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Sustainable Land Use and Climate Change in Belgrade - The Role of Urban Gardens

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Abstract
Population growth and urban sprawl are expected to continue increasing pressures on agricultural land, green infrastructure and climate change's impact on the urban environment. Accordingly, the challenge of securing sustainable land use and climate change mitigation needs to be confronted in cities globe wide. Urban green areas represent an asset of public interest with multiple roles – they are recreational zones, noise and pollution protection belts, areas with aesthetic, social and curative values as well as an infrastructure for combating climate change. All these functions accentuate the relevance of urban gardens in urban development, for which their preservation and development play an irreplaceable role in cities.
This paper analyses a specific form of urban gardens in Belgrade ("baštenske kolonije" or "garden colonies") with a focus on urban land use planning. The research methodology consists of a literature and document review and systematic analysis. The study includes legislative in Serbia and urban planning documents in Belgrade, with the goal being to identify governmental and planning attitude towards urban gardening and their recognition of ecosystem services and climate change combat. The preliminary results indicate that this form of sustainable land in Belgrade is left to the spontaneous actions of individuals with no legally defined status in the previous period

Keywords: sustainable land use, urban gardens, climate change, urban planning, Belgrade.

1. Introduction

More than half of the global population resides in urban areas (UNFPA, 2007), prevailingly as a consequence of decades-long rural-urban migrations and with the growing tendency in the future (Henning, 2017). As cities represent areas with a significant share of sealed soil, population growth and urban sprawl will continue to increase pressures on green elements in the urban environment, thus increasing climate change impact. Therefore, a challenge for securing a sustainable future and climate change mitigation needs to be confronted in cities, as they represent spaces with significantly altered natural environment, pollution, resource degradation, and waste generation (UNFPA, 2007).
Limited access to natural resources in cities, together with growing concerns about the quality and cost of food, have increased interest in growing food locally in urban gardens (Guitart et al., 2012). Among various positive effects of urban gardening, its role in climate change mitigation/adaptation is also relevant because green spaces have a positive impact on natural values such as air, water, soil, plants, and animals (Demuzere et al., 2014; Gill et al., 2007). Not only forests, but green areas play an overall significant role in diminishing urban heat island effects and temperature extremes (Marković et al., 2021). In addition, urban agriculture also plays a relevant role in limiting irrational sprawl of building land and

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soil-sealing (Kazmierczak & Carter, 2010). Therefore, it is of utmost value to promote and incentivise the development of urban gardens.

EU cities try to minimize the effects of climate change by expanding their urban green infrastructure (De la Sota et al., 2018). Ecosystem services in urban environments can reduce the ecological footprints of cities and at the same time enhance the resilience, health, and quality of life of city inhabitants (Gómez-Baggethun & Barton, 2013). In their study on the potential of forestry and agricultural measures for climate change mitigation, De la Sota et al. (2018) have demonstrated that the degree of final carbon uptake depends on the type of urban green infrastructure elements and their management. Despite the potential of urban gardens to contribute to delivering ecosystem services and climate change mitigation in cities, they are largely neglected in urban planning policy (Camps-Calvet et al., 2016; Deelstra & Girardet, 2000; Taylor Lovell, 2010). Urban planners are inclined to think that urban agriculture is an inappropriate activity in the urban setting and have little understanding of people's need to grow food in cities (Deelstra & Girardet, 2000).

Allotment gardening is still largely informal in many European countries (Lorbek & Martinsen, 2015), mainly in those in Eastern and South-Eastern Europe (Drilling et al., 2016; Keshavarz, 2014). The lack of policies and legal protection renders urban gardens vulnerable to land use changes (Domene & Saurí, 2007). Urban development and land use changes can cause the loss of allotment gardens, which consequentially leads to the loss of the many ecosystem services those gardens provide. Djokić et al. (2018) suggest that, as long as urban gardening remains an informal practice without clear legal and planning status, it will be impossible to work towards the systematic improvement of their design and spatial organization.

