

Three Decades of Urban Forest and Green Space Research and Practice in Croatia and Slovenia

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Abstract: Background and Objectives: Urban forests and green space contribute to human wellbeing. Green infrastructure is recognized by the European Union as a planning tool that contributes to the implementation of many public policies, with urban forests and green space as its main building blocks. Croatia and Slovenia are young democracies and recent members of the European Union. Hence, they also need to contribute to the implementation of those policies. Previous review studies on urban forests and green space rarely addressed scientific or professional publications in those countries. Furthermore, the body of knowledge about urban forest and green space research and practice in post-socialist countries is still rather weak. The goal of the paper is (a) to show that urban forest and green space research and practice is much stronger in these countries than it is possible to assume based only on previous review papers or only by searching Scopus and Web of Science, and (b) to describe publications written by scientists and professionals in the past 30 years. Materials and Methods: We used a trilingual systematic literature review to identify scientific and grey literature in various databases, as well as a snowballing technique, and yielded 211 publications in Croatia and 84 in Slovenia. Results: We identified many more publications on urban forests and green space science and practice in Croatia and Slovenia than it was possible to assume based only on previous review papers and when searching solely publications in English. Croatian authors showed continuity over time in terms of number of publications, while Slovenian publications have been on the rise in the past decade. In both countries, scientific papers were most frequent, and the vast majority of studies addressed capital cities. Croatian publications mainly focused on parks and park-forests, while Slovenian publications focused on urban forests. Interestingly, Croatian authors were affiliated with over 60 organizations, and in comparison to Slovenian authors, have stronger preference towards publishing in their local language. Green space planning and design followed by resource inventory were the most frequent themes. The least addressed themes in both countries were resource management, economic aspects, policy, legislation or governance. Conclusions: Important discussion in the future, especially in Croatia, would be regulation of urban forestry as a profession. Cross-sectoral and interdisciplinary studies, as well as focusing on cities other than capitals in future, can help in addressing issues such as climate change or application of participatory approaches.

Keywords: urban forests; urban forestry; green space; post-socialist countries; scientific and grey literature

1. Introduction

Previous review papers on urban forests and green space rarely address papers published by authors from Mediterranean and Eastern European countries [1] (Table S1). Hence, the impression is that studies targeting those urban natural resources in some of those countries almost do not exist. This applies to publications of Croatian and Slovenian authors as well. However, reasons for the reported scarcity of publications in these countries could be various. One of the reasons might be criteria for journals to be listed in the leading databases of scientific journals such as Web of Science or Scopus and many journals are left out in the process. Another reason could be the language of the publication. Papers published in languages other than English have a limited audience, which is especially applicable for languages spoken by a limited number of speakers, such as Croatian and Slovenian. Furthermore, the research culture of a certain country in general or in certain disciplines could also favor publications in local languages [2]. The type of publication and keywords taken into consideration may also limit the final selection of papers. Review papers usually focus on scientific and review papers, probably due to the goal(s) of those reviews. This often leads to exclusion of grey literature such as professional and conference papers, books or book chapters.

Hence, the goal of this paper is to show that urban forest and green space research and practice exists in Croatia and Slovenia to a much bigger extent than one might conclude from review papers and focusing only on publications in English. Furthermore, the goal is to take a closer look and describe scientific and professional production in those countries. Croatia and Slovenia are relatively young states forged in the early 1990s due to the demise of socialist Yugoslavia. During which time, both countries went through political, economic and societal transition. Now, both are members of the European Union (EU)—Croatia from 2013 and Slovenia from 2004. The European Commission (EC) acknowledges green infrastructure as one of the planning tools that contributes to implementation of many policies, such as biodiversity and nature protection, regional development, climate change adaptation, disaster risk management, etc. [3]. As EU member states both Croatia and Slovenia are expected to contribute to implementation of those policies. Green infrastructure is defined as “a strategically planned network of natural and semi-natural areas with other environmental features designed and managed to deliver a wide range of ecosystem services” [3]. As such, the definition implies urban forests and other green space are among the structural elements of those networks. On the other hand, the body of knowledge about urban forest and green space science and practice in post-socialist countries is still rather slim (for some exceptions please see [4–10]).

Urban forestry as a professional and scientific field has emerged from the forestry sector, and partially horticulture, and been applied on urban and periurban woodlands [11]. The concept of urban forestry originated in the 1960s in North America. Its emergence in Europe can be traced back to the United Kingdom and Ireland in the 1980s, from where it spread to the Netherlands and Northern Europe [12,13]. The concept gradually gained its currency in Europe in the 1990s [11,14]. However, interpretations of what is or should be considered as urban forests and urban forestry are various [12]. Urban forestry is generally acknowledged as being cross-sectoral and interdisciplinary and that the forestry sector is only a stakeholder in the urban forestry mosaic [12]. Besides foresters and forestry, several other sectors and/or disciplines are important for the field, such as landscape architects, urban planners, horticulturalists, arborists and tree workers. For readers' better understanding and interpretation of results, we will first briefly present the context in Croatia and Slovenia.

1.1. Short Description of the Context Related to Urban Forests and Green Space in Croatia

Croatia is rather small country (total area 87.661 km² of which land accounts for 56.594 km²) with a population of about 4.3 million (Table 1). It is divided territorially into 21 regional units made up of 20 counties and the city of Zagreb, the Croatian capital, which has a status of both city and county. Croatia has 127 cities and 428 municipalities, and on average about 70% of the population live in cities.

Table 1. Number of cities and municipalities in Croatia per regional unit, number of people living in cities and municipalities, and percentage of urban population (those who live in cities). Source: Ministry of Public Administration of the Republic of Croatia based on the Census in 2011.

Counties and City of Zagreb in Croatia	Number of		Number of Citizens in			
	Cities	Municipalities	Cities	Municipalities	Total	% of Urban
Zagrebačka	9	25	223.068	94.538	317.606	70.23
Krapinsko-Zagorska	7	25	48.897	83.995	132.892	36.79
Sisačko-Moslavačka	7	12	120.756	51.683	172.439	70.03
Karlovačka	5	17	92.693	36.206	128.899	71.91
Varaždinska	6	22	97.075	78.876	175.951	55.17
Koprivničko-Križevačka	3	22	60.240	55.334	115.574	52.12
Bjelovarsko-Bilogorska	5	18	76.936	42.828	119.764	64.24
Primorsko-Goranska	13	23	219.994	76.201	296.195	74.27
Ličko-Senjska	4	8	33.368	17.629	50.997	65.43
Virovitičko-Podravska	3	13	40.281	44.555	84.836	47.48
Požeško-Slavonska	5	5	58.448	19.586	78.034	74.90
Brodsko-Posavska	2	26	73.370	85.205	158.575	46.27
Zadarska	6	28	102.570	67.447	170.017	60.33
Osječko-Baranjska	7	35	193.964	111.068	305.032	63.59
Šibensko-Kninska	5	15	81.937	27.438	109.375	74.91
Vukovarsko-Srijemska	5	26	88.195	91.326	179.521	49.13
Splitsko-Dalmatinska	16	39	350.671	104.127	454.798	77.10
Istarska	10	31	143.976	64.079	208.055	69.20
Dubrovačko-Neretvanska	5	17	78.455	44.113	12.2568	64.01
Međimurska	3	21	41.226	72.578	113.804	36.23
City of Zagreb	1	-	790.017	-	790.017	100.00
Total	127	428	3016.137	1268.812	4284.949	70.39

