

The role of an international treaty in creating over time a sustainable network for interdisciplinary landscape approaches

Ileana Pătru-Stupariu

University of Bucharest: Universitatea din Bucuresti

Andreea Nita (✉ andreea.nita@cc.unibuc.ro)

University of Bucharest: Universitatea din Bucuresti <https://orcid.org/0000-0002-0661-608X>

Research Article

Keywords: European Landscape Convention, implementation, landscape research, bibliometric analysis, network, co-occurrence

Posted Date: February 11th, 2021

DOI: <https://doi.org/10.21203/rs.3.rs-217829/v1>

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Abstract

Context. The European Landscape Convention (ELC) of the Council of Europe represents the first international treaty that envisage all aspects when planning European landscapes. Through this convention, public authorities have been encouraged to adopt policies and measures at local, national and international level in order to protect, manage and properly plan landscapes in a sustainable manner.

Objectives. Our study aims to provide a better understanding of the landscape governance research trends by using an innovative methodology to highlight ways to improve and optimize ELC implementation.

Methods: For this, we analyzed published articles in international journals directly connected to ELC implementation between 2000 and 2020 (n=400). We use bibliometric indicators (i.e., publications, authors affiliations) and co-occurrence analysis with overlay visualization in time (i.e. keywords), in order to discover the landscape research trends and evolution in the past 20 years. Furthermore, we extracted 119 articles that we review considering for each article the assigned different attributes in order to perform a more detailed analysis of the ELC aspects covered in research.

Results: The findings of our innovative analyses show the key player in promoting the European Landscape Convention principles in the research field, along with the evolution in time of the most common trends of ELC by identifying the perspectives of landscape conservation in the future.

Conclusions. This paper provides insights for integrating novel technologies and innovative landscape approaches in the future and for the landscape sustainability.

Introduction

The year 2020, besides the major change in human lives caused by the Covid-19 pandemic, also represents the celebration of 20 years since the implementation of the European Landscape Convention, something we do not want to forget. This unique international treaty that defined the landscape as “*a common resource and patrimony*” (CE 2000a), is currently ratified by 41 countries being considered the point from which *research, policy management of landscapes and landscape practice related to key concepts for landscape sustainability* (Brandt et al. 2012, Antrop et al. 2013). This change pushed landscape science further *into a different disciplines arena* (Antrop et al. 2013), for instance: ecological approach (landscape ecology, biodiversity) or geography, geology, geomorphology, history, archaeology and landscape architecture or social, economic, cultural and why not political approaches.

This interdisciplinary approach has linked landscape science to planning, policies, management, and stakeholders involvement in order to find solutions to improve local life conditions and landscape perception. If 10 years after the implementation of the European Landscape Convention (ELC) the IALE community (Antrop et al. 2013) raised the question of *how ELC will be able to better integrate the concept of landscape among decision-makers and in the different sectoral policies dealing with the European*

territory. 20 years after its implementation, we still wonder if this step was taken and if the joint research – practical actions are still lacking (Hernández-Morcillo et al. 2017).

At first, this treaty encouraged countries to identify and characterize their landscapes in order to identify and classify their landscapes for protection, management and planning (Chuman and Romportl 2010, García-Llamas et al. 2016). Due to the multidisciplinary nature of landscape research, several methods have appeared in the literature, which tried to quantify the landscapes. For example, (Simensen et al. 2018) in a systematic review show that there are multiple methods that can be used differently to characterize landscapes and depending on user needs. In addition to classical methods, dedicated tools have appeared, e.g. landscape inventories (Van Eetvelde and Antrop 2011, Santé et al. 2018), or *web-platform for facilitating public participation such as: Public Participation GIS -PPGIS* (Brown et al. 2014). Furthermore, the development of participatory scenario development process designed by stakeholders is encouraged (Santé et al. 2020).

By the clear and simple definition of *landscape seen as “areas, as perceived by people”* (CE 2000b), people were encouraged to realize that they have an important role in the *management of their landscapes* (Conrad et al. 2019). This involvement is also supported by the 5th and 6th articles of the convention, where it is specified that the *public involvement and participation is considered to be a key factor in developing these landscape policies* (Santé et al. 2020). Citizen participation policies refer to actions, such as the conservation, protection, management and planning for different landscape types. These actions should be systematically integrated into regional and local planning policies (Brunetta et al. 2018). Also, landscape preferences of people could be the ideal tool for implementing these actions (Serrano-Montes et al. 2019).

As in any research field, collaboration in landscape planning, in policies implementation and in decisions concerning the landscape governance (Folkeson et al. 2013) between the general public, developers and the responsible public authorities, which should be an arena for the implementation of ELC (Sandström and Hedfors 2018), still remain a challenge.

Nevertheless, the network RECEP-ENELC (at local and regional authorities at European level) encouraged local authorities to consider ELC within planning policy and reactivate local communities' initiatives. But there is still a need to develop working groups to promote good practice, and existing networks (e.g., *RECEP - ENELC, UNISCAPE, CIVILSCAPE networks*) create stronger links between authorities, universities and civil society for the implementation of the ELC (EAI 2009). Furthermore RECEP-ENELC that could help implement the ELC within the territory through scientific, technical and political support (Dempsey and Wilbrand 2016).

From this point of view, network analysis can provide a connected view on innovation and at the same time can reveal valuable new insights that can solve landscape problems (Bixler et al. 2016a). This research method is used more and more often in ecosystem governance as it is an innovative method of analyzing interconnected links and nodes that form a functional, adaptive socio-ecological system (Barnes et al. 2017, Manolache et al. 2018).

Bibliometric analysis is often used in the scientific literature to identify patterns of collaboration, most cited papers or authors and clusters of interest or directions in research over time (Badiu et al. 2019, Nita 2019). This type of perspective uses a network approach, which has recently gained prominence in research dealing with the conservation (Bixler et al. 2016b, Bodin et al. 2016, Rozyłowicz et al. 2019), governance and management of natural resources or protected areas (Nita et al. 2018, Bodin et al. 2019, Manolache et al. 2020) and environmental policy improvement (Berardo et al. 2016). This approach is also used to investigate the social capacity or how stakeholders interact for landscape planning approach (Fischer et al. 2016) and investigate human–nature connections (Hartel et al. 2020, Pătru-Stupariu et al. 2020b).

