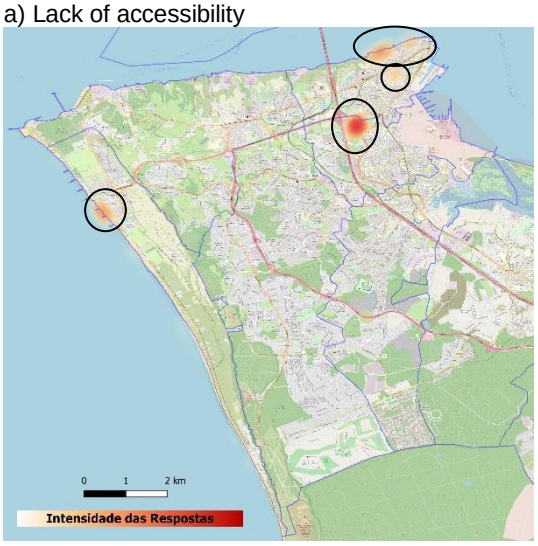
i) Biodiversity



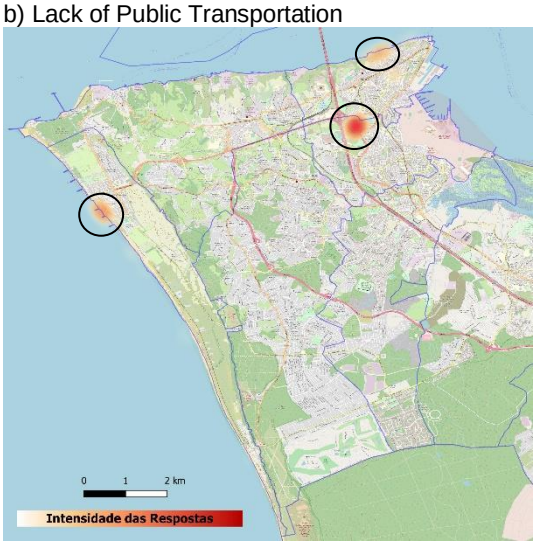
Ginjal, that belongs to the parish of Cacilhas has as physic characteristics being abandoned, degraded and vandalized. In terms of negative characteristics Ginjal has strong hotspots in terms of neglected and destroyed areas, which confirms with physical characteristics of the place itself. It has also (smaller hotspots) lack of accessibility, lack of public transportation, security, noise, and air pollution (figure 12). Coastal area has smaller hotspots of all negative characteristics. Parque da Paz has more stronger hotspots of all negative characteristics (figure 12). The urban park Comandante Júlio Ferraz in the center of the local parish Almada has lack of security, noise, air polluted and neglected and destroyed areas as more evident negative characteristics, as less evident is lack of accessibility and lack of transportation (figure 12).

Figure 12 – Hotspots maps of individual negative characteristics (n=6) (red indicate hotspots).