Croatia is also a highly forested country with almost 50% of its land covered with forests and forest land [15]. It has a long tradition of forestry and forestry education [16]. However, the first documented use of urban forestry as a term and definition among Croatian scientists was identified in two conference papers presented during the conference “Greenery of the City of Zagreb” organized in 1990 by the Zagreb branch of the Yugoslavian Academy of Science and Arts [17,18]. To the best of our knowledge, the first documented use of the term in the professional journal *Hrvatske šume* occurs at about the same time [19]. However, the practice of urban forestry existed prior to the 1990s as well, especially in forestry offices along the Adriatic coast, where forestry organizations provided maintenance services for trees and green space around tourist objects, such as hotels or camping sites, as a source of additional income [20]. Later on, the term is used in the Strategy of Spatial Planning (1997) [21] and Program of Spatial Planning of the Republic of Croatia (1999) [22]. However, publications addressing the history of forestry in Croatia do not mention urban forests or urban forestry [16]. In 2003, the Croatian Forest Policy Strategy (OG 120/2003) [23] included urban forestry as one of the strategic goals. Formally, urban forestry higher education in the Faculty of Forestry, University of Zagreb has been provided since 2005 [24] with 212 graduates by the 1st of October 2019 [25]. In 2006, the Croatian Chamber of Forestry and Wood Technology Engineers in its statute acknowledged the profession of licensed forestry engineer for urban forestry and provided a list of competences that such professionals should possess [26]. Some of these include planning and design of urban forest ecosystems, developing guidelines for urban forest management, analysis and assessment and design of parks or implementation of arboricultural work. However, according to the statute, forestry engineers, regardless of whether they studied urban forestry or not can get a license for urban forestry works. Urban forestry is recognized as a “type of work” within the forestry profession, which can be performed only by certified forestry professionals (forestry engineers), according to the Rulebook on Types of Forestry Works, Minimal Requirements for Those Works and Works that Private Forest Owners Can Perform by Themselves [27]. The latest forest law of the

Republic of Croatia [28] for the first time takes into consideration urban forestry by solely providing its definition. It also prescribes procedure for designation of urban forests. The law also provides a definition of a forest, and it does not include trees outside forests. The Croatian Arboricultural Society, established in 2003, represents professionals and companies working in arboriculture. Members are mostly foresters and people working in municipal companies in charge of green space maintenance. However, the main problem for urban forestry professionals in Croatia is that those who have finished urban forestry studies at the Faculty of Forestry in Zagreb have a hard time finding jobs. These professionals are low in demand due to the low level of awareness in Croatia that tree care is a job for professionals and not just any person who has permission to handle a chainsaw. As a result, municipal companies often do not have professionals who are educated tree workers or urban foresters.

On the other hand, architects and landscape architects in Croatia have dealt with urban green space for a significantly longer time. For instance, [29] provides an overview of the development of landscape architecture as a profession from 1900 until 1940. It is generally acknowledged that Croatian landscape architecture was at its peak in the 19th and early 20th century, while Croatia was part of the Austro-Hungarian Empire or at latest until the Second World War [30]. The same authors claim that during the socialist period (1945–1991) no landmark urban green space was created, while at the same time existing landscape architectural and cultural heritage, especially those around manors, was left to deteriorate. This continued in the transition and post-transition period that in general favored development (private investors) over green space [31]. However, urban and green space planning in socialist times in Croatia is generally acknowledged as being of better quality than in the transition and post-transition period [32]. This is also true for other post-socialist countries in Europe [33]. Regarding formal education in landscape architecture, in 1996 interdisciplinary studies of landscape architecture started at the Faculty of Agronomy, University of Zagreb, provided collaboratively by six faculties, even though some courses at the faculty had been provided since 1968 [34]. However, those who graduated from the Faculty of Architecture, University of Zagreb can also work as landscape architects as well as urbanists and spatial planners. Both architects and landscape architects have their professional associations.

1.2. Short Description of the Context Related to Urban Forests and Green Space in Slovenia

Similarly to Croatia, Slovenia is rather a small country based on its total area (20,273 km²) and population (about two million) (Table 2). It is divided into 12 regional units and has 67 cities and 212 municipalities. On average about 37% of the population live in cities.

Table 2. Number of cities and municipalities in Slovenia per regional unit, number of people living in cities and municipalities, and percentage of urban population (those who live in cities). Source: [35].

Statistical Regions in Slovenia	Number of		Number of Citizens in			
	Cities	Municipalities	Cities	Municipalities	Total	% of Urban
Pomurska	4	27	20.626	104.309	124.935	16.50
Podravska	5	41	127.721	199.391	327.112	39.00
Koroška	5	12	24.978	47.547	72.525	34.40
Savinjska	8	31	88.727	169.260	257.987	34.40
Zasavska	4	4	31.816	26.287	58.103	54.80
Posavska	5	6	21.153	55.479	76.632	27.60
Jugovzhodna Slovenija	6	21	47.803	96.498	144.301	33.10
Osrednjeslovenska	9	25	344.227	190.060	534.287	64.40
Gorenjska	8	18	83.493	122.826	206.319	40.50
Primorsko-notranjska	3	6	17.809	35.353	53.162	33.50
Goriška	6	13	34.255	85.246	119.501	28.70
Obalno-kraška	4	8	46.122	68.324	114.446	40.30
Total	67	212	888.730	1200.580	2089.310	37.30

In comparison to Croatia, Slovenia is even more forested with about 60% of its area covered by forests and forest land [36]. In Slovenia, urban forest as a concept being formally acknowledged for the first time can be traced to the establishment of a landscape protected area (hereafter LPA) ‘Zajčja dobrava’ in 1972 [37], which was also one of the first LPA according to the nature protection act from 1970 [38] and the first of its kind in the capital, Ljubljana. Its designation was considered an important long-term project as its green areas were protected from being converted into land-uses other than forests, meadows, cultivated grasslands, tree lines, etc., being an important foundation for public health of a great part of local residents. Later on and with similar legal grounds, four more LPAs with significant proportions of forest lands near larger cities were designated—LPA of Tivoli, Rožnik in Šišenski hrib in the city of Ljubljana [39], LPA of Drava and LPA Mariborsko lake in the city of Maribor [40], and the memorial park of Udin boršt near the city of Kranj [41]. However, even before the 1970s, urban forests were, rather indirectly, recognized as one of the elements of the so-called ‘green belt’ around the city of Ljubljana [42], where very different categories of forest, green areas and individual trees were all considered as urban forests [43]. In the 1980s, the first scientifically based elaborations of the definitions of both urban forests and urban forestry were evolving as [44] published a set of definitions—“urban forest is a forest nearby urban centers and has a unique character, given by its role in people’s social benefits”. A term—suburban forest—indicating a strong spatial connection with urban areas was beginning to be used by forestry professionals in the 1980s and 1990s. The term related to forests very close to cities or larger towns affecting the quality of life in densely populated areas [45].

Nevertheless, albeit with a relatively long tradition of recognition of the concept, there is still no uniform definition of the term ‘urban forest’ as a special legal category in Slovenia’s legal framework [7]. A forest management-related category of ‘forests with a special purpose’ [46] seems to be a proxy for now that can also indicate forest lands with special designation, among which are forests notably important for outdoor recreation, aesthetic enjoyment or air purification.

Perhaps similar to in Croatia, urban forestry as a professional field is in Slovenia still in its infancy. Despite the fact that urban forestry has been a specially designed study module for more than 15 years, it is not equally treated as other professional areas in the forestry service, like logging, construction of infrastructure, management planning, hunting, silviculture etc. Slovenia Forest Service as the sole public agency to provide forest management expertise to land owners does not have a section committed to urban forestry. This is despite the fact that Slovenia Forest Service prepares management plans for forests in or close to urban areas and acknowledges their specific character of being important for physical recreation, aesthetical enjoyment and microclimate regulation. Even at the ministry levels there is not a single position within the forestry sector that anyhow focuses on issues related to urban forestry. Altogether, urban forestry in Slovenia is marginalized, even though the field is quickly evolving globally and society seems to be recognizing the benefits of having forests or other woody vegetation nearby.