Research on community and allotment gardens in Eastern and South-Eastern Europe region is less extensive (Čepić & Tomićević Dubljević, 2017). In the past couple of years, initial studies have been made about urban gardening in Belgrade, Ljubljana, and Zagreb (Adžić, 2012; Djokić et al., 2018). Therefore, this paper examines the existing planning and legal framework of urban gardening in the city of Belgrade. It discusses the policy development needed for the effective regulation and facilitation of allotment gardening and options for their integration into urban development and land use plans, as they are an important component for sustainable city development and climate change mitigation and adaptation.

1.1 History of Belgrade's allotment gardens[1]

Urban and peri-urban gardening is far from being a novelty in Serbia, as various forms of urban gardens have been present throughout the 20th century. These gardens are typically private and family-run, primarily focused on cultivating flowers, medicinal and aromatic herbs, orchards, and vegetables (Popović & Živanović Miljković, 2013). Massive housing construction in the 1960s and 1970s did not favour the establishment of gardens within the housing blocks, so remote spots of land that were not yet designated for its use and peri-urban areas became the places for a sprout of urban gardens (Djokić et al., 2018). After the Second World War, Belgrade experienced major urban development, accelerated

[1] Another term is 'garden colonies' (orig. baštenske kolonije).

by a massive flow of rural population in the city, which was followed by the construction of large residential blocks. The number of dwelling units increased from about 107,000 in 1950 to 512,000 in 1991 (Hirt & Petrović, 2010) and was supposed to accommodate the growing urban population in large "Spartan-looking" residential towers as a new architectural standard, rather than the individual house with a private garden (Hirt & Petrović, 2010, p.4). In such circumstances, new urban residents have spontaneously claimed the land in the vicinity of their apartment buildings and transformed unused green plots into gardens, thus resisting the "power of technocratic and bureaucratic planning" (Djokić et al., 2018, p.249). These initiatives carried another important value, which was the ability for the newly established gardeners to identify with the new environment and develop a sense of belonging, most new dwellers coming from a rural setting. Similarly, the period of post-socialist transition during the 1990s, brought difficult economic conditions, so residents illegally occupied public unbuilt urban construction land and transformed it into smaller garden lots, where they grew basic vegetables without soil quality control or basic infrastructure requirements (Popović & Živanović Miljković, 2013).

Urban allotment gardens in Belgrade were first defined and mapped in 2007 in the General Regulation for Green Area System in Belgrade (GRPGA) (2019) (Key for Biotope Mapping). They are defined as a complex that consists of a set of small arable areas, i.e. agricultural land, that are leased to interested persons, including common areas, trails, and infrastructure. Allotment gardens are located in almost every part of the city, on the territory of urban municipalities of New Belgrade, Zemun, Palilula, Voždovac, Rakovica, Čukarica, etc., covering about 126 ha of land (Adžić, 2012; GRPGA, 2019). Mapping of the gardens was the initial step of public institutions in acknowledging their existence and their values as part of the urban green network (Djokić et al., 2018). Djokić et al. (2018) point out an interesting fact that even though urban gardening has been an informal activity, not defined within any institutional document, allotment gardens have not been sanctioned by the city authorities, but rather overlooked and disregarded. Still, until today, no model has been found to legally integrate urban allotment gardens into the system of green areas. Therefore, urban gardening in Belgrade is an informal activity (Adžić, 2012), where allotment estates are divided into plots that are cultivated individually by gardeners who had occupied the plots and have been using them without obligation to pay a fee or rent (Djokić et al., 2018). The status of urban gardens (community gardens, allotment gardens) remains undefined in Serbia, as there are no legal regulations at the national or local level. It is unclear whether these gardens are illegal or simply the result of residents' initiatives, as highlighted by Živanović Miljković and Crnčević in 2019. However, a recent study (Cepic et al., 2020) documented the persistence of the existing allotment gardens across the city because of their importance for the users, although there was no support from local authorities.