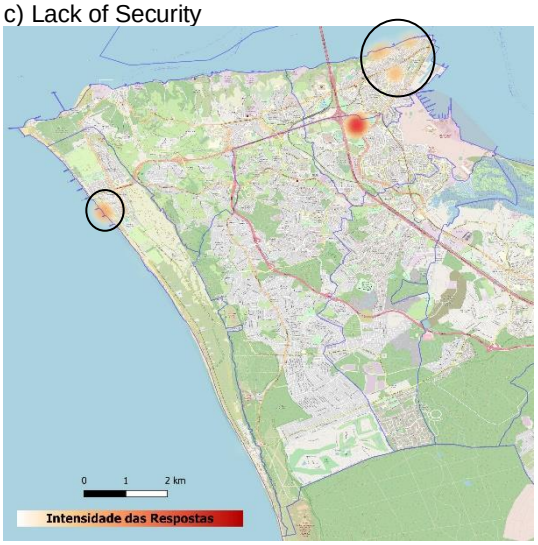
a) Lack of accessibility



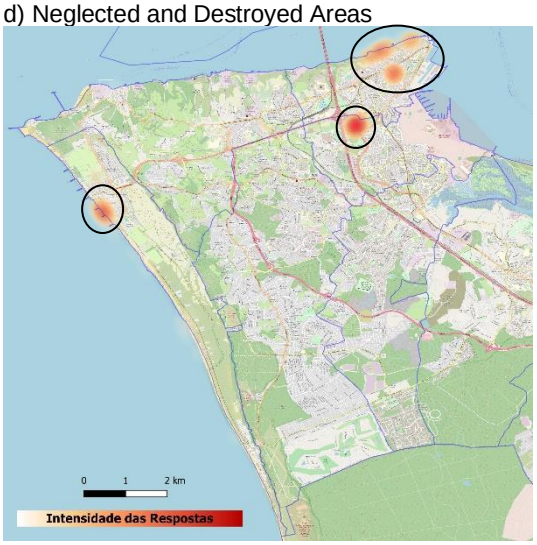
b) Lack of Public Transportation



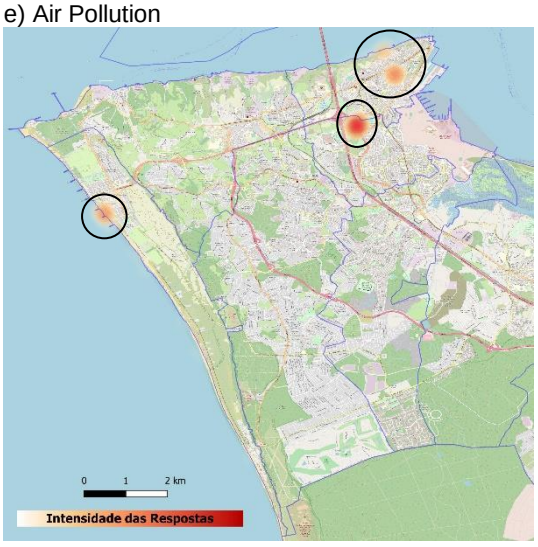
c) Lack of Security



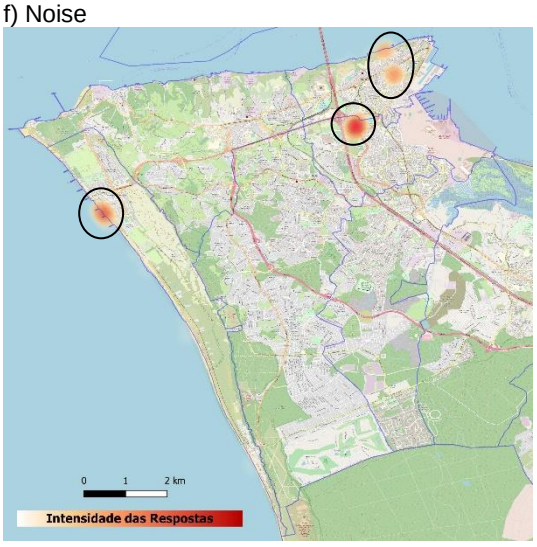
d) Neglected and Destroyed Areas



e) Air Pollution



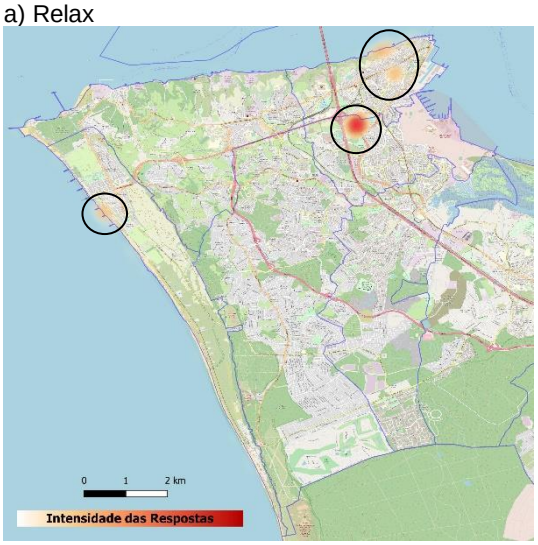
f) Noise



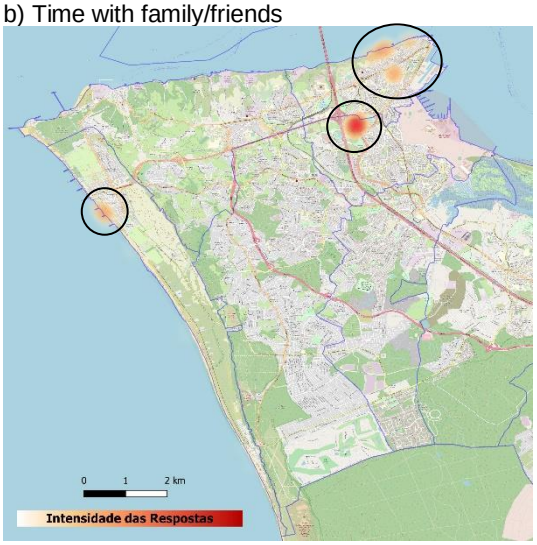
In terms of type of uses that respondents give to the UGS, to relax, to spend time with family or friends, to walk the dog or to experience nature are in most of the mapped areas (figure 13). People practice more sports in Parque da Paz (figure 13). People swim mostly in the coastal area of Costa da Caparica. Places where people go with kids to play are mostly in specific parks, like Parque da Paz. The only place where people use UGS to take shortcuts are in the Parque Comandante Júlio Ferraz that is in the most center part of the municipality, in the local parish Almada (figure 13).

Figure 13 - Hotspots maps of individual of uses (n=11) (red indicate hotspots).