2. Materials and Methods

We searched for relevant scientific and grey literature on various types of tree-based urban green infrastructure from various sources over the timespan of 30 years (from 1990 and 2019). For scientific literature, global databases SCOPUS and Web of Science (WoS) were the starting point. The documents were searched for based on the combination of keywords: “green space”, “urban forest*”, “urban woodland*”, “street tree*”, “tree line*”, “tree avenue*”, “green infrastructure” and “green system”. An initial search was performed in July 2019, but the database of relevant publications was updated until the 28 November 2019. However, not all nationally relevant journals are listed in those databases. We also checked national databases of journals, namely Hrčak and the catalogue of the National and University Library in Croatia, as well as CBS/COBISS database and dLib in Slovenia, where we also applied variations of key words in local languages. In both countries we checked national scientific bibliographies where it is possible to find information not only about scientific but also about professional and conference papers. In Croatia, we also checked the national repositories of scientific master theses and doctoral dissertations where it was possible to list publications not

only by key words but also by institutions. This was useful because in both countries there is a limited number of institutions educating professionals dealing with certain aspects of tree-based, urban green infrastructure. Scientists and professionals in forestry, landscape architecture, architecture, horticulture, arboriculture, life sciences, social scientists and other fields have their most popular journals, and their communities are rather small, so it was easy to identify such national journals in each country. Those are also available online and provide full access to papers. Therefore, it was possible to carry out a thorough search of those journals issue by issue to identify relevant papers that might not be included in the database based only on key words. For instance, in Croatia the main national journal for scientists and professionals in forestry is *Šumarski list*, due to its more than century long timespan, while for instance, for architects, the most important national journal is *Prostor*. Similarly, in Slovenia, the journal *Gozdarski vestnik* is the main national journal for forestry research and practice. The authors of the review are native speakers of Croatian or Slovenian, which gave them an opportunity to investigate publications in those languages besides publications in English. We also used a snowball technique to expand the database of relevant publications by checking the reference section of the documents in the database. In order to show a variety of publications, written by both scientists and professionals, we included scientific research and review papers, preliminary communications, professional and conference papers and books and book chapters. Conference proceedings containing abstracts only were excluded. The only deviation for this rule was proceedings of the IUFRO conference “Forests for Cities, Forests for People—Perspectives on Urban Forest Governance” that took place in Zagreb, Croatia in 2012 [47] and proceedings of the European Forum on Urban Forestry in 2016 that took place in Ljubljana, Slovenia, the same year Ljubljana was a European Green Capital. The reason for including those proceedings was the international character of those events and the fact that all the presentations targeted research and practice of urban forests and green space. Proceedings of the conference “Greenery of the City of Zagreb” organized in 2013 [48] were considered as one publication (the same as a book), and we did not analyze each paper published in these proceedings separately. However, conference papers published as a result of two conferences in 2004 and 2005 were analyzed separately, since those were published in the Croatian journal *Agronomski glasnik* (vol. 66, no. 3–5 in 2004 and vol. 67, no. 2–4 in 2005) as separate papers. Publications were taken into account only when authored or coauthored by Croatian or Slovenian authors. In cases when publications addressed specific locations, we included only publications that studied locations in Croatia or Slovenia. Our approach yielded altogether 211 publications authored or co-authored by Croatian researchers or professionals and 84 by Slovenian researchers or professionals (Database S1). In a few cases, publications were co-authored by Croatian and Slovenian researchers, and we counted those based on the affiliation of the first author. If the first author was Croatian, the paper was counted as a Croatian publication. The database was analyzed per country to enable between-country comparison. Furthermore, it was analyzed based on number of publications per year, number of publications per type of publication, language of publication, study locations, authors’ affiliations, type of green infrastructure, methods and themes. When publications addressed several types of urban green space in the same publication, we counted each type as one. For our purposes, we adapted green space typology developed in the EU’s Green Surge project [49]. Green Surge addressed various types of green space not only tree-based green space.

3. Results

The number of publications retrieved showed a difference between two countries with significantly more publications associated with Croatian authors or about 2.5 times more (Figure 1). The overall distribution of publications per country in the period 1990–2019 also exhibited differences between countries regardless of the type of publication. With a few exceptions, there is almost a continuity of publishing over time in the investigated period in Croatia, while in Slovenia publishing intensified in the past decade. Croatian authors were the most prolific in 2004 and Slovenian in 2015. The reason for the peak in Croatia is the international interdisciplinary conference “Care for Urban Areas—Urban Tree Lines” organized in Dubrovnik by the Faculty of Agronomy, University of Zagreb. The highest peak in the number of publications in Slovenia can be explained by the

conference “Green infrastructure in Central, Eastern and Southeastern Europe: Is There a Universal Solution to Environmental and Spatial Challenges?” organized by the Biotechnical Faculty, University of Ljubljana in 2015.

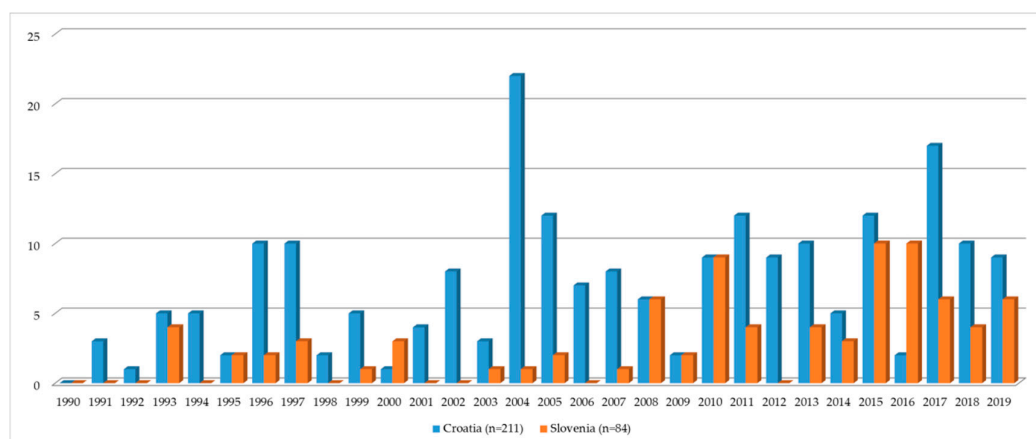


Figure 1. Distribution of publications in Croatia and Slovenia per year.

When looking at the type of publications in both countries, the most frequent were research papers (Figure 2). Next frequent in Croatia were conference papers, followed by books and professional papers. Book chapters, master’s theses, dissertations and conference proceedings contributed to a much lesser extent to the total number of publications. The main difference was in the fact that in Slovenia we found no professional papers in the given period, and the number of master’s theses was much higher than in Croatia.

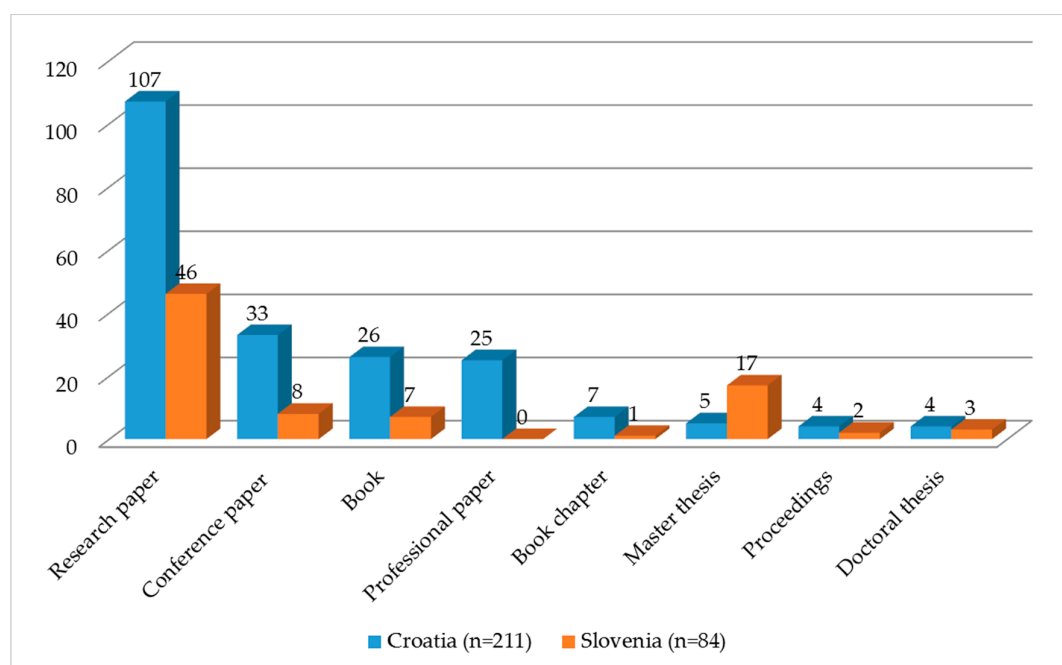


Figure 2. Distribution of publications in Croatia and Slovenia per type of publication.

Analysis of the language of publication showed authors’ preferences in both countries towards publishing in local languages (Figure 3 and 4), which was more emphasized among Croatian authors, who published four times more in Croatian than in English (Figure 3). Bilingual and multilingual publications were rather scarce. For instance, in Croatia four publications were published as bilingual Croatian-English publications, and there was only one that was mainly written in Croatian but with

extensive summaries in English, German and Italian (Figure 3). On the other hand, in Slovenia there was almost a balance between publishing in English and Slovenian. Only one publication was bilingual and one in Croatian (Figure 4).