In the scientific literature, there are different analyses and literature review performed to acknowledge the different definitions, classifications, tools, measures or indicators used in landscape assessment (Pătru-Stupariu et al. 2020a). In this paper, we use an innovative approach, namely network and co-occurrence analysis to investigate scientific articles that discuss the European Landscape Convention implementation in order to answer the research question that envisages how the European Landscape Convention contributed to creating over time a network for interdisciplinary research approaches and also what are the points that need to be improved to optimize its implementation?

Methods

Our methodology consisted in extracting from Scopus database the articles that have in their title, abstract or keywords the mention of the European Landscape Convention. After data curation, we obtained 400 articles and created a database with the following aspects: *Bibliographical information, Abstract & keywords, Author(s), Article title, Year, Source title, volume, issue, pages, Source & document type, Publication Stage, Affiliations, Author keywords and Index keywords*. We created a network for the collaboration established for the promotion of the ELC research to understand the cooperation for landscape research driving factors (Rozyłowicz et al. 2017, Hossu et al. 2018). Separately, we investigated the research productivity in order to identify the top journals in this field. For the collaboration network, two countries were connected if they had at least 1 paper published together, isolated countries were not represented in the collaboration network. In this stage of our analysis, we used centrality metrics to identify the promoters of ELC at European and why not international level and highlight the countries with best position in the network to influence (Everett and Valente 2016) (Abbasi et al. 2012). After uniformization of the dataset, we performed a co-occurrence analysis (Radhakrishnan et al. 2017) of the authors keywords evolution in time considering the average publication and of the criteria used in the reviewed publication. Keyword co-occurrence network based method helps to create a systematic review of scientific literature by using visual analysis in order to directions to advance a particular scientific domain (Radhakrishnan et al. 2017). Nevertheless, when using complex networks, the visual representation does not allow visibility of all nodes, this is why we chose to illustrate keywords that appear at least 2 times.

The results of this analysis will highlight the evolution of the ELC concepts will determine future directions of research and ways to improve the implementation of the principles of the convention by identifying the policy issues, gaps in landscape conservation and planning discussed in the literature (Pedroli et al. 2013, Roe 2013).

Furthermore, we also extracted from the original database and reviewed 119 most important publications published in journals such as: Landscape Ecology, Land Use Policy, Landscape and Urban Planning, Ecological Indicators, Applied Geography, Landscape research, European Planning Studies, Biodiversity and Conservation, Journal of Environmental Planning and Management, Ecological Engineering, Environmental Impact Assessment Review, Regional Studies, European Journal of Geography, Journal of Maps, Journal of Forest Economics, Ecology and Society, Journal of Agricultural Engineering, Landscape Online, Geosciences (Switzerland), Sustainability (Switzerland). In selecting the articles for review, we considered the type of the publishing journal, including some BDI recognized by the landscape ecology community. Another criterion was related to the ELC requirements and recommendations, described, or applied in these articles. The article excluded from this last analysis envisaged the following: the journal type (we excluded the Conference Proceedings and other papers with limited access, only presenting their abstract, in other language than English or those from the gray literature with very brief reference to the requirements of this treaty).

The criteria (C1-C8) which were considered in the analysis, were chosen from the requirements promoted by ELC, respectively: i) C1-C3, definition, characterization of landscapes (particularly values of landscapes); ii) C4-C5, to develop several assessment methodologies for delineate landscape units; iii) C6-C7, to recognizes the importance of public participation on decision-making and to establish procedures for the participation of the general public, in the definition and implementation of landscape policies, the municipalities as an important instrument for the development and implementing of landscape policies. iv) C8 -networks established to promote the implementation of the ELC, a broad range of European stakeholders, such as political institutions, universities, and local and regional NGOs Or the ELC promotes collaboration between public agencies, NGOs and local communities.

The softwares used for analysis were R and Ucinet (Borgatti et al. 2002) and the graphs and figures were performed with Netdraw, VosViewer and Biblioshiny (Borgatti 2002, van Eck and Waltman 2010, Aria and Cuccurullo 2017).

Results

Our results are focused on the extracted research articles concerning the implementation and role of the European Landscape Convention within landscape conservation and management. The core sources of the analyzed articles are presented in Fig. 1, gathering international journals such as: Landscape research, Land Use Policy, Sustainability, Landscape and Urban Planning, Journal of Environmental planning and Management, Landscape Ecology, Naturschutz und Landschaftsplanung, The Routledge Companion to Landscape Studies, Applied Geography, Estudios Geograficos, European Planning Studies,

Journal of Environmental Management, Journal of Landscape Ecology, Landscape and sustainable development. Figure 2 illustrates a significant evolution of research done exclusively on ELC, especially after 2010.

In terms of country productivity on the papers discussing ELC implementation principles or best practice examples, stands out in the top the following countries: Italy, Spain, United Kingdom, Sweden, Poland, Germany, France, Norway, USA, Netherlands, Belgium, Czech Republic, Turkey, Denmark, Switzerland (see Supplementary Material Table 1). Among the countries that have produced scientific articles on this subject but in a lower number maybe due to the fact that their countries have not ratified the convention, we list: New Zealand, China, Japan, Serbia, Canada, Chile, Colombia, Iran, Kyrgyzstan and Lebanon (see Supplementary Material Table 1).