a) Relax



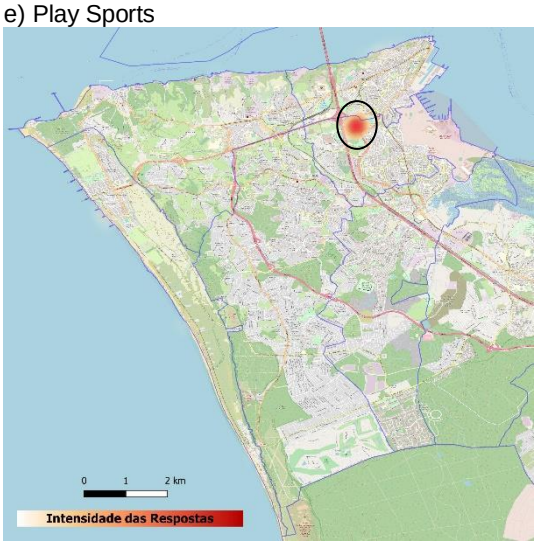
b) Time with family/friends



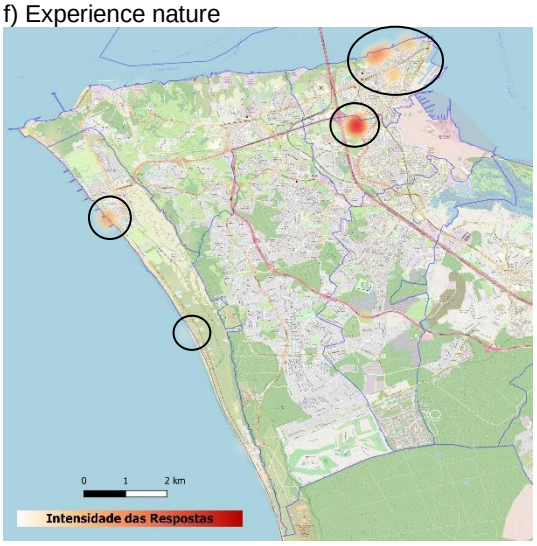
c) Play with kids

d) Walk dog

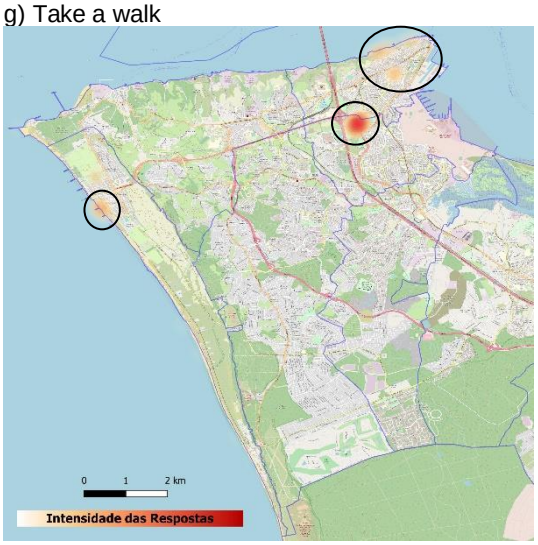
e) Play Sports



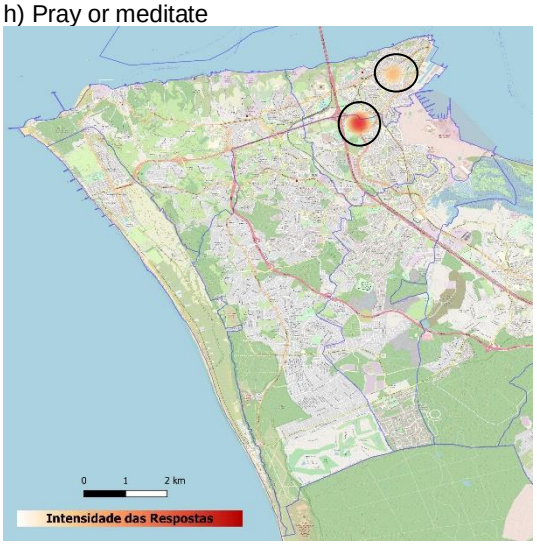
f) Experience nature



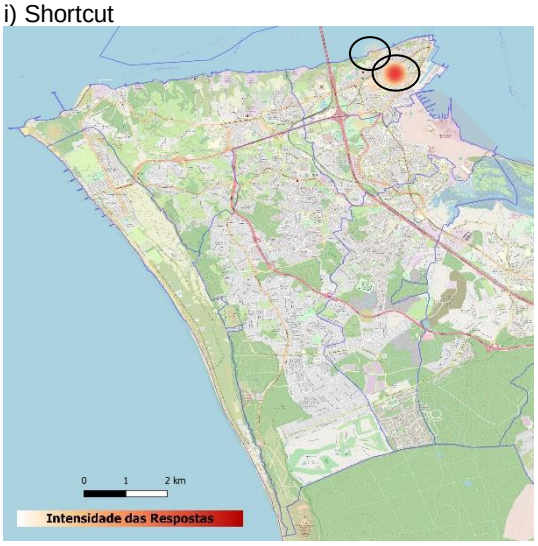
g) Take a walk



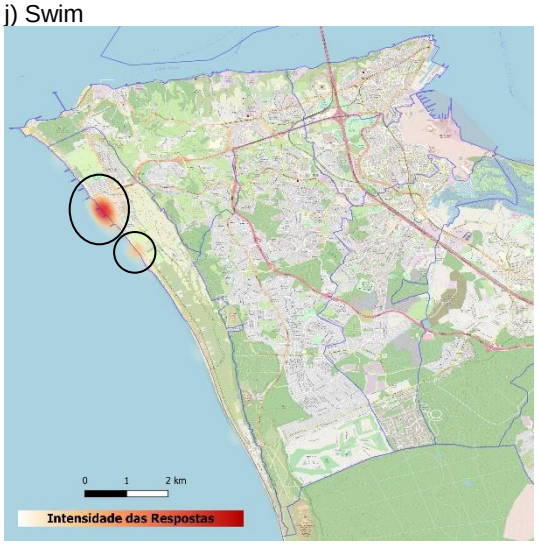
h) Pray or meditate



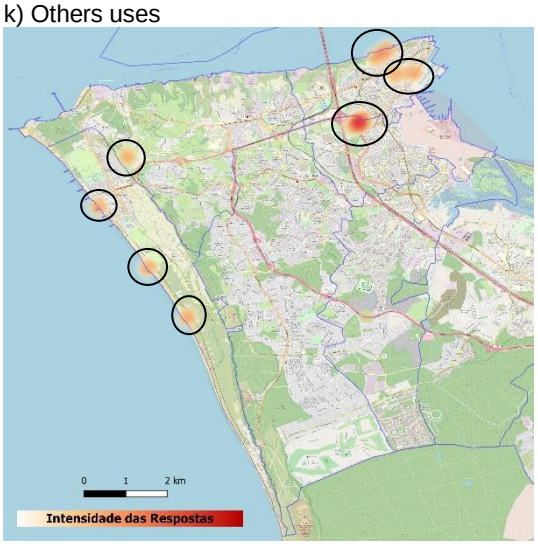
i) Shortcut



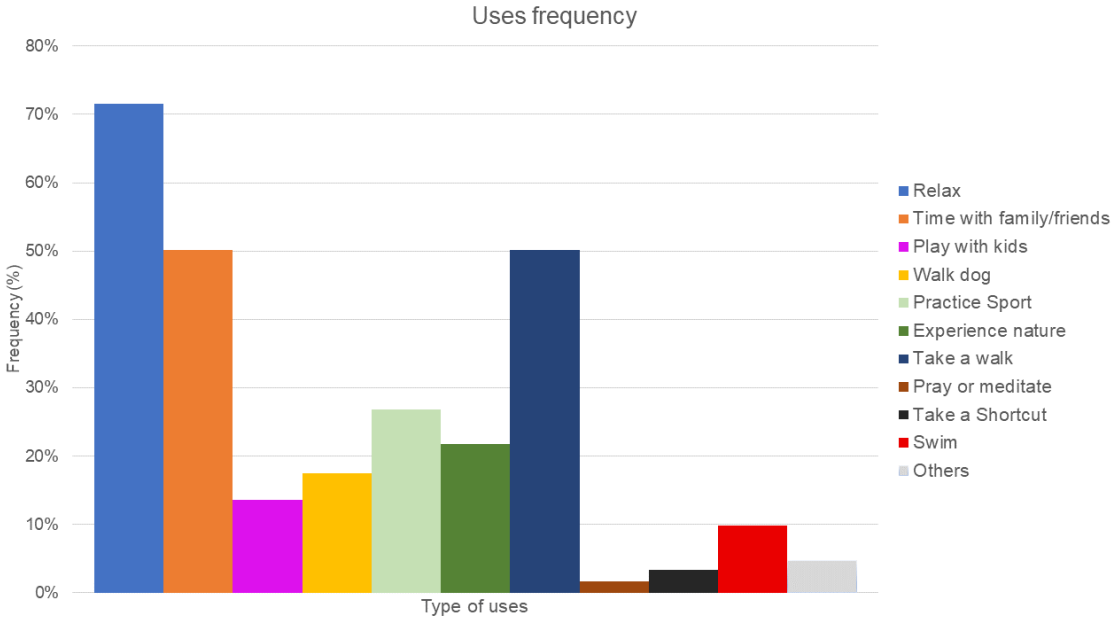
j) Swim



k) Others uses



The type of uses people do more in UGS were:71,5% of UGS' users relax, 50,2% spent time with family/friends and 52,5% go for a walk. What people less do in UGS is pray or meditate (1,7%) (graphic 4). 56,2% of respondents said that they would use more the UGS if improvements were made.



Graphic 4 - Frequency (in percentage) of UGS uses.

5.5. Analysis of the relationships among results.

In table 4, regarding correlations between CES, it can be observed that most CES are strongly correlated with all of them. Except between spiritual and recreation, and spiritual with aesthetics. The correlation between cultural heritage and recreation, between biodiversity and sports, and cultural heritage and sports is also a little bit week comparing to the others.

Table 1 - Correlations between CES.
**. Correlation is significant at the 0.05 level (2-tailed).*
***. Correlation is significant at the 0.01 level (2-tailed).*

	Recreation	***Sports***	***Aesthetics***	***Culture heritage***	***Educational values and Nature experience***	***Spiritual***	***Inspiration***	***Social***	***Biodiversity***
Recreation									
Sports	**,207****								
Aesthetics	**,370****	**,243****							
Culture heritage	**,142***	**,144***	**,292****						
Educational values and Nature Experience	**,307****	**,261****	**,421****	**,611****					
Spiritual	,036	**,204****	,102	**,425****	**,429****				
Inspiration	**,219****	**,180****	**,412****	**,356****	**,490****	**,334****			
Social	**,363****	**,288****	**,392****	**,227****	**,382****	**,264****	**,339****		
Biodiversity	**,351****	**,143***	**,362****	**,293****	**,445****	**,299****	**,360****	**,335****	

There are not so many correlations between CES and UGS uses (table 5). The few that are correlated are: inspiration with relax (,161*); time with family/friends with recreation (,167*), aesthetics (,218**), educational values and nature experience (,167*), spiritual (,169*), and social (,351**); walk the dog with aesthetics (-,155*); nature experience with recreation (,133*), and with educational values and nature experience (,185**); and pray or meditate with cultural heritage (,135*), and with spiritual (,189**) (table 5).