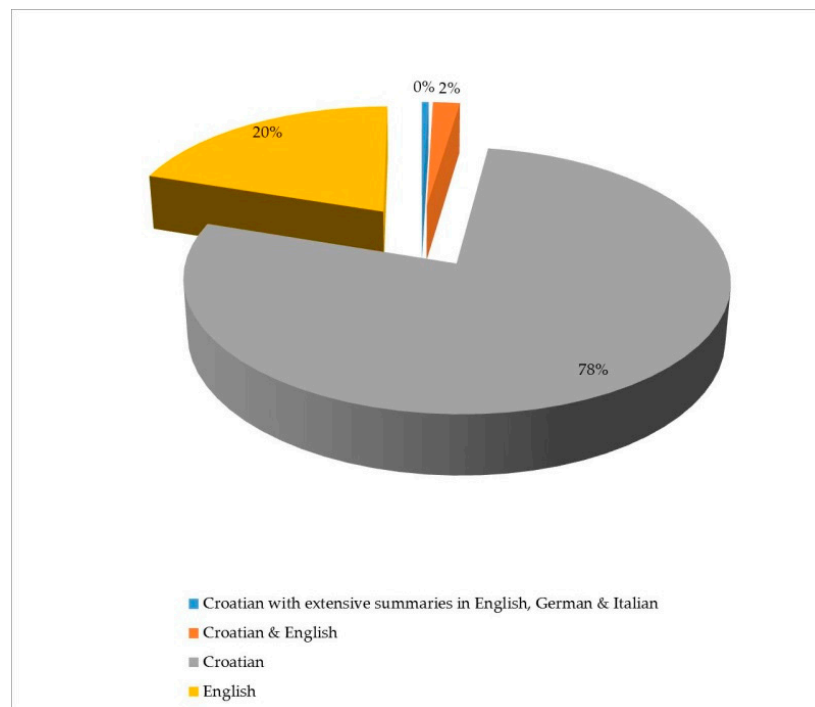


Figure 3. Language of Croatian publications ($n = 211$).

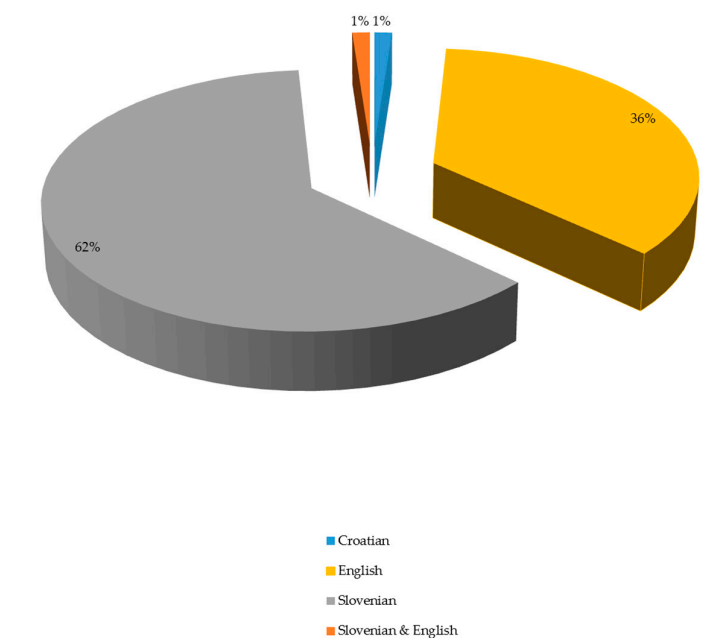


Figure 4. Language of Slovenian publications ($n = 84$).

We further examined where those publications were published in terms of journals and publishers. Altogether Croatian scientific and professional production was distributed over 77 journals and other publishers. Croatian authors published 159 papers in 46 journals of which 90 publications (about 43%) were concentrated in three journals (Agronomski glasnik, Šumarski list and

Prostor), the three most important national journals for researchers and professionals in agronomy, forestry and architecture respectively (please see Table S2 for the comprehensive list). Out of 46 journals, 27 are indexed in Scopus and 21 in WoS (Table S2). Both Šumarski list and Prostor are indexed in Scopus and WoS, while Agronomski glasnik is not present in either of those databases. For only 14 journals, publishers were not organizations from Croatia. On the other hand, Slovenian authors published 48 papers in 23 journals with the majority of publications published in Gozdarski vestnik, the main national journal for researchers and professionals in forestry in Slovenia. The second most frequent source of publications was the journal Urbani izziv, the main national journal for spatial planners and urbanists.

Furthermore, we investigated affiliations of Croatian and Slovenian authors in order to identify the most productive organizations based on how many times authors were connected with a certain organization. The results showed that Croatian authors were affiliated with 62 organizations, while Slovenian authors were connected with only 18 organizations. In Croatia, the top five organizations were the Faculty of Forestry ($n = 34$), Faculty of Agronomy ($n = 32$), Faculty of Architecture ($n = 30$) and Faculty of Science ($n = 26$), all constituencies of the University of Zagreb, while the Croatian Forest Research Institute (Forest Research Institute, Jastrebarsko until 2009) ($n = 18$) is a public institute. Authors were affiliated six or less times with each of the other organizations. In Slovenia, the most productive organization based on the number of affiliated authors was the Biotechnical Faculty, University of Ljubljana ($n = 40$). The Slovenian Forestry Institute ($n = 16$), Slovenia Forest Service ($n = 11$) and Faculty of Civil and Geodetic Engineering, University of Ljubljana ($n = 8$) followed. Authors were affiliated three or less times to each of the other organizations in Slovenia. Independent researchers accounted to 26 in Croatia and five in Slovenia.

Out of 211 Croatian publications, 187 (88.6%) addressed specific cities as study locations. Those locations were spatially distributed across 73 cities. However, the ultimate champion city was Zagreb, the capital of Croatia, with 99 publications (Figure 5). Dubrovnik, Opatija, Osijek and Split, as regionally important cities, were also addressed but to a much lesser extent (13, 10, 11 and 9 times respectively). All other cities were represented even less (with 1–6 publications each). In Slovenia, out of 84 publications, 67 (80%) addressed urban forests and green space in specific cities. In Slovenia we identified only 11 study locations, and again, the majority of publications were related to the capital of Slovenia, Ljubljana ($n = 51$). A relatively small number of publications addressed Celje ($n = 6$) and Maribor ($n = 3$), while other locations were represented by only one publication each.

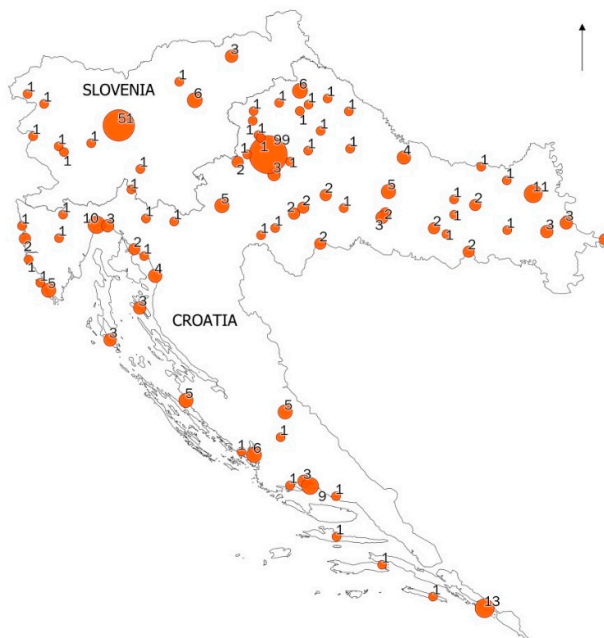


Figure 5. Study areas in Croatia and Slovenia.

We were also interested to see how many times publications addressed a certain type of green space. The results showed big differences between Croatia and Slovenia (Figure 6). For instance, Croatian publications showed greater variation of green space addressed in those publications. We identified altogether 24 types of green space. In comparison, Slovenian publications showed less variation with only 14 types of green space. The most frequent type of green space in publications of Croatian authors was parks (with or without adding historical parks into account), followed by park-forests, tree lines and urban forests. On the other hand, in Slovenian publications urban forest was conspicuously the most frequent type of green space.