1.2 Belgrade's climate and climate change tendencies

The City of Belgrade belongs to the humid continental climate region, which is characterised by rather hot (and often humid) summers, cold winters, and spring and autumn as transitional seasons. The ecological Atlas of Belgrade differentiates five topographic-climate zones: the city centre, Novi Beograd, Surčin Plateau, Krnjača, and

hilly outskirts (Environmental Quality in Belgrade (EQB), 2017). Average annual temperatures nowadays rise significantly faster than was the case in the previous century. Hence, the temperature in the Belgrade area increased by 1.4-1.8 °C/100 years between 1951 and 2000, and by 3.5-4.5 °C/100 years only for the period 1991 to 2005. This makes Belgrade a region with the most exaggerated warming effect (Regional Spatial Plan of the Administrative Area of the City of Belgrade (RSPB), 2011) and expectations of continued rising.

When compared to other smaller cities/towns in Serbia, Belgrade has 0.4-1.0 °C higher temperatures. Rapid urbanisation trend in the second half of the 20th century has led to the creation of an urban heat island (PEPB, 2015; EQB, 2017), which varies depending on year season, and day-time. In September, the difference between the city centre and the periphery is 0.1 °C, whereas in January it goes up to 1.0 °C (PEPB, 2015). In particular circumstances, the city centre can be warmer in the winter even by 8 °C (Andjelković, 2003). During winter days around 9 P.M., central zone is usually 0.9 °C warmer than the city outskirts (PEPB, 2015). Hence, the most exaggerated effect of Belgrade's urban heat island is in winter and the evening.

Some changes are notable also regarding precipitation. Observed at the national level, years with precipitation deficit were dominant between 1982 and 2005 (RSPB, 2011), and according to the optimistic scenario, summer precipitation will drop by 20%, but based on the pessimistic scenario, it will be reduced to a half of needed amount until the end of the century (PEPB, 2015; EQB, 2017). The overall trend is a notable decrease in precipitations that is expected to be particularly devastating for the agricultural and forest land within the city with the possibility of floods as was the case in 2014.

Presented facts about temperature and precipitation trends already indicate that climate change is a relevant topic for the Republic of Serbia as well as for the city of Belgrade. Also based on Djordjević (2008), the Action Plan for Climate Change Adaptation with Vulnerability Assessment (APCCA) (2015), and Pachauri & Meyer (2015), together with some other regions of the World, South-East Europe is affected by climate change. Belgrade is, on the one hand, a "victim" of climate change, but on the other hand, it is the urban heat island with its contribution to climate change, too. The consequences will come as extreme weather conditions that bring floods despite the general trend of precipitation decrease followed by storms and significant material damages, droughts, increased chances of natural hazard increase, rising pressure on infrastructure, and staggering of the city economy (EQB, 2017; PEPB, 2015).

2. Methodology

The focus of this paper is to examine the significance of urban gardens within the context of urban agriculture and their potential contributions to climate change mitigation and adaptation, as they are recognized in legislative, strategic, and planning documents in Serbia. The research methodology consists of literature and document review and analysis. Existing legal and planning documents concerning 1) sustainable land use, 2) climate change, and 3) urban gardens in Serbia and the city of Belgrade were identified, reviewed, and then systematically analysed in terms of these three elements individually and mutually. The study includes legislative and planning documents at the national and regional/local

(city) level. By examining regulations from the state to local level, we aimed to present a preview, identify governmental and planning attitudes towards urban gardening and its recognition regarding ecosystem services in urban agriculture and climate change combat.

3. Results and discussion

3.1 Regulations on urban gardening, sustainable land use, and climate change

Over the past few decades, the Republic of Serbia has consistently worked on enhancing its strategic, legislative, and planning framework. The process was guided by key documents: the National Strategy for Sustainable Development (2008), the National Strategy for Sustainable Use of Natural Resources and Properties (2012), and the Nature Protection Program for the period 2021 to 2023 (2021). These documents emphasize the importance of achieving sustainable land use through a well-coordinated implementation of agricultural, forestry, environmental, and spatial development policies.