Table 2 - Correlations between CES and uses.
**. Correlation is significant at the 0.05 level (2-tailed).*
***. Correlation is significant at the 0.01 level (2-tailed).*

	Relax	Time with family /friends	Play with kids	Walk dog	Play Sports	Experience nature	Take a walk	Pray	Take a shortcut	Swim
Recreation	,001	**,167***	-,070	-,019	-,053	**,133***	-,008	,048	-,083	,004
Sports	-,022	-,047	,041	,017	**,348****	-,112	-,034	-,009	-,054	,122
Aesthetics	,069	**,218****	-,115	**-,155***	-,021	,066	068	,097	-,115	,064
Cultural heritage	-,005	,071	,011	-,126	-,020	,015	,086	**,135***	-,096	,045
Educational values and nature experience	,032	**,167***	-,074	-,032	-,039	**,185****	-,001	,128	-,117	,042
Spiritual	-,007	**,169***	,039	-,088	-,003	-,075	,022	**,189****	-,033	-,041
Inspiration	**,161***	,128	-,071	-,068	-,022	,067	,000	,075	-,107	,103
Social	,027	**,351****	,114	-,017	-,055	-,061	-,028	,078	-,094	,010
Biodiversity	,058	**,165***	**-,135***	-,001	,021	**,172***	-,006	**,148***	-,081	-,079

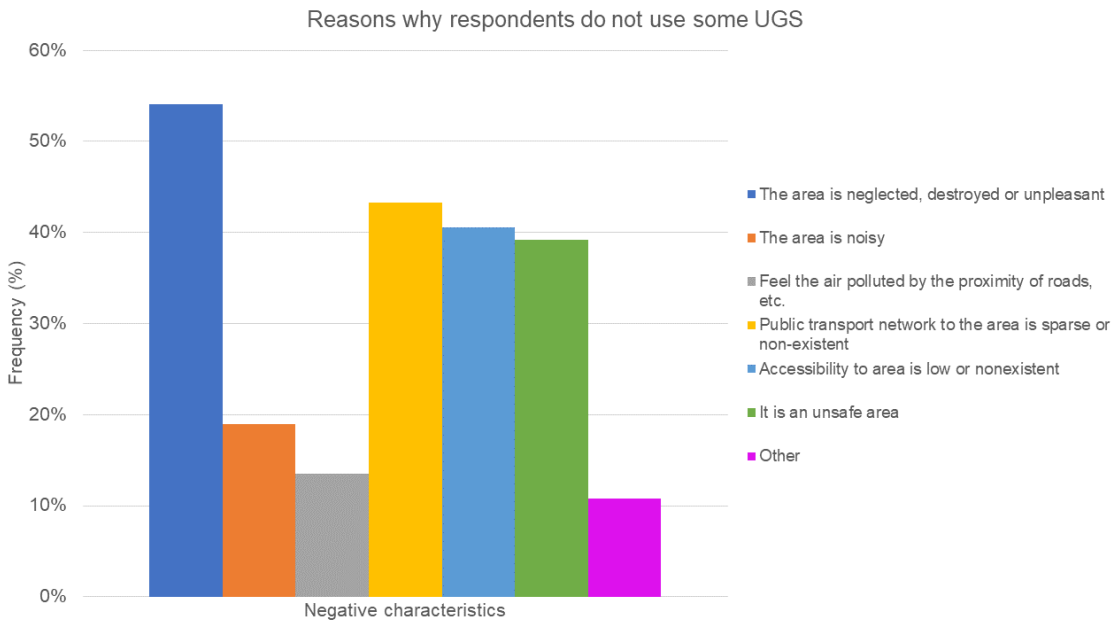
However, there are no correlations between uses (table 6).

Table 3 – Correlations between uses.
**. Correlation is significant at the 0.05 level (2-tailed).*
***. Correlation is significant at the 0.01 level (2-tailed).*

	Relax	Time with family/friends	Play with kids	Walk dog	Play Sports	Experience nature	Take a walk	Pray	Take a shortcut	Swim
Relax										
Time with family/ friends	,957									
Play with kids	,024	,803								
Walk dog	,648	,001	,067							
Play sports	,110	,000	,460	,140						
Experience nature	,974	,987	,005	,003	,080					
Take a walk	,004	,165	,042	,017	,016	,004				
Pray	,031	,334	,418	,349	,217	,283	,334			
Take a shortcut	,142	,950	,910	,585	,078	,506	,434	,702		
Swim	,394	,227	,164	,019	,262	,031	,742	,502	,338	

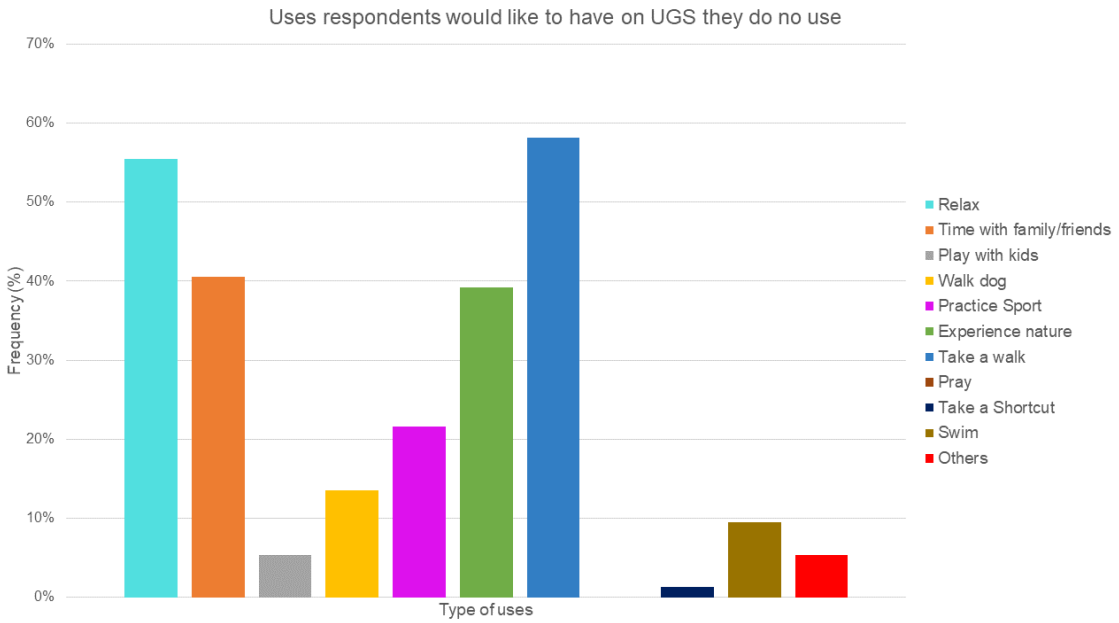
5.6. UGS that people do not use but would like to

A total of 74 UGS were selected as places people are not using but would like to use. Most respondents (54.1%) do not use those places because they are neglected, destroyed or unpleasant. The second major reason is the lack of public transportation to the place (43,2%). The third is the lack of accessibility and the fourth is unsafety (39,2%) (graphic 5).