Figure 3 presents the analysed Country Collaboration network for ELC research (see Supplementary Material Table 2), where we represented the cooperation established by the authors of the analysed articles considering their affiliation. After investigating the betweenness centrality results we can see that countries such as: Norway, Spain, Sweden, and Denmark have the highest betweenness indicating the fact that they are the brokers for collaboration having the best position in the network. Considering the analyzed articles, United Kingdom was the leader in landscape research being the first most coted country, followed by Belgium, Sweden, Netherlands and Italy. In terms of most important affiliation of our investigated network in terms of productivity and that had a great academic impact, we mention the first three positions, namely: Swedish University of Agricultural Sciences, Norwegian University of Life Sciences and Ghent University.

The keyword network database investigated had initially 1314 authors keywords that were unified. After this, in order to generate a network with a good visualization, we selected as minimum number of occurrences of a keyword: 2, obtaining a final graph of the most common 187 keywords used in landscape research (Fig. 4). Considering the evolution in time of the concepts discussed in the literature, there is a focus in the average publication year between 2012–2014 on concepts such as: *land cover, heritage, character, landscape structure, restoration, territory, infrastructure*. The middle cluster comprises keywords or concepts that have an average publication date between 2014 and 2016, this meaning that a concept could be in this group due to the fact that it is a concept discussed for the entire period of 20 years since the convention began to enter into force. In this cluster, we identified keywords such as: *focus group, spatial planning, conservation, values, design, architecture*. The newer research directions are highlighted by the keywords from the last cluster with an average year of publication after 2015, here we mention keywords such as: *climate change, governance, human rights, community, commons, guidelines, policy, landscape education*. Our keyword analysis shows that *cultural landscape or landscape history* have as average publication date between 2010 and 2015, other keywords such as: *wind power, land use, regional planning* have the average year of publication in 2014 and keywords such as *conceptual framework, common agricultural policy and holistic approach* have as average year of publication 2016.

As seen in Fig. 5, the most important criteria discussed in the investigated publications is C1: only the mention of the convention in the text (as a reference to the law), envisage the definition of the landscape given by ELC is mentioned or discusses the implementation of ELC in general. The rest of them being used in the reviewed articles as follows: C2 found in 47.06% of cases, C6 42.86%, C7 37.82%, C3 38.66%, C5 28.57%, C4 24.37%, C8 15.97%. In Fig. 5, we also illustrate the connections between the criteria in the analyzed articles and in the graph (Fig. 5).

Discussions

The evolution of the research focused on ELC over time.

Important research journals focused on issues related to landscape ecology (e.g. Landscape Research, Landscape Ecology, Land Use Policy) have published research articles discussing ELC for the past 20 years (Figs. 1–2). At first, this treaty encouraged countries to identify, characterize their landscapes and then propose them for protection and conservation, or to identify and classify their landscapes for protection, management and planning. The temporal analysis showed a progress with respect to the research focused on landscape science developed towards policy, management, and practice especially thanks to the implementation of the ELC, nevertheless a common agenda should be made in order to adapt and apply to better define these actions and to implement a holistic approach (Wu et al. 2017), especially regarding the conservation and promotion of the cultural heritage (Hernández-Morcillo et al. 2017)..

A treaty signed 20 years ago, the European landscape Convention produced unexpected effects in landscape research, planning. Of course, the implementation was done gradually and differently in European countries as well as the research in this field (Fig. 3), referring to specific national landscape management systems and it will be interesting to see how the next 10 years will look like for the research and practice established by the ELC, and especially if we are going towards a sustainable landscape.

The findings of our temporal analysis show that before 2012, researchers encouraged landscape research in the following concepts: Landscape design (Nassauer and Opdam 2008), Landscape Character Assessment (Butler and Berglund 2012), land cover and use along with characterization of landscapes in different countries (Petrisor et al. 2010) or regions (Frondoni et al. 2011). After this period, in the next 10 years publications discussed the need of more involvement of local actors in landscape planning and the importance of collaborative processes in environmental management and governance of landscapes (Bixler et al. 2016a). Furthermore, in the last five years (Fig. 4), it was registered a growth in subjects related to: landscape values important to be kept in time, important landscape ecology metrics and indices to be considered in climate change adaptation in a European Context, as well as ways to adapt urban landscapes (Sandström and Hedfors 2018) to sustainable blue green infrastructures (Lamond and Everett 2019, Iojă et al. 2021). In terms of productivity over time, our results showed a low productivity in high impact journals of some European countries, and maybe that is why we are also talking about uneven ELC implementation, as some countries have evolved a lot in researching innovative

landscape analyses, while others are already very evolving, such as Italy, Spain, United Kingdom, Sweden, etc.

The emergence and implementation of ELC has generated the creation of networks for interdisciplinary approaches.

The implementation of the ELC contributed significantly for the awareness-raising (Riesco-Chueca and Gómez-Zotano 2013) of the landscape values (Fig. 2), *among* scientists, policymakers and the general public (Plieninger et al. 2015). The role of *landscape ecologists* was decisive in making the connections between scientists, researchers, practitioners and policymakers (Pinto-Correia and Kristensen 2013). Thus, our findings showed that a bridge between disciplines was built, that led to an interdisciplinary research approach (Fig. 3). This collaboration led to the creation of diverse landscape assessment methods, indicators or PPGIS platform, integration of concepts such as multidisciplinary (Fagerholm et al. 2019), co-design and co-governance (García-Martín et al. 2021).

Besides the fact that ELC encourages public perception as the main factor in landscape assessment, planning and management (López-Martínez 2017), the investigation of ELC articles showed that certain socio-demographic characteristics of the respondents (age, gender and education level) influenced their visual preferences. Furthermore, integrating public perception in landscape research has brought significant changes at the operational level and of course in the landscape assessment, planning, and policy has remained limited (Plieninger et al. 2015, De Montis 2016). Also, the significant challenge remains how governance design can facilitate the successful implementation of ELCs (Wu et al. 2017),.