As stipulated by the Law on Agricultural Land (2018) and the Law on Forestry (2010), both agricultural and forest land are considered resources of public interest. The protection of agricultural land, as a fundamental natural resource for food production, is given the utmost priority. To safeguard this priority, the use of the highest-quality arable land for non-agricultural purposes is strictly prohibited, except in cases permitted by law or when designated as a priority in urban/spatial plans, when being subject to compensation payments. Also, only limited instances of land use changes are allowed for forest land and only with the approval of the ministry in charge. The Spatial Plan of the Republic of Serbia (2010) serves as the primary long-term planning document, laying the foundation for the organization, development, use, and protection of land. The plan emphasizes national objectives, such as sustainable use and protection of natural resources, including agricultural land and its biodiversity for food production. This is particularly important as agricultural land faces threats from urban sprawl, mining, industrial activities, and greenfield investments. Furthermore, the National Strategy for Sustainable Development (2008) addresses the imperative of preventing further land loss, quality preservation, and enhancement. It also aims to prevent environmental degradation and discourage changes in land use that may negatively impact agricultural land. Efficient land management and the expansion of land resources are key elements of Serbia's agricultural policy, and they stand as priority areas for future policy adjustments, following the Strategy for Agriculture and Rural Development 2014–2024 (2014) and the Law on Incentives in Agriculture and Rural Development (2016). The Forestry Development Strategy (2006) promotes the role of forests in the context of climate change mitigation and supports their continuous improvement. Recognizing the multifunctionality of forests, the Strategy encourages the promotion of cooperation with other sectors, such as agriculture and tourism, intending to use other resources of forest areas.

Concerning climate change, the Republic of Serbia signed the United Nations Framework Convention on Climate Change and the Kyoto Protocol (2007), thus showing the willingness to consider climate change seriously at the national and sub-national levels. The City of Belgrade itself created the Action Plan for Climate Change Adaptation with Vulnerability Assessment (2015), and the City Mayor announced in 2018 that one of the primary goals of the city is competing for European Green Capital Award. Hence, the City

adopted the Green City Action Plan (2021) and Sustainable Energy and Climate Action Plan (2021) aiming at a 40% CO_2 reduction by 2030. The Strategy of Sustainable Urban Development (2019) indicates that adaptability to climate change in urban systems is not at the level it should be, and the Action Plan for Climate Change Adaptation (2015) calls for a systematic involvement of climate change issues in strategic and urban planning as well as city governance. Currently, the City Government in Belgrade announced the start of the development of the Strategy of Green Infrastructure of the City of Belgrade, which aims to perceive all the aspects of spatial, environmental, and institutional elements of green infrastructure and its evaluation as ecosystem services, in order to secure its protection and improvement through the context of planning, project design, construction and maintenance (City of Belgrade, 2023).

The National Climate Change Council in charge of climate change monitoring and development of national policy and strategies on climate change was established in 2014. So far, the Law on Climate Change (2021) has been adopted, but not the Strategy and entire range of subordinated acts necessary for effective legislative implementation (Laukkonen et al., 2009). The Council reports are in line with the monitoring and reporting procedures established by the Spatial Plan of the Republic of Serbia (2010). This plan proclaims the integration of climate change considerations into spatial and urban planning. It is accompanied by a set of planning legislations, such as the Law on Planning and Construction (2021), which further elaborates on the incorporation of climate change into the planning process. Moreover, environmental and nature protection aspects are defined through various laws, including the Law on Environmental Protection (2009), Law on Nature Protection (2021), Law on Environmental Impact Assessment (2009), and Law on Strategic Environmental Assessment (2010).

National strategies, legislation, and spatial plans in Serbia do not regulate allotment gardens and urban gardening as such. Additionally, spontaneous and uncontrolled urban growth and expansion of construction areas cause excessive conversion of agricultural and forest land, according to the Sustainable and Integrated Urban Development Strategy of the Republic of Serbia (2019). Such processes inevitably affect urban gardens, too. Since urban gardens are the product of spontaneous action, they are present both on agricultural land and within green areas. In 2003, Belgrade had more than 49% of agricultural land and about 13% of green areas, together with 6.4% of forest land. In the past 20 years[2], land use has changed to the extent that forests and public green areas, as natural and cultural urban public spaces of common interest, currently occupy about 9%, whereas agricultural land occupies about 51% of the Belgrade area, but including the land that is designated for land use change by the plan.