Graphic 5 - Frequency (in percentage) of reasons for people do not use some UGS.

Most people would like to take a walk (58,1%), relax (55,4%), and some would like to spend time with family and friends (40,5%) and experience nature (39,2%) on these UGS (graphic 6).

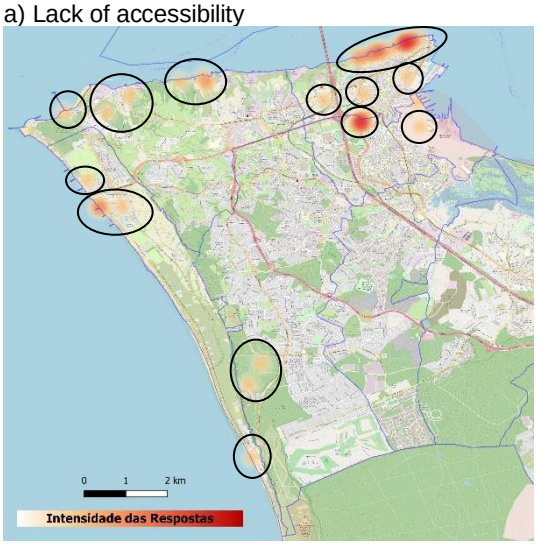


Graphic 6 - Frequency (in percentage) of uses people would like to give on some UGS.

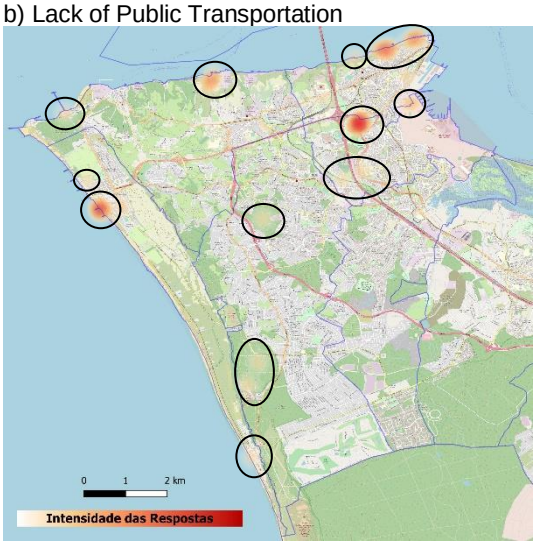
Lack of accessibility, lack of public transportation and air pollution are common problems to those places. The main problem of the Ginjal (UGS) is the fact that it is considered neglected, destroyed, with lack of security and noise. There are some areas in Trafaria and in the coastal area Costa da Caparica that also considered destroyed and neglected by respondents. The beach Costa da Caparica have noise complaints (figure 14).

Figure 14 - Hotspots maps of individual reasons for people do not use some UGS (n=7) (red indicate hotspots).