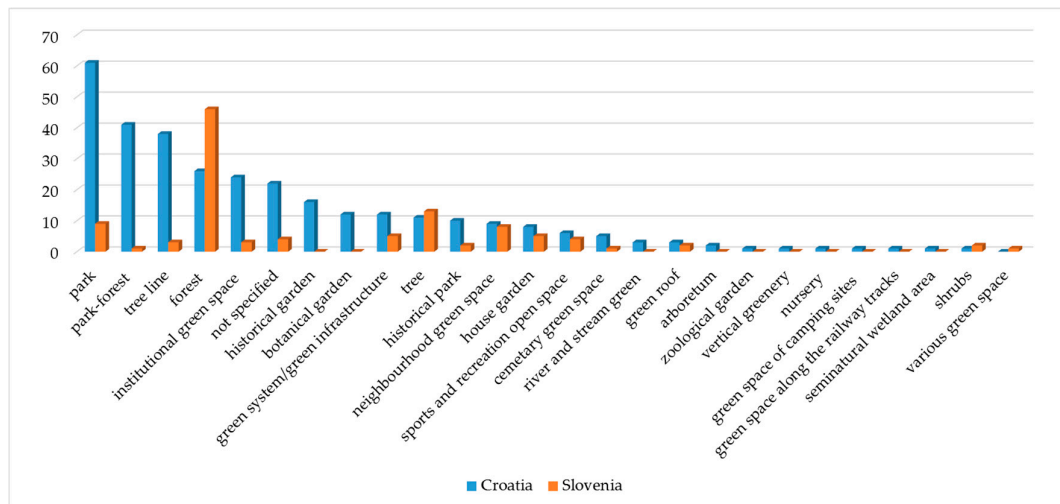


Figure 6. Type of green space.

Another point of investigation was the analysis of publication themes (Figure 7). The most frequent themes in Croatia were green space planning and/or design, resource inventory, public perspectives, plant health, as well as ecology and tree ecology, while in Slovenia the same themes gained prominence, but in a different order. The only exception is the theme of plant health, which gained only marginal interest among Slovenian authors.

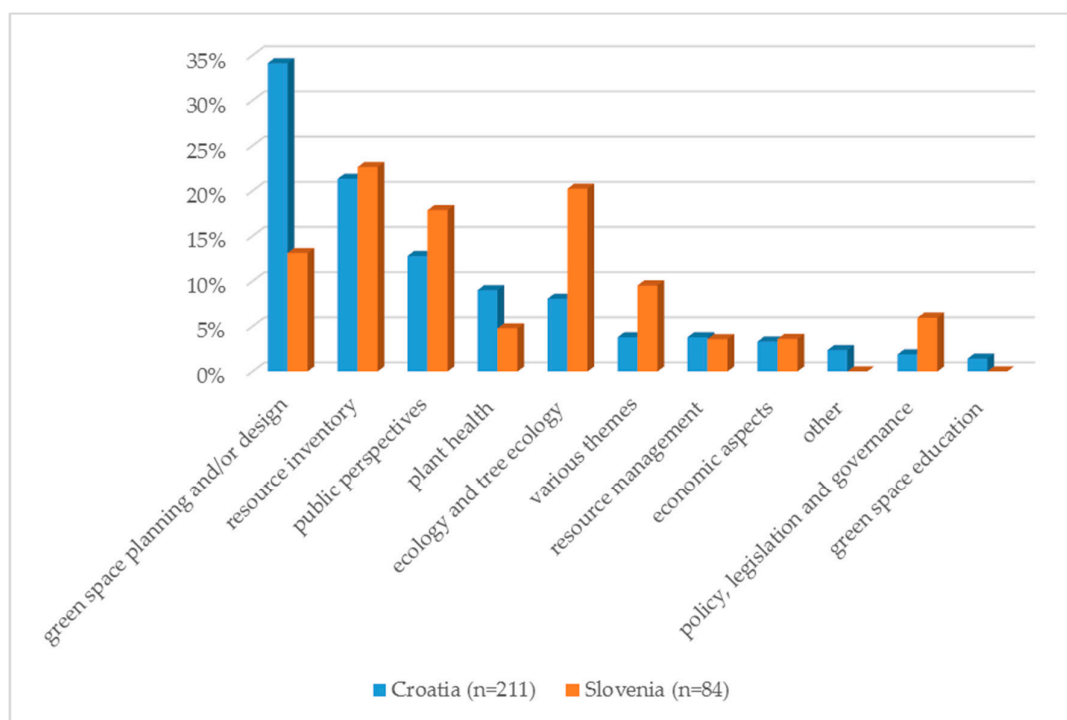


Figure 7. Themes of interest for Croatian and Slovenian authors.

In Croatia, one third of publications dealt with green space planning and/or design and the theme was present over the entire period. Architects and landscape architects wrote almost all these, with only a few exceptions where they were written by, for instance, art historians, e.g., [50]. Within the group it was possible to identify several subthemes. One subgroup of publications (30 out of 72) discussed the establishment and historical development over time of various types of green space, but mostly parks, e.g., [51–53], in a descriptive manner, based on the exploration of literature, archival records, old maps, photos or postcards. The other somewhat smaller subgroup of publications (12 out of 72) went beyond a purely descriptive approach and provided recommendations for renewal and conservation of certain urban green space. Again, most of these addressed parks as well as historical parks and gardens, e.g., [54–56]. Another rather small subgroup of publications (only 6 out of 72) presented plans and a design for a new or renovation of existing green space, e.g., [57,58]. Other topics were even less frequently present. From these we will mention only the most significant works. One of these is a textbook on methodology for the restoration and preservation of Croatian landscape architectural heritage [59] based on the Florence Charter on Historic Gardens (1982) adopted by the International Council of Monuments and Sites (ICOMOS) and International Federation of Landscape Architects (IFLA) [60]. Another is a book on Dubrovnik Renaissance gardens, a type of garden that has some authentic features that distinguish these gardens from other Renaissance gardens [61], and a book on Zagreb's Green Horseshoe, a Gesamtkunstwerk developed in the late 19th and early 20th century [50]. It is also Zagreb's landmark network of green spaces comprised of seven square parks and a botanical garden.

Publications dealing with green space planning and design mostly addressed single green spaces, but several books are considered monumental works in terms of both their importance and the number of sites included. Obad Šćitaroci [55] explored more than 60 manors with their parks and gardens in the Croatian north-west region of Hrvatsko Zagorje. Šćitaroci and Šćitaroci [54] explored another 60 manors and their parks and gardens in historical area of Slavonia between the cities of Zagreb and Ilok, while the same authors investigated 50 19th century green spaces in 20 cities and municipalities [30]. The goal of these books was to bring into the spotlight valuable Croatian cultural landscape and architectural and horticultural heritage, as well to discuss the importance of this heritage in the European context. Obad Šćitaroci [59] claims that Croatian park heritage is rich in terms

of quality and quantity but is widely unknown even in Europe, because it has not been explored and, as such, is left to oblivion. However, according to the same author, it is part of western civilization, influenced mostly by Italy, Austria and Germany, and shows continuity in development from antiquity until nowadays.

Only several publications addressed networks of green spaces. Beside three publications addressing Green Horseshoe, one master's thesis dealt with landscape analysis and the possibility of developing Zagreb's green system as a network of green spaces [62], and the other one carried out the landscape analyses of the city of Dubrovnik in the context of green infrastructure development for climate change adaptation [63].

On the other hand, in Slovenia the theme of green space planning and/or design was only the fourth most frequent based on number of publications (Figure 7). Studies mainly focused on the analysis of landscape structure in terms of connectivity of forest patches and the state of naturalness of forest remnants in the otherwise urbanized environment. Three out of five studies addressed the issue of rapid build-up by either road infrastructure or residential construction on the functioning of system of green areas [64–66]. This issue is somehow a critical aspect of spatial development in Slovenia since it shows that urban forests as a key element of the landscape might not have a priority over development in or near the cities. The public and some decision makers also criticized this. It seems that this research clearly reflects socially relevant discussion. Additionally, one paper gave an overview of studies using GIS analysis and calculation of several landscape metric indices to support the assessment [67].