As shown by our co-occurrence findings (Figs. 4–5), over the last 20 years, there has been a higher frequency of the analyzed elements envisaged by the first 3 criteria (C1, C2, C3), referring to ELC generally mentioned as a legislative reference, considering the landscape according to ELC definition, either encouraging local actors to be part of the decision process, ELC being considered as a policy instrument. These criteria were the most connected in the analyzed articles. This result draws attention to the need for greater promotion in the future of the following criteria in practice and in research: interdisciplinary methods of landscape assessment, along with perception research envisaging proper protection and management of the landscape, and especially implemented by municipalities or local authorities in collaboration with public stakeholders that should have the most important role in landscape planning and decision-making (Sandström and Hedfors 2018).

Conclusions

Our paper presents a retrospective of the research dynamics from the beginning of the implementation of the European Landscape Convention and until now, these being particularly important aspects in tracing the future of landscape planning and conservation. These findings are achieved using topical innovative methods in the scientific literature. as is the case of network analysis or co-occurrence keyword analysis.

A treaty signed 20 years ago has produced unexpected effects in landscape research, landscape planning or landscape policies. Of course, the implementation was done gradually and differently in European countries, *referring to specific national landscape management systems* (De Montis 2014). The review of the investigated articles highlighted the fact that there is still a need for the transfer of good practices and clear policies for the implementation of the ELC depending on the landscape specificity. Moreover, creating networks among political institutions, universities, and local and regional NGOs, public agencies, local communities or working groups, to promote and why not improve ELC remains still a challenge (Bixler et al. 2016b), such shortcomings can also be covered by using network theory in future research that can improve ELC implementation (at international level and at local level), and further develop national landscape policies by integrating all interested actors on the one hand, and linking landscape ecology concepts with planning process on the other (Hersperger et al. 2021).

Given the digitization period that the entire planet is going through, maybe in the next 10 years, policy makers will consider proposing coherent examples that are easy to follow, especially for developing countries. Future policies should also envisage the creation at European or international level of a network to promote the interdisciplinary approaches along with novel technologies, which could stimulate the development of new research directions or could provide suitable solutions to landscape issues, considering past landscape planning mistakes. At the same time, the novel technologies and perspectives must consider at the same time past values, current perceptions, and future threats. All this, must be supported by an assumed collaboration to promote landscape sustainability and better communication of researchers' know-how to policy makers, landscape experts, architects, scholars and other practitioners.

Declarations

Authors' contributions

Ileana Pătru-Stupariu: idea and conceptualization, data curation, methodology, investigation, formal analysis, writing - Original Draft. Andreea Nita: conceptualization, data curation, methodology, formal analysis, investigation, Writing - Original Draft. Ileana Pătru-Stupariu and Andreea Nita contributed equally to this work.

Acknowledgment

Andreea Nita was supported by a grant of the Romanian National Authority for Scientific Research (<https://uefiscdi.gov.ro>), PN-III-P1-1.1-TE-2019-1039.

References

1. Abbasi A, Hossain L, Leydesdorff L (2012) Betweenness centrality as a driver of preferential attachment in the evolution of research collaboration networks. *Journal of Informetrics* 6:403–412
2. Antrop M, Brandt J, Loupa-Ramos I, Padoa-Schioppa E, Porter J, Van Eetvelde V, Pinto-Correia T (2013) How landscape ecology can promote the development of sustainable landscapes in Europe: the role of the European Association for Landscape Ecology (IALE-Europe) in the twenty-first century. *Landscape ecology* 28:1641–1647
3. Aria M, Cuccurullo C (2017) bibliometrix: An R-tool for comprehensive science mapping analysis. *Journal of Informetrics* 11:959–975
4. Badiu DL, Nita A, Iojă CI, Niță MR (2019) Disentangling the connections: A network analysis of approaches to urban green infrastructure. *Urban Forestry Urban Greening* 41:211–220
5. Barnes ML, Bodin O, Guerrero AM, McAllister RRJ, Alexander SM, Robins G (2017) The social structural foundations of adaptation and transformation in social-ecological systems. *Ecology and Society* 22
6. Berardo R, Alcaniz I, Hadden J, Jasny L (2016) Policy Networks and Environmental Governance. *in* J. N. Victor, A. H. Montgomery, and L. M., editors. *The Oxford Handbook of Political Networks*. Oxford University Press
7. Bixler RP, Johnson S, Emerson K, Nabatchi T, Reuling M, Curtin C, Romolini M, Grove JM (2016a) Networks and landscapes: a framework for setting goals and evaluating performance at the large landscape scale. *Front Ecol Environ* 14:145–153
8. Bixler RP, Wald DM, Ogden LA, Leong KM, Johnston EW, Romolini M (2016b) Network governance for large-scale natural resource conservation and the challenge of capture. *Front Ecol Environ* 14:165–171
9. Bodin Ö, Alexander SM, Baggio J, Barnes ML, Berardo R, Cumming GS, Dee LE, Fischer AP, Fischer M, Mancilla Garcia M, Guerrero AM, Hileman J, Ingold K, Matous P, Morrison TH, Nohrstedt D, Pittman J, Robins G, Sayles JS (2019) Improving network approaches to the study of complex social-ecological interdependencies. *Nature Sustainability* 2:551–559
10. Bodin O, Robins G, McAllister RRJ, Guerrero AM, Crona B, Tengo M, Lubell M (2016) Theorizing benefits and constraints in collaborative environmental governance: a transdisciplinary social-ecological network approach for empirical investigations. *Ecol Soc* 21:40
11. Borgatti SP (2002) *Netdraw Network Visualisation*. SAGE Publications
12. Borgatti SP, Everett MG, Freeman LC (2002) *Ucinet for Windows: Software for Social Network Analysis*. Analytic Technologies, Harvard
13. Brandt J, Christensen AA, Svenningsen SR, Holmes E (2012) Landscape practise and key concepts for landscape sustainability. *Landscape ecology* 28:1125–1137
14. Brown G, Weber D, de Bie K (2014) Assessing the value of public lands using public participation GIS (PPGIS) and social landscape metrics. *Appl Geogr* 53:77–89
15. Brunetta G, Monaco R, Salizzoni E, Salvarani F (2018) Integrating landscape in regional development: A multidisciplinary approach to evaluation in Trentino planning policies, Italy. *Land Use*