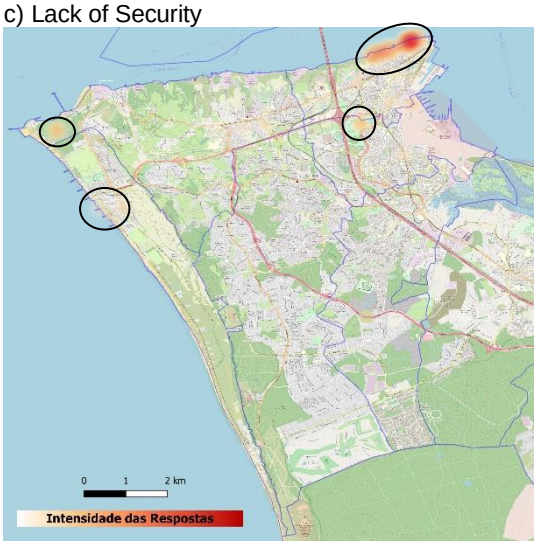
a) Lack of accessibility



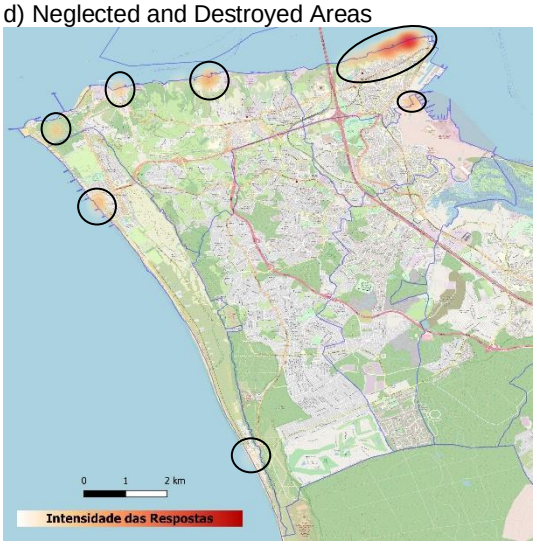
b) Lack of Public Transportation



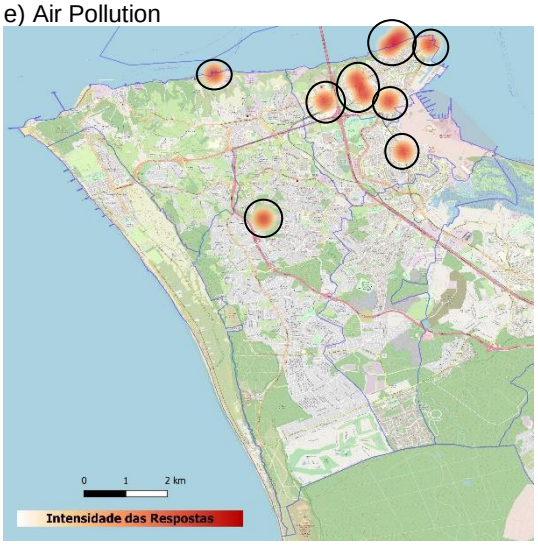
c) Lack of Security



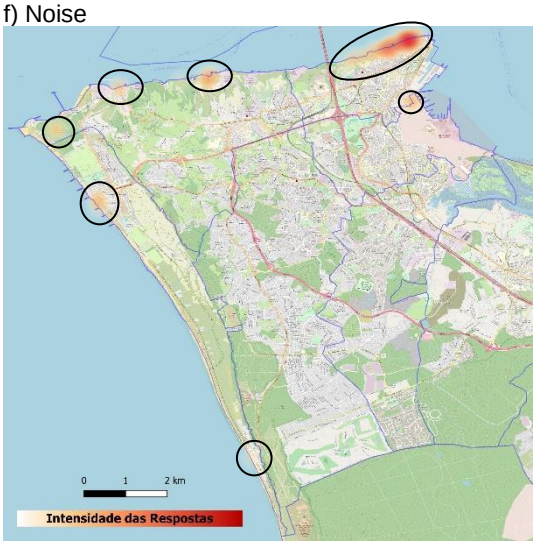
d) Neglected and Destroyed Areas



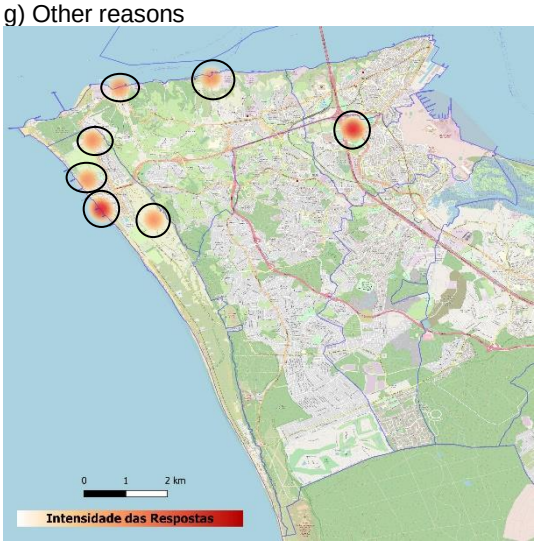
e) Air Pollution



f) Noise



g) Other reasons



6 Discussion

This research allows to better understand the location and the type of cultural ecosystems services that citizens considered to benefit in Almada' UGS, the type of uses people give to those places, their negative characteristics, the frequency time they spent there, the places that people would like to use and the reasons why they do not use them and main characteristics of the UGS' users.

Through the results we can understand that the elderly population (+60 years) is the one that less uses the UGS, even though UGS are important for elderly people to practice physical activities which is important for them to stay health (Gong, et al., 2016). The lack of public transportation and the lack of accessibility might be one the reasons for less use of UGS by them. A study done in Hong Kong about the accessibility by elderly to UGS on dense cities, gave suggestions on planning and design UGS to increase their use by elder population (Gong et al., 2016). The suggestions made were: the increase of the number of UGS with larger sizes once they are more attractive comparing to the small ones; and in UGS with poor accessibility increase the improvement of walking routes or building more small to median sized UGS patches which will cover the city (Gong et al., 2016). Further analysis should be done to test correlations between UGS' users age and CES, uses and negative characteristics.

A study done in China about how socioeconomic affects the perception on UGS concluded that UGS with open and polished landscape and "intense patronage" decrease criminal activities and increase the sense of security, consequently boosting UGS use and their health benefits (Jim and Shan, 2013:p-130). Jim and Shan (2013) also propose the conservation and grant of small and easily accessible UGS to increase their use by kids and elderly people, especially on high density cities with lack of private green spaces. Nature education is another tool to increase the contact with nature and their benefits, especially to younger generations that are the future, being nature education tools examples: the study of wildlife, tree planting and gardening (Jim and Shan, 2013).

According to Casado-Arzuaga, et al. (2014) there are several studies that show that recreation is one of the most common CES. As we can see on this study, recreation is also one of the frequent CES, but as equal as aesthetics, social, inspiration, and education value. All these CES are strongly correlated with one another. A positive and significant correlation was found between recreation and time with family/friends and with experience nature.

However, the negative characteristics associated to some UGS, might be decreasing their use, as in the study of Casado-Arzuaga et al. (2014), which concluded that those characteristics decrease recreation, they also concluded that the aesthetics of certain areas, the smoke from industries and the lack of knowledge about the existence of recreation areas, decrease recreation as a cultural

ecosystem service (Casado-Arzuaga et al., 2014). Casado-Arzuaga et al. (2014) map recreation and aesthetic values of ecosystems and integrated those results in regional and urban planning. In our study future correlation analysis should be done to confirm this relationship. Nevertheless, it is possible to see that most of the unpleasant characteristics mentioned by Almada's residents were in Parque da Paz, Ginjal, in the coastal area Costa da Caparica and Parque Comandante Júlio Ferraz,

In this research we can verify that there is a strong correlation between inspiration and educational values and nature experience. There is also a positive significant correlation between use of UGS to relax and inspiration, with an increase of inspiration just by relaxing on UGS. The experience of nature on UGS have a strong correlation with educational and nature experience values, affecting positively. This research confirms other studies that proves that the contact with nature increase inspiration, creativity, and educational values of nature that leads to the fulfillment of important needs for humanity (Russell et al., 2013).

Empirical research talk about the connection between nature and physical and mental health, and the contributions of nature to human health (Russell et al., 2013). Even though this study cannot analyze those benefits directly, it still shows that 50,2% of the users of UGS take walks, 26,8% practice sports, 17,4% use UGS to walk their dog and 9,8% swim on blue spaces. The practice of sports is highly correlated with health benefits. In terms of mental health, other studies prove that visualizing nature and relax in nature increase mental health reducing the impact of job stress, increasing productivity on work and life satisfaction, patience and happiness (Russell et al., 2013). The distance between UGS and people' residence area does not affect the increase of physical activity according to Schipperijn et al. (2013). What affects the increase of physical activity is the size of UGS (> 5 ha) and how better prepared they are in terms of water features, cycling routes, trails, aesthetics view or existence of parking lots (Schipperijn et al., 2013). Our study concluded that 80% out of 100 UGS' users, use UGS to take walks, practice sports, walk the day, swim, experience nature and experience nature.

When it comes to spiritual values as a cultural ecosystem service, this one is "not limited to indigenous populations" (Russell et al., 2013:p-482). As we can observe in this research there is a small percentage of people (1,7%) that pray or meditate on UGS. Not only praying or meditating on UGS increase and have a correlation with spiritual ecosystem service, time with family or friends on UGS also increase this cultural ecosystem service and have a strong correlation with it. Spiritual ecosystem service is also highly correlated with sports, cultural heritage and educational and nature experience values. With ecological degradation cultural or spiritual values can be affected even if it does not affect or have a big impact on ecosystem functions (Garibaldi and Turner, 2004; Turner et al., 2003).

The knowledge on ecosystem services allow a more sustainable and ecological planning in urban regions (Niemelä et al., 2010). CES assessments are important to understand which design is better

and to know the preferred activities on parks and to improve health provided by UGS (Peschardt and Stigsdotter, 2014). In Peschardt and Stigsdotter (2014) study it is about the design of pocket parks and how can this design create opportunities for people to seat in the sun or shade, the recognition of this parks as urbans parks and a place for recreation.

Almada cultural ecosystems services are concentrated in specific areas (e.g. urban parks, such as Parque da Paz and a park in the city center, or beaches such as Costa da Caparica). Even though there is significant percentage of UGS with lack of security, destroyed and neglected areas, lack of accessibility and lack of public transportation, most respondents still agree that the municipality UGS have quality and conditions. However, there is still improvements that can be done to increase the use of UGS. It's necessary an increase of public transportation and accessibility, which might increase the use by the elder population (future analysis should be done and tested to confirm). The fact that 74 UGS were selected as places people would like to use, is a prove that the city council can improve the conditions and quality of municipality UGS. Ginjal is a place with lack of security and the area is neglected and destroyed according to the respondents, also have lack of accessibility. Parque da Paz is the more used place, although it has lack of security according to the population.