The theme of resource inventory was the second most important among Croatian authors (Figure 7). These publications bring information on results of mostly woody plant inventories at different scales and of different types of green space. Only a few papers addressed exotic species [68]. Some authors were interested in inventory of invasive species, e.g., [69,70]. Several papers, of which almost all were written by botanists, presented inventory of flora in general, not only woody species [71–76]. Gardens of educational organizations such as schools were addressed in four papers [75,77–79]. Field inventory as a method prevailed, but in some papers, remote sensing was used for this purpose [80–82]. Several mostly conference papers provided inventories of tree lines, e.g., [83]. The champion paper based on number of sites is a paper by Bertović et al. [84] who conducted an inventory of 66 green space areas and of different types of green space in the city of Rijeka. Plant diversity was investigated in only two papers [85,86].

Resource inventory was the most frequent topic for Slovenian authors (19 out of 84 publications). Several studies have been addressed tree cadasters in the cities of Kobarid [87], Logatec [88] and Velenje [89], all as part of a master's thesis. The importance of such tools to guarantee sustainable monitoring of urban trees was the main argument to promote its implementation. Further on, a large body of literature targeted resource inventory in terms of straightforwardly measuring the size of forest patches, state of growing stock and tree species composition, and the condition of infrastructure. The primary methodological approach was GIS analysis of either satellite imagery, e.g., [90,91], or ground data obtained by field inventory, e.g., [92]. In addition to that, Tavčar [93] investigated the effect of ownership on the state of urban forests. Two studies depended on remote data as well but moved further from elementary forest-related metrics and investigated the provision of ecosystem services [94,95].

Public perspectives were addressed in 27 out of 211 Croatian publications (Figure 7), whereby public perceptions of, as well as preferences and attitudes towards, green space were investigated or users' behavior was addressed. The earliest publication is from 1997, but the majority (22 out of 27) were published between 2010 and 2019. The capital city of Zagreb was a study area in almost all papers. In only five papers study areas were in more than one city, e.g., [96], three papers had each more than one study area in one city, e.g., [97] and only one paper about residents' perceptions of green space made a comparison among seven cities in five countries [8]. The survey questionnaire prevailed as a method of choice in almost all papers (24 out of 27). With the exception of one conference paper, all others were research papers. Some papers investigated perceptions and preferences of specific trees and woody plants, e.g., Dorbić et al. [98], who studied the perceptions of black locust in public green space, Dobrić et al. [99], who addressed attitudes towards and

perceptions of ash-leaf maple, or Caput-Jogunica and Martinis [100], who studied perceptions of ornamental woody plants. One paper studied the perception of and preferences towards green space composition [96]. A single paper surveyed the perception of green space by children [101]. Recreational preferences were addressed in several publications. For instance, Sever and Verbič [102] studied trail preferences among recreationists, while Sever et al. [103] investigated the perception of crowding.

In Slovenia, 14 out of 84 publications addressed this theme (Figure 7). All data was obtained through interaction with the public, decision makers or policy makers. Hence, the survey questionnaire was a main method. The bulk of the studies focused on peoples' preferences regarding the setting of urban green areas, especially forests [46,104–111]. Some also covered urban forest visitors' behavior in terms of frequency, duration of visits and main activities [107,108,110,111], and a few also employed non-market valuation to determine peoples' willingness to pay as a monetary proxy for preferences [105,110,111]. Furthermore, at least three studies collected data by counting visitors at entrance points [105,107,112]. All publications attached to this theme dealt exclusively with urban forests in the capital city of Ljubljana. In general, studies on public perspective are the key for designing green spaces and especially urban forests, as this is a type of green space with multiple management goals is most obvious.

In Croatia, plant health as a theme was present in 19 out of 211 publications (Figure 7). The majority of papers addressed tree health in the context of the effect of pests and diseases. Some publications reported on the presence of certain insect species, such as bark beetle *Orthotomicus erosus* on Aleppo pine [113] or alochtonous *Cinara cedri* [114]. The health of horse chestnut trees was investigated in tree publications. Another tree publication studied tree health from an arboricultural perspective. Authors used different methods to conduct tree risk assessment, e.g., [115]. Authors of research papers mostly reported field observations with or without laboratory analyses. In only one instance remote sensing methods were used to assess the health status of trees in park-forest Maksimir, one of the most important green spaces in the capital [116]. Authors of 13 out of 19 publications were affiliated with forestry research organizations, namely the Faculty of Forestry of the University of Zagreb or the Croatian Forest Research Institute. A book with international authorship provides an overview of the most important pests and diseases on urban trees [117]. Just above half of the publications addressed tree health in the capital.

On the other hand, in Slovenia, this theme gained only marginal interest with only four publications (Figure 7). These publications addressed pathogenic fungi on the university's green space [118] and non-native insects in an urban forest [119], as well as mechanical wounding [120] and stress factors [121]. The last two publications both act as general guidelines on how different agents affect tree health and how to mitigate those negative impacts.

A relatively small number of Croatian publications dealt with ecology and tree ecology (Figure 7). Seven papers addressed tree ecology from the perspective of tree phenology, e.g., [122]. Five publications discussed species selection, for instance what species are recommended for green roofs [123] or in general as street trees, park trees or trees for urban woodlands [124]. Three papers reported on soil studies, e.g., [125], of which two were conducted in forests and the other investigated the content of selected trace elements in the context of pollution monitoring in park soils. One paper addressed the influence of light on natural regeneration of pedunculate oak in an urban park-forest [126]. The majority of papers (11 out of 17) were published in Šumarski list, the main national journal for researchers and professionals in forestry.

On the other hand, the theme of ecology and tree ecology was the second most frequent among Slovenian authors (17 out of 84). They cover master's theses and scientific papers mainly published by authors associated with the Faculty of Civil and Geodetic Engineering, University of Ljubljana and Slovenian Forestry Institute. The majority dealt with the effects of urban forests or urban trees in built environment, such as surface runoff [127–133] or quality of groundwater [134]. Thus, the hydrological aspect of urban forests seemed to be the most important. One paper analyzed the potential of having innovative measures to mitigate surface runoff in urbanized areas such as permeable paving, infiltration pipes and green roofs [135]. This study was one of those that relied

heavily on field measurements, similar to Kermavnar [127,128] and Šraj et al. [133]. Others based their conclusions mainly on modelling. Apart from this, two studies tackled the relation between urban green areas and heat islands effect. A study at the EU level showed that different types of green areas have different effects on lowering the surrounding heat and that especially a forest's configuration and composition has an important impact [136]. Perhaps more focused, [137] investigated how an urban park can have a cooling effect in days of extreme summer heat. Research showed that the capacity of such green areas to attenuate high temperatures depends on the density and age of woody plants.

In Croatia, a small group of publications, more specifically six books and two conference proceedings, addressed various topics. Almost all the publications are related to the city of Zagreb. A book written by an activist diagnosed various issues with public space in Zagreb, including public green space, but also provided suggestions for improvement [138]. Two books presented work of municipal companies for the maintenance of green space and other public areas, e.g., [139]. A popularly written book on the park-forest Maksimir was published to mark the 200-year jubilee of its establishment [140], while another one, subtitled 'a nostalgic look into the past', presented the history of some of Zagreb's parks and promenades [141]. Lastly, one book addressed various themes related to park-forests in Zagreb [142]. In Slovenia, several conferences were organized, with conference proceedings published in Slovenian, focusing on various topics related to urban forestry history and evolution on a national level [64,143]. The city of Ljubljana hosted the European Forum on Urban Forestry, an international event with various topics related to urban forests and green space, involving Slovenian and foreign researchers and professionals [144].

Resource management was a theme of only seven publications of Croatian authors (Figure 7). Four papers were written in the second half of 1990s by foresters, published in the journal *Šumarski list*, and addressed forests or park-forests from a silvicultural perspective. Authors advocated active management as in economic forests regardless of the fact that recreational use prevails, e.g., [145]. Additionally, tree conference papers discussed management, or better said, lack of proper management of tree lines in two of Croatia's regional capitals, namely Osijek and Split, e.g., [146]. The theme was weakly present among Slovenian authors as well (Figure 7), as only four relevant publications were identified. All these focused on providing guidelines on how to manage urban forest [147–149] and how to include other aspects, such as game management [150].