Nevertheless, gardening exists in its spontaneity and, as Drilling et al. (2016) notice, they are often perceived as a kind of spatial planning anomaly – they emerge in the absence of any planning framework and disappear once other spatial planning visions arise. Countries with a long tradition of allotment gardening, such as Germany, the UK, Slovakia, and Austria have allotment gardens legally protected, having legal rent control and stable and secure use of municipally owned land (Lorbek & Martinsen, 2015). Austria and Germany established legal frameworks for allotments already at the beginning of the 20th century,

[2] Data on land use is derived from Master Plans of Belgrade (2003) and (2022).

so urban allotment gardens are nowadays firmly established, with approximately one million garden lots in Germany and five million users (Lorbek & Martinsen, 2015).
In the majority of European countries with legislation on urban allotment gardens, those gardens are normally embedded in more than one national law, such as the law on land use planning, agriculture, gardening law, environmental law, etc. (Drilling et al., 2016). In such conditions, when allotments are not safeguarded by one specific law, but the combination of several, interest groups need to negotiate the specific function to be used as a main argument to foster gardening (recreation, food production, environmental functions, etc.), the legal framework under which gardening is possible, and the conditions of space and time (Drilling et al., 2016). Research of four European cities (Poznan, Warsaw, Basel, and Lisbon) has shown that local municipal authorities hold great power over spatial planning, especially when national laws are weak or vague, and it is their will to support or not to support allotment gardening; that is decisive for their presence or absence in the urban fabric (Drilling et al., 2016). In the case of Serbia, there is no contrast between national and local level regulation regarding allotments – they are simply not recognized within the legal system and there is no obligation to distinguish it as land use within local-level spatial and urban plans.

3.2 Institutional framework related to green areas, urban agriculture, and climate change

The national-level documents do not define responsible institutions in the field of urban greenery, urban agriculture, or climate change. The only case among analysed documents is the Strategy of Sustainable Urban Development (2019), assigned by the Ministry of Environmental Protection, to finance protection and development activities related to afforestation, urban gardens, urban "pockets", parks, green roofs, climate change issues, etc. Additionally, the Program for Environmental Protection (2015) also lists a range of other ministries (responsible for environment, energy, and traffic to different extend) among institutions responsible for the implementation of measures and goal achievements in the field of urban greenery and climate change.
City-level documents (APCCA (2015), City of Belgrade Development Strategy (2017); EQB (2017), Program for Environmental Protection (2015)) distribute responsibilities among national companies such as "Srbijašume" Public Company (in charge of forests), "Elektroprivreda Srbije" (in charge of electricity production and distribution), and the Republic Hydro-meteorological Service of Serbia, which are to some extent related to planning and maintenance of green areas and combat against climate change impacts.
Among city-level institutions, the greatest number of analysed documents entitle the Secretariat for Environmental Protection as the main responsible institution regarding environment and climate change issues. The Action Plan for Climate Change Adaptation (2015) and Program for Environmental Protection (2015) recognize the role of other secretariats, too: the Secretariat for Communal and Housing Issues, the Secretariat for Urbanism and Civil Engineering Issues, the Secretariat for Energy, the Secretariat for Traffic, the Secretariat for Economy – but also three public utility companies – "Zelenilo Beograd" (in charge of city green areas), "Beogradske elektrane" (in charge of heating energy production and distribution) and "Gradsko saobraćajno preduzeće" (in charge of public transport). Other institutions, occasionally addressed in the analysed documents,

are primarily academic institutions in the sphere of research such as research institutes and faculties or the Institute for Urbanism of Belgrade.

Green areas and green spaces that are not assigned to any institution represent an issue because the subject(s) of their maintenance remains unclear (EQB, 2017). These areas are excluded from programs, development documents, and procedures of "Zelenilo Beograd" or "Srbijašume", which leaves them to sporadic actions of sporadic individuals. They are most often areas around business buildings, greenery in front of individual residential buildings, etc.