To increase the use of UGS some efforts should be done and new UGS can be built. The understanding of ecosystem services and their services allow a better design and management of UGS (Tan and Jim, 2017). The book *Greening Cities. Forms and Functions* by Tan and Jim (2017:p-3) gives some examples for UGS planning, some of them are: "ground-level greening to elevated skyrise greening expressed as green roofs, green walls and sky terraces"; transformation of isolated green patches in green spaces with connectivity between them, such as habitat corridors, and "permeating ecological network of greenways and blue ways"; urban farming and allotments, community gardens; and green and blue infrastructures with "applications in stormwater management in terms of both quantity and quality".

In Portugal, a sub-global assessment was made at a national scale of the ecosystem's services for the Millennium Ecosystem Assessment, as part of the 18 Sub-Global Assessments (Pereira, et al., 2009). This assessment analyzed the state of the biodiversity and ecosystems services, the main causes for the ecosystem's changes, compared the several options to an answer the problems, and developed different scenarios for the biodiversity and ecosystems services future (Pereira et al., 2009). However, more detailed assessments for each municipality are important for their urban planning and management.

7 Conclusion

The socio economic dimension is important when it comes to the planning of UGS, for example, to identify the basic needs for recreation and leisure in order to create places that increase social cohesion; to identify different uses by different socio-economic groups, or to encourage an active engagement and participation of the community on UGS design and management. “The evaluation of citizen expectations and preferences” for UGS and their recreational demands, park accessibility studies, evaluation of tangible and intangible barriers, and socio-demographic profiles (Tan and Jim, 2017) are critical for urban planners and decision-makers. All these examples help to improve UGS planning (Tan and Jim, 2017).

The main objectives of this study were to map the location and the perception of Almada citizens about the role of CES in their municipality, to understand the different uses of CES in UGS, and to understand how can ecosystem services, more specifically CES be considered in the spatial planning instruments and on local environmental policies.

This research started with an explanation on the first chapter about the importance of cities, UGS and cultural ecosystem services (CES). Cities are responsible for direct and indirect impacts on the planet, however there are also a source for innovation, wealth, creation, human social interaction, participatory governance processes, economic development, efficient resource management and sustainable planning policies (Bettencourt et al., 2007; Burger et al., 2019, 2017; Galli et al., 2020; Lehtonen et al., 2016; Moavenadeh et al., 2002; Moore et al., 2013; Pearson, 2013). Cities should be able to supply multiple functions and have quality UGS that allow those functions (Byrd et al., 2017). There are several types of UGS that contribute to the human well-being, being created a typology of UGS that allow a better understanding of the UGS benefits that are biodiversity protection, climate change adaptation, green economy support and increase of social cohesion (Byrd et al., 2017; Hansen et al., 2017). To promote the social and ecological well-being of urban environment a framework with four core principals was created which improve the UGI planning, those principals are the green-grey integration, connectivity, multifunctionality, and social inclusion and justice (Byrd et al., 2017; Hansen et al., 2017). UGS supply cultural ecosystem services that increase the physical and mental health of urban citizens (Branquinho et al., 2015). It is important to understand the social and cultural needs and their locations in the cities, and this information’s can be obtained through UGS users (Haase et al., 2014). Cultural ecosystem services are hard to quantify because of their intangible and subjective characteristics, however they are important and indispensable to the human well-being (Daniel et al., 2012; Millennium Ecosystem Assessment, 2005). There is still a huge gap of knowledge about CES that some studies are trying to fill, such as Plieninger et al. (2013) and Rall et al. (2017) studies.

The second chapter explained the importance of valuation, the types of valuations, the creation and importance of the ecological economics and decision-making processes. Several frameworks

(Millennium Ecosystem Management (MEA) and TEEB) arise for the practical use of ecosystem services by decision-makers (TEEB, 2010). TEEB framework arise because of the lack of attention by the MEA on the economics of ecosystem change (TEEB, 2010). Being distinguished the ecological, social-cultural and economic benefits and values of ecosystems (TEEB, 2010). Social valuation is the best for the valuation of intangible and subjective ecosystem services, that sometimes can be more important to society than material benefits (Chan, Guerry, et al., 2012). Social valuation is also important once it make people's opinions and beliefs visible in decision-making processes, being the participatory approach a good method for a better planning, resource management and nature conservation (Reed, 2008; Walz et al., 2017). The social valuation method used on this research was the PPGIS approach – Public Participation Geographic Information Systems (Kronenberg et al., 2017). Urban policies allow a sustainable development and promote inclusive cities with opportunities for all urban residents with access to all drivers of social inclusion (OECD Regional Development Ministerial, 2019).

In this study it was possible to identify the areas where CES are available using the perception of UGS users and some test correlations were done between CES with one another and the uses. Other conclusions could be taken regarding the socio-demographics profile of the respondents, the quality of Almada' UGS according to their users, the time spent on UGS, the specific use given to Almada UGS, the negative characteristics, the places people would like to go and the reasons why they do not use them. These information's were important to understand which areas can be improved in the municipality, how to increase UGS use, how we can improve and increase them.

However, several other analyses can be tested, such as correlations between CES and negative characteristics, negative characteristics and uses, CES, uses and negative characteristics with demography characteristics (e.g. age, gender and educational level). Some studies analyzed in the discussion, explained how these correlations help to better understand the needs of urban population, such as the lack of accessibility that affects the use of UGS by elderly population, the lack of security that decrease the use of UGS by population in general, and the neglected and destroyed areas that also decrease the use of UGS. "Cultural ecosystem services are directly experienced" if UGS are well managed and planned (Casado-Arzuaga et al., 2014:p-1403).

Common urban green parks are not the only source of CES, as the typology of Kronenberg et al. (2017) show, and it is possible to increase CES and other ecosystem services and decrease the climate change mitigation. This research provided information to Almada municipality about their UGS and how they can better plan and manage them and suggestions to increase and improve their UGS. This research can also be replicated in other municipalities.

The major limitation of this study was the application of the survey. It is a questionnaire that takes between 5 to 15 minutes and should be answered by more people to increase the reliability of data. This study can be applied in other municipalities contributing to the knowledge of ecosystem services

in Portugal or other countries. The survey can also provide a huge amount of information and interesting results for urban planning and local policies; however, it should be done with the support of specialists in statistics and GIS for a better reading of data.

The municipality of Almada should reinforce the application of this survey and increase the number of data collected for better results. It should also compare the mapped cultural ecosystem services with the other ecosystem services. To improve the municipality UGS and the quality of life of the Almada residents, the city council should use the results of this research to improve the municipality planning and management by keeping and increase the positive aspects found and by promoting actions to reduce the negative characteristics found and mapped.