The economic aspects of urban forests and other green space was another less frequent theme in both countries (Figure 7). In Croatia, publications under this general theme dealt with the economic assessment of urban trees [151], the value of urban forests for residential land use that implements the hedonic pricing method [152], assessment of forest ecosystem services in urban forests [153], or the role of urban green space in tourism [154]. Two papers are more general. One of these papers brings general discussion on valuing nature in an urban context [155], while another reviews literature on the valuation of urban green space benefits [18]. Finally, one conference paper discusses children's parks/playgrounds as public goods [156]. In Slovenia, three papers employed willingness to pay for either the possibility of public access to urban forests [105] or to improve several attributes of forest setting, which are related to quality of outdoor recreation [110,111]. All these studies focused on one of two major urban forest patches in Ljubljana, either Rožnik [105,110] or Golovec [111]. All were conducted as cross-sectional surveys based on a stated preferences approach and aimed to establish coarse information on the public's recreational preferences in urban forests in the capital of Slovenia.

Only several publications in each country dealt with policy, legislation or governance of urban forests (Figure 7). In Croatia, a dissertation provided description and assessment of the quality of governing tree-based green spaces in the city of Zagreb [19], while another paper discussed the legal procedures of putting a public park under protection [157]. Additionally, two book chapters were recently published of which one discussed the concept of governance in general [158] and the other one critically addressed the European Green Capital Award [159]. In Slovenia five publications addressed this theme. Four out of five addressed long-lasting work on the city forest of Celje [43,160–162], where extensive analysis of strategic and subordinated legal documents was carried out in order

to show a complete process of designation. Public participation was highlighted as an important element of democratic society. People's needs and wants related to public urban forests and green space needs to be somehow channeled into the planning and management of those natural resources.

Green space education as a theme was present only among Croatian authors, even though with only three publications (Figure 7). Two papers discussed curriculum for urban forestry, environmental and nature conservation professionals, a potential and an actual study program at the Faculty of Forestry, University of Zagreb [17,24], while another paper presented an educational trail in a park-forest [163].

The label 'other' referred to several publications that could not be associated with any other theme (Figure 7). In Croatia, two publications are review papers investigating urban forest and green space-related scientific literature at a global and regional level [1,14]. One paper discusses the general importance of green space in urban areas [164], another one investigates the influence of fertilization on the growth of *Thuja occidentalis* 'Smaragd' [165], and finally, recreational supply in a city district is discussed in correlation with the demographic profile of the district [166].

Finally, we took closer look into methods used in research publications (research papers, preliminary communications, dissertations and scientific master's theses). The majority of publications in both countries used some form of field work (in Croatia 44.1% of publications, while in Slovenia 52.9%) (Figure 8). By field work we mean measurements, inventories, assessments or observations on the natural resource, so we did not include on site face-to-face interviews, even though these are also implemented in the field. The second most frequent method in both countries was a description or a narrative (30.9% in Croatia and 40.9%). In Croatia, this is mostly due to one third of research publications being review papers (39 out of 116). The survey questionnaire as a method was in third place in Croatia (20.7% of publications), while in Slovenia it was spatial analysis (27.3%).

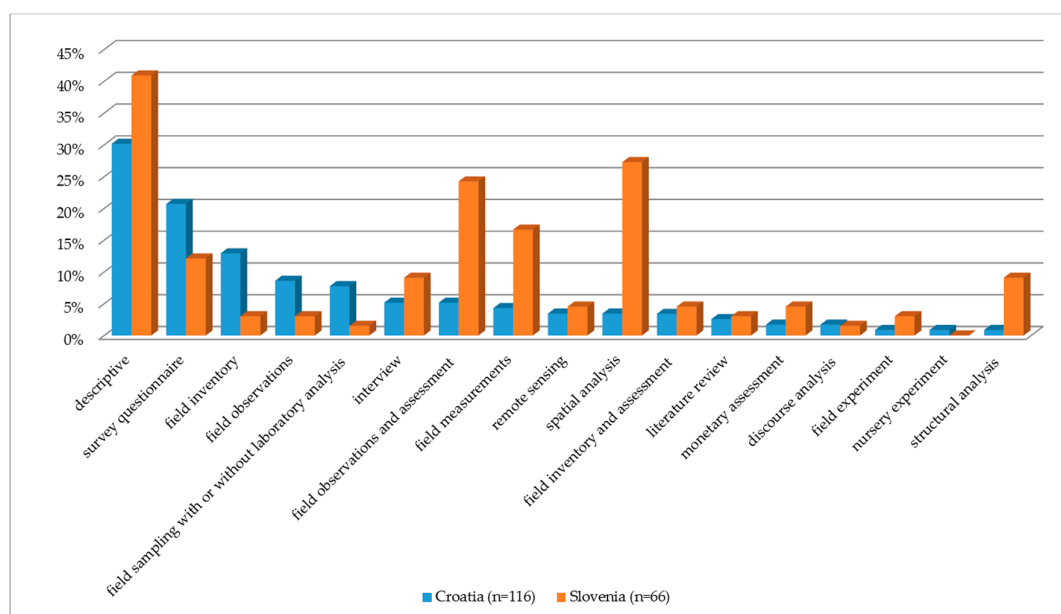


Figure 8. Methods used in publications of Croatian and Slovenian authors.

4. Discussion and Conclusions

The literature review showed many more publications authored by Croatian and Slovenian authors than it was possible to perceive only by reading review papers on urban forests and green space, and by solely searching publications in English (Table S1, Database S1). While review papers showed only a few publications from these countries (Table S1), our approach came up with 211 publications authored by Croatian authors and 84 publications of Slovenian authors (Database S1). This is probably due to the language issue, when it comes to small languages such as Croatian and

Slovenian. Another advantage of this review is that we covered some segments of grey literature, which is not often the case in literature reviews (Table S1). However, we assume that there is much more grey literature that was beyond our reach, such as planning and design studies for new green spaces or renewal of the existing ones or any other studies that are commissioned by local and regional government but are not traceable online. Another avenue of grey literature that we also did not explore are bachelor and diploma theses because many of them are not fully accessible, and even when they are, it is not the case for the entire period we investigated. Possibly, some other publications are also beyond our grasp, for instance conference proceedings, especially those from the 1990s, that are not available online and hence not easily accessible. However, we did not limit our database only to publications that are available online. Possibility to search for publications in local languages in national publications fully available online certainly added to the final number of publications taken into consideration.

In terms of the timeline, and correspondence with the development of urban forestry in other European countries [11], since we only studied the period between 1990 and 2019, we cannot say how many research and professional papers were written before that time. In Croatia, certainly it was part of forestry practice even before the period [20], and landscape architecture and horticulture dates go back even further [29]. However, it is interesting to see that in Croatia research and professional production showed more continuity in the given period while in Slovenia it followed a course similar to other Mediterranean [1] or Latin America and Caribbean countries [167], which means it has proliferated in the past 10 years or so.

The prevalence of research papers in our database is not a surprise since many authors were affiliated with research and education organizations (Figure 2). Capital cities were the most frequently addressed in publications probably due to many research and education organizations being located in capitals. This is certainly true for Slovenia (Figure 5). In Croatia, the Faculty of Forestry, Faculty of Architecture, Faculty of Agronomy and Faculty of Science (with its departments of botany and geography) are all located in the capital. These organizations are among the top five based on number of affiliated authors and coauthors of analyzed publications. It may also be that researchers tend to choose study locations closer to their workplace. Research funding in Croatia and Slovenia is still lower than the EU average. However, in comparison to Croatia, Slovenia invested more than double in R&D in 2017 (Slovenia 1.87, Croatia 0.86, EU average 2.07% of GDP) [168]. Choosing closer locations allows research to be done even when one has no specific research budget. Focus on capitals may leave out regional differences in many aspects related to urban forests and green space. However, we were surprised to see that Croatian authors were associated with more than 60 organizations, while Slovenian with much less. This is possibly due to the difference in size of each country and the number of research and education organizations (Table 1 and 2). It is also worth mentioning that categorization of papers in journals is not the same as now. For instance, those categorized as research papers in some national journals would probably not be in the same category now. However, we counted papers the way they were categorized by journals themselves. An important result of the review is the fact that research publications were published in many journals, but most frequently in professional journals of foresters and landscape architects due to the authors' professional backgrounds. Croatian authors had a stronger preference for publishing in the local language, influencing their international visibility. For instance, out of 116 research publications (research and review papers, preliminary communications, dissertations and scientific master theses), only 25% were published in English.

Different types of green space were differently addressed in both countries, with the main difference being prevailing focus on parks and park-forests in Croatia and urban forests in Slovenia (Figure 6). This is mostly due to the prevalence of publications by architects and landscape architects in Croatia under the green space planning and/or design theme (Figure 7). On the other hand, in Slovenia most of the authors are forestry professors from the Biotechnical Faculty at the University of Ljubljana and urban forestry practitioners from the Slovenian Forestry Service. Landscape architects or horticulturists in Slovenia have only been publishing green space planning and/or design publications in the past decade, but their interest is increasing.