16. Butler A, Berglund U (2012) Landscape Character Assessment as an Approach to Understanding Public Interests within the European Landscape Convention. *Landscape Research* 39:219–236
17. CE (2000a) European Landscape Convention, full list, https://www.coe.int/en/web/conventions/fulllist//conventions/treaty/176/signatures?p_auth=zQaONoxB, Accessed 17 July 2020
18. CE (2000b) European Landscape Convention. Firenze, Online. Available <https://www.coe.int/en/web/conventions/full-list/-/conventions/treaty/176> Accessed 17 July 2020
19. Chuman T, Romportl D (2010) Multivariate classification analysis of cultural landscapes: An example from the Czech Republic. *Landscape Urban Planning* 98:200–209
20. Conrad E, Fazey I, Christie M, Galdies C (2019) Choosing landscapes for protection: Comparing expert and public views in Gozo, Malta. *Landscape and Urban Planning* 191
21. De Montis A (2014) Impacts of the European Landscape Convention on national planning systems: A comparative investigation of six case studies. *Landscape Urban Planning* 124:53–65
22. De Montis A (2016) Measuring the performance of planning: the conformance of Italian landscape planning practices with the European Landscape Convention. *Eur Plan Stud* 24:1727–1745
23. Dempsey KE, Wilbrand SM (2016) The role of the region in the European Landscape Convention. *Reg Stud* 51:909–919
24. EAI (2009) Beyond boundaries -protected landscapes, cities and the European Landscape Convention
25. Everett MG, Valente TW (2016) Bridging, brokerage and betweenness. *Soc Networks* 44:202–208
26. Fagerholm N, Torralba M, Moreno G, Girardello M, Herzog F, Aviron S, Burgess P, Crous-Duran J, Ferreiro-Domínguez N, Graves A, Hartel T, Măcicăsan V, Kay S, Pantera A, Varga A, Plieninger T (2019) Cross-site analysis of perceived ecosystem service benefits in multifunctional landscapes. *Glob Environ Change* 56:134–147
27. Fischer AP, Vance-Borland K, Jasny L, Grimm KE, Charnley S (2016) A network approach to assessing social capacity for landscape planning: The case of fire-prone forests in Oregon, USA. *Landscape Urban Planning* 147:18–27
28. Folkeson L, Antonson H, Helldin JO (2013) Planners' views on cumulative effects. A focus-group study concerning transport infrastructure planning in Sweden. *Land Use Policy* 30:243–253
29. Frondoni R, Mollo B, Capotorti G (2011) A landscape analysis of land cover change in the Municipality of Rome (Italy): Spatio-temporal characteristics and ecological implications of land cover transitions from 1954 to 2001. *Landscape Urban Planning* 100:117–128
30. García-Llamas P, Calvo L, Álvarez-Martínez JM, Suárez-Seoane S (2016) Using remote sensing products to classify landscape. A multi-spatial resolution approach. *Int J Appl Earth Obs Geoinf* 50:95–105

31. García-Martín M, Quintas-Soriano C, Torralba M, Wolpert F, Plieninger T (2021) Landscape Change in Europe. In: Weith T., Barkmann T., Gaasch N., Rogga S., Strauß C., Zscheischler J. (eds)
32. Hartel T, Nita A, Rozyłowicz L (2020) Understanding human–nature connections through value networks: the case of ancient wood-pastures of Central Romania. *Sustain Sci* 15:1357–1367
33. Hernández-Morcillo M, Bieling C, Bürgi M, Lieskovský J, Palang H, Printsman A, Schulp CJE, Verburg PH, Plieninger T (2017) Priority questions for the science, policy and practice of cultural landscapes in Europe. *Landscape ecology* 32:2083–2096
34. Hersperger AM, Grădinaru SR, Pierri Daunt AB, Imhof CS, Fan P (2021) Landscape ecological concepts in planning: review of recent developments. *Landscape ecology*
35. Hossu CA, Iojă IC, Susskind LE, Badiu DL, Hersperger AM (2018) Factors driving collaboration in natural resource conflict management: Evidence from Romania. *Ambio*
36. Iojă CI, Badiu DL, Haase D, Hossu AC, and M. R. Niță. 2021. How about water? Urban blue infrastructure management in Romania. *Cities* 110
37. Lamond J, Everett G (2019) Sustainable Blue-Green Infrastructure: A social practice approach to understanding community preferences and stewardship. *Landscape and Urban Planning* 191
38. López-Martínez F (2017) Visual landscape preferences in Mediterranean areas and their socio-demographic influences. *Ecol Eng* 104:205–215
39. Manolache S, Nita A, Ciocanea CM, Popescu VD, Rozyłowicz L (2018) Power, influence and structure in Natura 2000 governance networks. A comparative analysis of two protected areas in Romania. *J Environ Manage* 212:54–64
40. Manolache S, Nita A, Hartel T, Miu IV, Ciocanea CM, Rozyłowicz L (2020) Governance networks around grasslands with contrasting management history. *J Environ Manage* 273:111152
41. Nassauer JI, Opdam P (2008) Design in science: extending the landscape ecology paradigm. *Landscape ecology* 23:633–644
42. Nita A (2019) Empowering impact assessments knowledge and international research collaboration - A bibliometric analysis of Environmental Impact Assessment Review journal. *Environ Impact Assess Rev* 78:106283
43. Nita A, Ciocanea CM, Manolache S, Rozyłowicz L (2018) A network approach for understanding opportunities and barriers to effective public participation in the management of protected areas. *Social Network Analysis Mining* 8:31
44. Pătru-Stupariu I, Hossu CA, Grădinaru SR, Nita A, Stupariu M-S, Huzui-Stoiculescu A, and A.-A. Gavrilidis. 2020a. A Review of Changes in Mountain Land Use and Ecosystem Services: From Theory to Practice. *Land* 9
45. Pătru-Stupariu I, Nita A, Mustățea M, Huzui-Stoiculescu A, Fürst C (2020b) Using social network methodological approach to better understand human–wildlife interactions. *Land Use Policy* 99
46. Pedrolí B, Antrop M, Pinto Correia T (2013) Editorial: Living Landscape: The European Landscape Convention in Research Perspective. *Landscape Research* 38:691–694