In contrast to Germany, where the most important feature of allotment gardens is to be institutionally regulated and governed by a community of gardeners organized in associations (Drescher et al., 2006), this form of land use and urban agriculture is in Serbia left to spontaneous actions of individuals or small groups of citizens with no legally defined status. However, Živanović Miljković et al. (2022) discuss urban agriculture as appropriate to be regulated at the local level, within traditional land use planning tools (e.g. zoning). Keshavarz (2014) notices that the laws are usually implemented by city councils, municipalities, and environmental agencies. Those allotment estates are mostly situated on municipally owned land and are leased to allotment associations, which are allowed to sublet plots to the members (Lorbek & Martinsen, 2015).

3.3 Recognition of urban allotment gardens in the context of sustainable land use and climate change

This section primarily analyses documents at the city level, therefore, the results also refer to the view of the City of Belgrade towards urban allotment gardens in the context of sustainable urban agriculture (land use) and climate change. Generally speaking, it could be noted that most of the targeted documents show an understanding of the functions and relevance of green areas in urban space. In some cases, it is being indicated explicitly (e.g. in the Action Plan for Climate Change Adaptation with Vulnerability Assessment (2015), Belgrade Master Plan (2014), or Program for Environmental Protection of the City of Belgrade (2015)), but in the majority of the cases, urban gardening and urban allotment gardens are put in the general category titled as "green areas" or "green spaces". The fact is that urban allotment gardens might be called by their name directly, but defined goals and measures related to them are only indirectly addressed. The Environmental Quality in Belgrade (2017) defined "small gardens" as one of the types of areas, being the only document that directly assigns an institution responsible for it – City Public Utility Company "Zelenilo Beograd", and stating that the total areas at the city level are 0.23 ha.

Regarding the recognition of the direct relationship between urban agriculture and climate change mitigation/adaptation, there are only two documents: the Regional Spatial Plan of the Administrative Area of the City of Belgrade (2011) and the Program for Environmental Protection of the City of Belgrade (2015). Interestingly, the former addresses the need for determination of climate change impacts on natural resources (water, arable land, forests, biodiversity), whereas the latter stresses the opposite need – evaluation of positive effects of green areas and certain plant species on environmental quality in the city (CO_2 absorption, noise reduction, temperature regulation, natural water run-off, evaporation, etc.).

The analysed documents show a tendency to address urban agriculture in the context of peripheral, peri-urban zones, so it leaves an impression that urban gardening is not taken seriously. The Belgrade Master Plan (2014) gives the most detailed mention of urban gardens and garden colonies, which defines them as areas on agricultural land within the Master Plan boundaries, that are not defined as areas of public interest, regulated as communal areas, while on building land they are planned for "other purposes" and also can be applied for production of flowers, mushrooms, seedlings, etc. However, the document itself at times becomes ambiguous by shifting urban agriculture from the "green area" category to the "communal land" category. Agricultural land and urban gardens are perceived as a part of green infrastructure within the newest Draft of the Master plan (2022), although land use is defined as "agricultural and other green areas".The Program for Environmental Protection of the City of Belgrade (2015) promotes urban allotment gardens (garden colonies) and supports plant production (flowers, seedlings, greenhouses for organic production, etc.) on small parcels on the periphery of the city. This document also recognizes the connection between three elements – urban gardens, land use, and climate change by setting the goal to identify diverse tendencies (e.g., demography, urbanisation) with impact on climate change increase (land use change, green areas, water areas, etc.). In principle, the analysed documents show a general attitude towards the increase of green area surface, equally distributed green areas, sustainability, multifunctionality of forests and green areas, and most commonly – creating a connection between existing and new green spaces into a system.