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Appendix

Appendix 1: Survey questionnaire (Portuguese and online version)

Mapeamento de Serviços Culturais dos Ecossistemas: perceção dos cidadãos de Almada

Considera que ter contacto com a natureza traz benefícios para si?

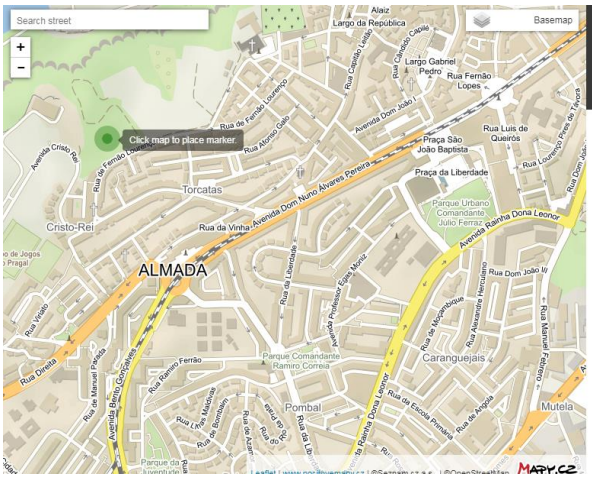
- ◯ Sim, sempre
- ◯ Sim, na maioria das vezes
- ◯ Sim, às vezes
- ◯ Não, nem sempre
- ◯ Não, na maioria das vezes
- ◯ Não, nunca

Se respondeu de forma positiva, quais os benefícios que acha que obtém ao ter contacto com a natureza?

Diga o seu grau de concordância ou discordância em relação às seguintes afirmações:

	Concordo totalmente	Concordo	Não concordo nem discordo	Discordo	Discordo totalmente
Sinto necessidade de estar frequentemente em contacto com a natureza.	◯	◯	◯	◯	◯
O concelho oferece condições para estar em contacto com a natureza.	◯	◯	◯	◯	◯
A Câmara Municipal promove a existência de espaços verdes (ex: jardins) e azuis (ex: praias) de qualidade no concelho.	◯	◯	◯	◯	◯

PRÓXIMO PASSO



Mapeamento de Serviços Culturais dos Ecossistemas: perceção dos cidadãos de Almada

Identifique no mapa do concelho de Almada até 5 zonas verdes

(ex: parques, jardins públicos/privados, áreas verdes abandonadas, jardins comunitários, parques de campismo, etc.) ou azuis (ex: praias, rios, lagos, etc.) **que usa e desfruta**.

Para cada um dos locais escolhidos, serão colocadas 4 breves questões.

Selecione um local

VOLTAR | PRÓXIMO PASSO

Em que altura do ano, e com que frequência, usa ou desfruta deste espaço (escolha as opções que entender)?

	Diariamente	2 a 3 vezes por semana	1 vez por semana	2 a 3 vezes por mês	1 vez por mês	Raramente	Nunca
Todo o ano	○	○	○	○	○	○	○
Verão	○	○	○	○	○	○	○
Primavera	○	○	○	○	○	○	○
Outono	○	○	○	○	○	○	○
Inverno	○	○	○	○	○	○	○

Diga o seu grau de concordância ou discordância em relação às seguintes afirmações relativamente ao local que selecionou

	Concordo totalmente	Concordo	Não concordo nem discordo	Discordo	Discordo totalmente	Não se Aplica
Desfruto de atividades recreativas (como passear animais, apanhar ervas ou frutas, ou distrair da agitação do dia-a-dia).	○	○	○	○	○	○
Faço atividades desportivas (como andar de bicicleta, andar a pé, correr, nadar ou pescar).	○	○	○	○	○	○
Desfruto da paisagem.	○	○	○	○	○	○
Desfruto da história local e da identidade que o local transmite para mim.	○	○	○	○	○	○
Desfruto de oportunidades para aprender, observar e experienciar a natureza.	○	○	○	○	○	○

Desfruto de aspetos sagrados, religiosos e espirituais.	○	○	○	○	○	○
Desfruto de aspetos inspiradores da natureza, onde me possa sentir estimulado(a) por novos pensamentos, ideias ou impulsos criativos.	○	○	○	○	○	○
Desfruto de encontros com a família e com os amigos (como passear com a família, amigos, brincar com as crianças).	○	○	○	○	○	○
Desfruto da variedade de plantas e animais.	○	○	○	○	○	○
Poderia desfrutar mais se a rede de transportes públicos para a área fosse melhor.	○	○	○	○	○	○
Poderia desfrutar mais se acessibilidade à área fosse melhor.	○	○	○	○	○	○
Poderia desfrutar mais se a área estivesse menos negligenciada e destruída.	○	○	○	○	○	○
Poderia desfrutar mais se a área fosse menos barulhenta.	○	○	○	○	○	○
Poderia desfrutar mais se o ar fosse menos poluído (pela proximidade de estradas, etc.)	○	○	○	○	○	○
Poderia desfrutar mais se a área fosse mais segura.	○	○	○	○	○	○
Outro (indique por favor):	○	○	○	○	○	○

Indique quais as atividades que mais frequentemente faz neste espaço (indique no máximo 3 atividades que considere mais relevantes)

- ☐ Relaxar
- ☐ Tempo para família/amigos
- ☐ Brincar com crianças
- ☐ Passear o cão
- ☐ Praticar desporto
- ☐ Experienciar a natureza
- ☐ Dar um passeio
- ☐ Rezar ou orar
- ☐ Encurtar caminho
- ☐ Nadar
- ☐ Outro (indique por favor):

Usaria mais este espaço, caso alguma melhoria fosse feita?

- ◉ Sim
- ○ Não

Se sim, indique qual.

Quais os motivos que o levam a não usar/desfrutar deste espaço (escolha as opções que entender)

- [ ] A área encontra-se negligenciada, destruída ou desagradável.
- [ ] A área é barulhenta.
- [ ] Sinto o ar muito poluído pela proximidade de estradas, etc
- [ ] A rede de transportes públicos para a área é escassa ou inexistente.
- [ ] A acessibilidade para a área é reduzida ou inexistente.
- [ ] É uma área insegura/pouca segurança.
- [ ] Outro (indique por favor):

Indique quais as atividades que mais gostaria de fazer neste espaço (indique no máximo três opções que considere mais relevantes)

- [ ] Relaxar
- [ ] Tempo para família/amigos
- [ ] Brincar com crianças
- [ ] Passear o cão
- [ ] Praticar desporto
- [ ] Experienciar a natureza
- [ ] Dar um passeio
- [ ] Rezar ou orar
- [ ] Encurtar caminho
- [ ] Nadar
- [ ] Outro (indique por favor):

Mapeamento de Serviços Culturais dos Ecossistemas: perceção dos cidadãos de Almada

Nacionalidade

Idade

anos

Género

Freguesia de Residência

A sua habitação fica em meio

Viveu sempre nessa Freguesia

Sim | Não

Se não, há quanto tempo reside nesta freguesia:

anos

Nível de escolaridade

Ensino Superior

Curso:

Profissão