47. Petrisor A-I, Ianos I, Talanga C (2010) Land Cover and Use Changes Focused on the Urbanization Processes in Romania. *Environ Eng Manag J* 9:765–771
48. Pinto-Correia T, Kristensen L (2013) Linking research to practice: The landscape as the basis for integrating social and ecological perspectives of the rural. *Landscape Urban Planning* 120:248–256
49. Plieninger T, Kizos T, Bieling C, Le L, Dû-Blayo M-A, Budniok M, Bürgi CL, Crumley G, Girod P, Howard J, Kolen T, Kuemmerle G, Milcinski H, Palang K, Trommler, Verburg PH (2015) Exploring ecosystem-change and society through a landscape lens: recent progress in European landscape research. *Ecology and Society* 20
50. Radhakrishnan S, Erbis S, Isaacs JA, Kamarthi S (2017) Novel keyword co-occurrence network-based methods to foster systematic reviews of scientific literature. *PLoS One* 12:e0172778
51. Riesco-Chueca P, Gómez-Zotano J (2013) Landscape Fieldwork: Scientific, Educational and Awareness-Raising Requirements in the Context of the European Landscape Convention. *Landscape Research* 38:695–706
52. Roe M (2013) Policy Change and ELC Implementation: Establishment of a Baseline for Understanding the Impact on UK National Policy of the European Landscape Convention. *Landscape Research* 38:768–798
53. Rozyłowicz L, Nita A, Manolache S, Ciocanea CM, Popescu VD (2017) Recipe for success: A network perspective of partnership in nature conservation. *Journal for Nature Conservation* 38:21–29
54. Rozyłowicz L, Nita A, Manolache S, Popescu VD, Hartel T (2019) Navigating protected areas networks for improving diffusion of conservation practices. *J Environ Manage* 230:413–421
55. Sandström UG, Hedfors P (2018) Uses of the word ‘landskap’ in Swedish municipalities’ comprehensive plans: Does the European Landscape Convention require a modified understanding? *Land Use Policy* 70:52–62
56. Santé I, Fernández-Ríos A, Tubío JM, García-Fernández F, Farkova E, Miranda D (2018) The Landscape Inventory of Galicia (NW Spain): GIS-web and public participation for landscape planning. *Landscape Research* 44:212–240
57. Santé I, Tubío JM, Miranda D (2020) Public participation in defining landscape planning scenarios and landscape quality objectives (LQO): Landscape Guidelines for Galicia (NW Spain) case study. *Land Use Policy* 94
58. Serrano-Montes JL, Martínez-Ibarra E, Arias-García J (2019) How Does the Presence of Livestock Influence Landscape Preferences? An Image-Based Approach. *Landscape Online* 71:1–18
59. Simensen T, Halvorsen R, Erikstad L (2018) Methods for landscape characterisation and mapping: A systematic review. *Land Use Policy* 75:557–569
60. van Eck NJ, Waltman L (2010) Software survey: VOSviewer, a computer program for bibliometric mapping. *Scientometrics* 84:523–538
61. Van Eetvelde V, Antrop M (2011) From Landscape Atlas to Flemish Heritage Landscapes. Using landscape inventories to formulate landscape quality objectives in a participative process. *Landscapes of Everyday Life. In Crossed Perspectives on Research and Action, Proceedings of the*

PDD International Conference, Perpignan, France and Gerona, Spain, 16–18 March 2011; Terrason, D., Ed.; UNISCAPE: Zoetermeer, The Netherlands; p. 2011

62. Wu C-J, Isaksson K, Antonson H (2017) The struggle to achieve holistic landscape planning: Lessons from planning the E6 road route through Tanum World Heritage Site, Sweden. Land Use Policy 67:167–177