Analysis of authors' affiliations showed that forestry research and education organization prevailed in both countries. This may have to do with the focus in our study being on tree-based green infrastructure and trees usually fall within the scope of forestry or urban forestry professionals.

When it comes to prevailing themes, it is not a surprise that the most frequent theme in Croatia was green space planning and design given the long tradition of landscape architecture and horticulture [29]. They certainly have a much longer tradition in comparison to urban forestry. Publications mainly focused on a search for origins and transformation of green space over time. We agree this is important in the context of revitalization of often old green spaces. Sometimes those publications act as a tribute to green spaces that lost the battle with urbanization or negligence or when there are only a few trees left as remnants of once glorious parks and gardens attached to old manors in an equally sorry state. However, only a minority of publications went further in proposing a way forward. Revitalization, especially of historical gardens and parks that are abundant in Croatia, implies significant resources and commitment of various actors as well as knowledge and skills of various professionals. Based on our professional knowledge, collaboration even between organizations in the same sector is often missing. The study on urban forest governance in the city of Zagreb based on the interviews with stakeholders came to the same conclusion [19].

Another important theme in both countries was resource inventory (Figure 7). Inventory of woody vegetation is certainly the first and necessary step for effective green space management and maintenance [169] as well as the quantification and valuation of ecosystem services trees provide (i-Tree, 2019). In recent decades, there is an increasing interest in urban tree inventories [170] supported by methodological and technological developments, such as i-Tree [171] or remote sensing. For Croatia and Slovenia we do not have information about the extent to which cities and municipalities have woody plant inventories, and even if they have, whether the information is up to date or used whatsoever. The city of Zagreb has its own green cadaster available online, but it shows only trees maintained by the city company [19]. From discussion with professionals working in city companies in charge of the management and maintenance of public green space, we know that some cities do have at least partial tree inventories for their own purposes. However, this information is not available online and so far there has not been a survey investigating which cities and to what extent have such databases. A conference paper indicated possibility that even when cities do make an effort to develop a database, it does not automatically mean that it is used, updated or useful [146]. Similarly, a pilot study of several North American and European cities showed that even when cities do have inventories, these are not necessarily updated or taken to the next level and used in the development of a strategic management plan [169]. In Slovenia, the city of Ljubljana also has its own green cadaster, maintained by a private company with professional arborists. Smaller cities in Slovenia often take advantage of diploma or master's theses, dealing with green infrastructure inventories, and base their management plans on the theses' results, e.g., [87–89]. Findings from Sweden show that size of municipality affects whether a municipality has an urban tree inventory and that there is a higher possibility that those who have an inventory also have a tree management plan [172]. Furthermore, recently a discussion has been initiated in Europe on the potential of using Forest Inventory data to extract data on forests in urban areas [173]. Urban trees and other woody vegetation are facing many threats, such as urban densification [174] or effects of climate change [175]. Resource inventory in cities and municipalities is certainly a topic that needs to be further investigated in both countries for the purpose of effective management and securing sustainable urban futures.

The public perspectives theme was somewhat less important in both countries (Figure 7). Focus prevailed on recreationists, their perception, preferences or behavior. In both countries, the majority of publications occurred in the past 10 years. This is somewhat later than reported in some other review papers identifying an increase in the number of publications dealing with this topic in the period from 2000 onwards [14,176]. A review paper on the human-nature relationship identified survey questionnaires as the most common method [176] and our review came up with the same result. The same authors claim studies are rarely cross-country, cross-age, or cross-park. Publications in Croatia and Slovenia follow suit. However, regarding the age groups, these are not always

reported or results are not discussed in this context. A literature review of urban forest and green space related research in Mediterranean countries showed that the theme of sociocultural values, as labelled by the authors, is the third most important topic, based on number of publications [1]. Furthermore, connection between green space and human health receives even more interest, however not to the same extent in all countries. On the other hand, in both Croatia and Slovenia there is a research gap on the health effects of green spaces. Additionally, social and environmental justice (equity) was out of focus, similarly to the conclusions of Ordóñez-Barona et al. [167].

Plant health received only a marginal interest of Croatian and Slovenian authors with less than 10% of publications associated (Figure 7). Given the fact that the urban environment is harsh to trees and due to the effect of climate change, they are prone to lower vitality, pests or diseases, e.g., [175]. In Croatia and Slovenia, forest pests and diseases are continually monitored [28,46]. On the other hand, urban tree health monitoring is not obligatory and falls under the authority of cities and municipalities. We are not aware how many cities and municipalities perform such monitoring. However, there is an obligation in the European Union on taking protective measures against pests and plants including also in urban areas [177,178]. Furthermore, arboriculture as a discipline is rather young and still not widely recognized in both countries, which may explain why only a few papers addressed this aspect.

Interest in ecology and tree ecology in urban areas was only marginal in Croatia. In contrast, one fifth of publications in Slovenia addressed this theme (Figure 7). Interestingly, pollution, especially airborne, was the most pronounced theme in Mediterranean countries, especially Italy [1]. However, pollution and the possibility of its attenuation by urban trees have not received attention in Slovenia and in Croatia; only two papers addressed this theme [179,180]. In Slovenia, however, due to the LIFE+ project EMoNFUr [181], focusing on monitoring of urban forest ecosystem services, the research interest and number of publications related to urban forest ecosystem services has increased. When it comes to the hydrology of urban forests or trees, Slovenian authors from two organizations (Faculty of Civil Engineering at University of Ljubljana and Slovenian Forestry Institute) published 12% of all publications (Figure 7), indicating the recognized importance of studying the role of urban green infrastructure in water regulation and purification [182]. Regarding urban forests and green spaces in the context of climate change, this topic is still not part of the scientific or professional discourse in Croatia and is in its infancy in Slovenia, e.g., [136,183].

Other themes such as resource management, economic aspects, policy, legislation and governance or green space education received even lesser interest in both countries (Figure 7). In Croatia papers discussing adapted urban forest management are conspicuously missing, especially given the prevalence of recreational use and other cultural ecosystem services in urban areas. A possible explanation may be the prevailing focus of foresters on economic forests in rural areas serving wood production. On the other hand, in Slovenia there was continuous discussion and work of foresters in the city of Celje on Celje urban forest and how to include the public [162].

In the future we expect more discussion among researchers and professionals about positioning of urban forestry as a profession, especially in Croatia, and providing legal regulations in terms of providing definitions and rules of the game. In Croatia, there is no formal definition of what is or should be considered as urban forest. However, definition of urban forestry in the latest Law on Forests [28] implies that these are forest ecosystems of a certain minimum size, which means forests and park-forests regardless of whether these are protected or not. Hence, the definition as such does not include parks, street trees, groups of trees or single trees. Regardless of the definition provided by the law, there is no common understanding among researchers and professionals. Based on the practice of arboriculture, performed by some foresters and urban foresters, the focus is on trees (tree-based green infrastructure) regardless of where they are.

We would also encourage in both countries studies focusing on urban areas outside capitals. Regarding the specific themes, review showed only limited focus on some ecosystem services. We encourage expanding the focus on ecosystem services other than recreation, water regulation or purification. Expanding the current knowledge base on urban tree inventories in both countries would serve as a basis for more effective management, especially in the context of providing a

response to climate change, pests or diseases, and other issues. Cross-sectoral and interdisciplinary studies, as well as studies performed across different types of urban forests and green space, focusing on multiple sites and dealing with various types of stakeholders or age groups should be encouraged in the future.

Regardless of the limitations we previously mentioned, our review showed benefits of including publications in languages other than English, as well as benefits of reaching beyond research papers. The review contributed to better understanding of the status and development of urban forest and green space research and practice, especially of urban forestry, in post-socialist countries, a rarely discussed topic so far.

Supplementary Materials: The following are available online at www.mdpi.com/xxx/s1, Table S1: Overview of some review papers addressing urban forests and green space with regard to databases used, timeline, language, key words and included number of publications in Croatia and Slovenia; Table S2: Journals and number of publications published by Croatian and Slovenian authors including information whether the journal is indexed in Scopus or WoS; Database S1: List of publications in Croatia and Slovenia included in the analysis.

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