In general, the roles of urban gardening in Serbia are predominantly recognized in the environmental, less in the social, and not at all in the economic domain. According to experience in other countries, the ecological and environmental benefits of urban agriculture are highly important and may even outweigh the production benefits for some users (Taylor Lovell, 2010). Environmental protection and improvement are closely related to the mitigation of climate change impacts (BMP, 2014) e.g. forests in inundation zone absorb water and mitigate the effects of flooding, preventing erosion and torrent flows (Kazmierczak & Carter, 2010). Forests can also prevent landslides after massive precipitations or snow melting, they also purify the air and reduce the amount of CO_2 and polluting particles in the atmosphere and regulate temperature and humidity in the air (Demuzere et al., 2014). Old mature trees, for instance, have considerable capacity for above-ground carbon storage. Strohbach & Haase (2012) suggest that above-ground carbon storage in both domestic and allotment urban gardens can amount to 14 t C/ha. Suburban allotment gardens have comprehensively larger plots and normally a higher ratio of mature trees per area (Cabral et al., 2017). Due to the high pressure on the "free" land in urban zones, urban gardening has started to intensify in the city outskirts, which brings Belgrade to a favourable position when it comes to climate change mitigation.

Other most common motives for urban gardening are consuming fresh food, social development or social cohesion, improving health, and making or saving money (Guitart et al., 2012). Some authors stress the social and psychological benefits of urban gardening as relevant factors to be taken into consideration in planning (De la Sota et al., 2018). Viljoen et al. (2005) and Taylor Lovell (2010) stress the importance of local food production, as opposed to long-distance food travel, which is environmentally damaging through CO_2 emissions. On the other hand, most CO_2 emissions coming from urban

agriculture are related to the use of fertilizers and irrigation (De la Sota et al., 2018), however, Viljoen et al. (2005) suggest that principles of organic agriculture, local trading, and seasonal consumption of food – as the main characterises of allotment gardens – support the concept of a productive urban landscape and climate change-friendly food production.

According to the results, the regulatory framework for planning, use, and protection of agricultural land does exist in Serbia. On the other hand, the planning of public green areas is regulated by urban and spatial planning i.e. the Law on Planning and Construction (2021), the Law on Environmental Protection (2018), and the Spatial Plan of the Republic of Serbia (2010).

The share of urban allotment gardens in Belgrade is rather small. The Belgrade Master Plan (2014) proclaims a large change in the share of overall agricultural land on the plan's territory (from 49.1% in 2010 to 5.9% in 2020). Even though this document shows the highest interest in urban allotment gardens, it is surprising that it also recommends such a remarkable shift in the share of agricultural land. Besides, it is similar to other documents: by principle, they all support green infrastructure but ignore the sustainability concept and fail to give concrete measures when it comes to the increase of green areas. Therefore, urban allotment gardens are usually "invisible" because they are not significantly distinguished from other types of urban green that also might have a positive environmental impact, but not social and economic as is the case with urban gardening.

4. Conclusion

Urban green areas represent an asset of public interest, an infrastructure for climate change mitigation and adaptation, and ecological infrastructure – therefore, their preservation and development play an irreplaceable role in cities. The microclimate, which can be positively influenced by green spaces, has an impact on climate change issues in the City of Belgrade, too. All these functions, plus the multiple social benefits of urban allotment gardens, accentuate also their relevance in urban development. As recreation zones, noise and pollution protection belts, areas with aesthetic value, and points where people meet and socialise, green spaces make life in cities more convenient and less stressful.

Sustainable land use has a solid legislative and strategic background in Serbia. Unfortunately, the analysis has shown that the concept of urban gardens and urban gardening, as well as urban agriculture in Belgrade, despite all positive influences and unlike positive examples from Europe, is not actively recognized, institutionalised, or significantly involved in the urban development of the city, except for the peri-urban zones. However, the peri-urban belt of the city already has various elements of a rural area (significantly lower population density, individual housing, large plots of privately or publicly owned agricultural land, etc.). This implies that urban agriculture is more intensive in areas that have never been significantly urbanised than it is the result of implemented spatial and urban planning measures and actions of public authorities.

Finally, urban planning plays a crucial role in preventing conflicts related to land use. But planning alone cannot bring the necessary impact if the implementation is omitted. In addition, urban allotment gardens should be included in the legal framework more

explicitly, whether as special land use within "green areas" or "agricultural land", otherwise, they are vulnerable to land use changes and remain only in the framework of spontaneously organized and illegally practiced activities. Their legislative and institutional invisibility leads to the risk of their loss, together with their multiple ecosystem services and their positive impact on climate change mitigation and adaptation.

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