Figures

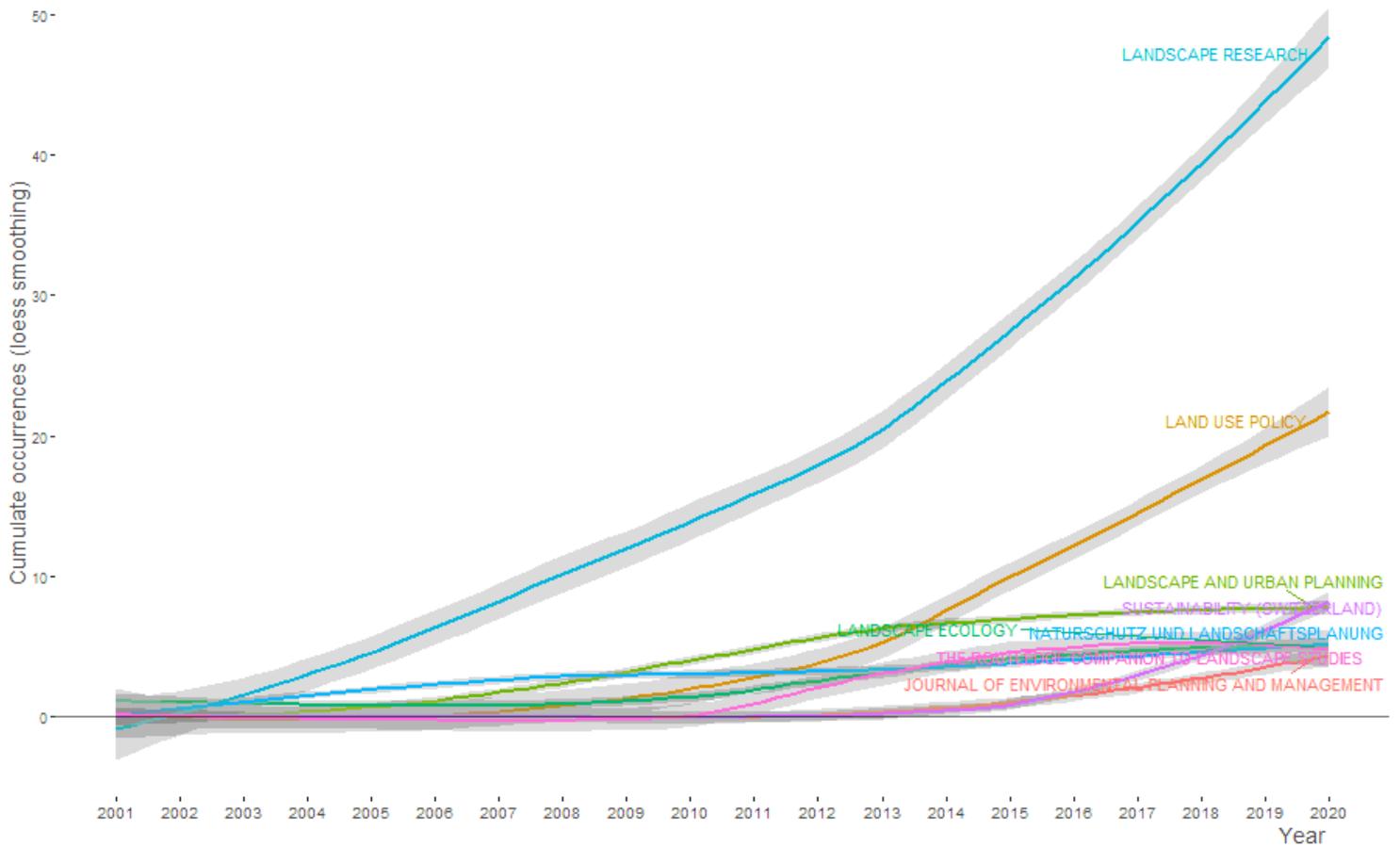


Figure 1

Source growth of the top journals in which the analyzed articles were published with direct reference to ELC.

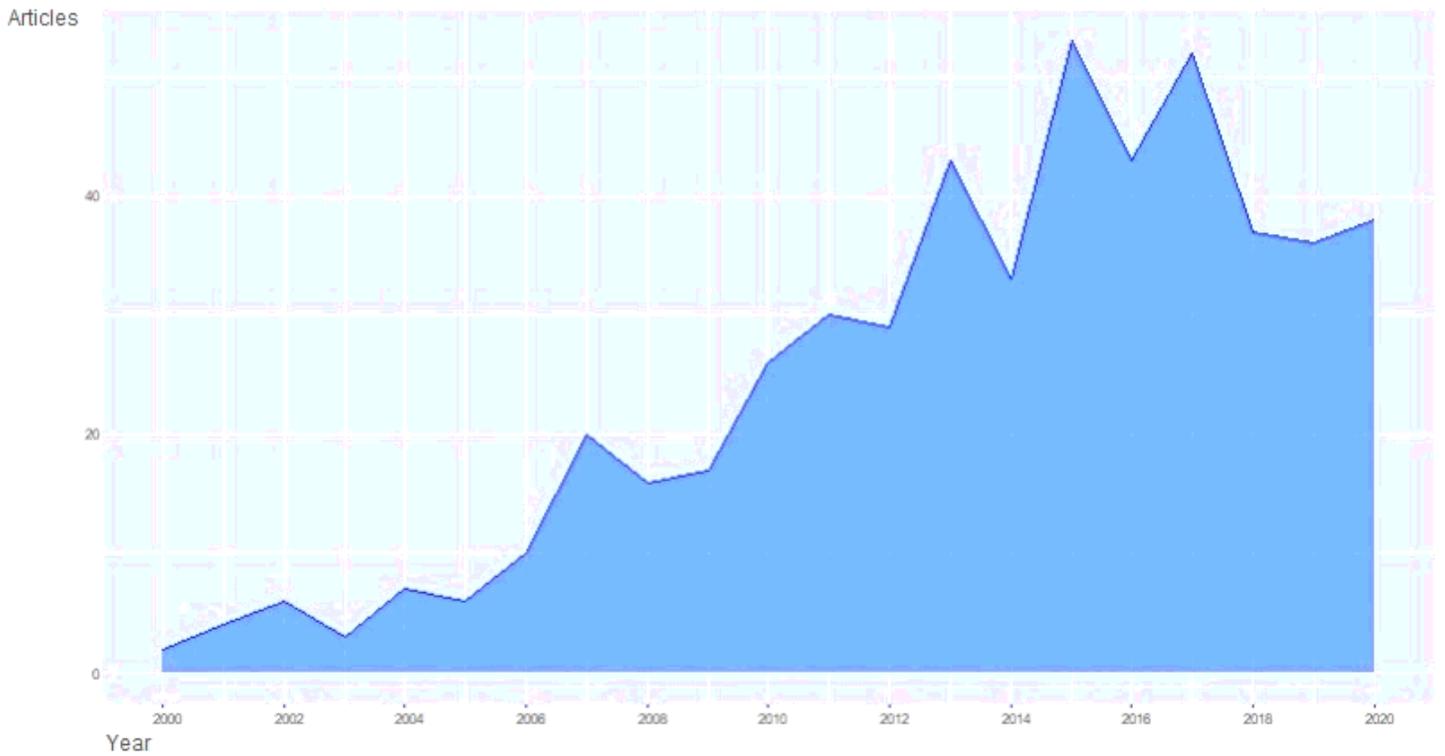


Figure 2

Annual Scientific production of the analyzed articles related to ELC.

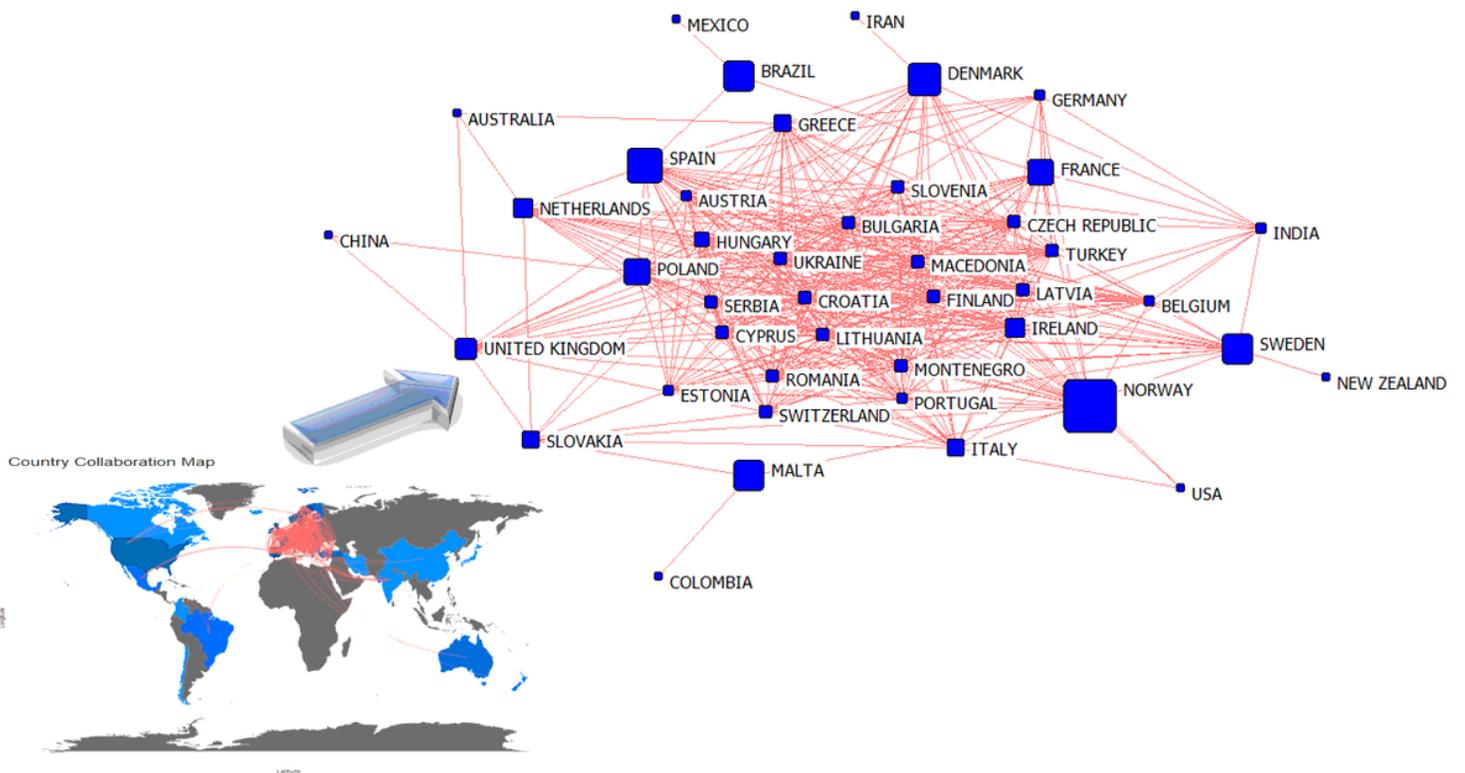


Figure 3

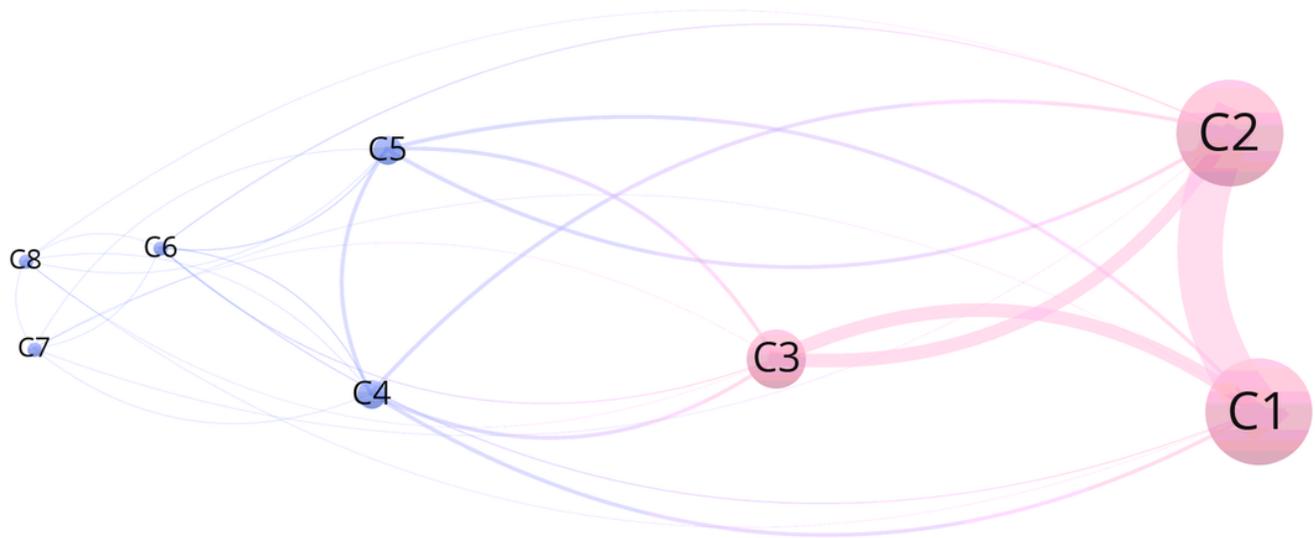


Figure 5

Links between the criteria within the analysed research articles (size of nodes by total link strength)

Supplementary Files

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