Does landscape play a role in strategic spatial planning of European urban regions?

Abstract

Cities and urban regions have become central to ensuring a sustainable future. Many regions employ strategic spatial planning, a transformative and integrative public-sector-led activity, to create a coherent spatial development strategy in order to pursue sustainable development. Due to its encompassing, cross-sectoral qualities, landscape science is expected to strengthen nature-related aspects of urban planning. The aim of this paper is thus to assess the role of landscape in contemporary strategic spatial planning. This study is based on content analysis of the strategic spatial plans of 18 European urban regions. Plans were assessed following a framework that focuses on how plans took advantage of landscape's integrative power, how plans are based in knowledge on functioning of landscape systems, and how plans show the contribution of landscapes to human well-being. The findings show that landscape science contributes considerably to strategic planning. Overall, the strategic plans of European urban regions had a strong anthropocentric perspective on landscapes. Most of the plans are based on knowledge about landscape functioning and show the contribution of landscapes to human well-being**.** However, only few use the full potential of the integrative power of landscapes in terms of governance processes. Based on our analysis, we identified research needs and suggested recommendations for future strategic planning with the aim of strengthening nature-related aspects in strategic spatial planning.

Key words: landscape science; spatial planning; governance; plan evaluation; plan; green infrastructure

1 INTRODUCTION

Cities and urban regions have become central to ensuring a sustainable future (Acuto, Parnell, & Seto, 2018; McPhearson, Parnell, Simon, Gaffney, Elmqvist, Bai, Roberts, & Revi, 2016). Urban science and policy thus need to develop knowledge and tools to address complex urban challenges. Strategic spatial planning can be considered as one of the key policies in guiding the sustainable development of urban regions: consisting of urban centres and their hinterland, often forming a mosaic of built, agricultural and forest uses. Strategic spatial planning is a well-established transformative and integrative public-sector-led activity involving multi-level governance (Albrechts, Balducci, & Hillier, 2017).

Also referred to as metropolitan governance or regional governance, strategic spatial planning aims to formulate a coherent spatial development strategy with an integrated logic regarding land use (Albrechts, Healey, & Kunzmann, 2003). To pursue sustainable development, strategic spatial planning brings together multiple actors from private and public sectors in a social and collaborative process. Typically, the planning process stimulates the generation, exchange and management of different forms of lay and expert knowledge (Legacy, 2012) and takes place within a territory-based or place-based context (Healey, 2009). The outcome of the planning process goes beyond a new strategic plan, it can lead to building a shared discourse about long-term transformations (e.g. Albrechts, Healey, & Kunzmann, 2003) or form new institutional capacities to address future issues (e.g. Oleson 2014; Oliveira & Hersperger, 2018a). Strategic spatial planning in urban regions, as outlined here, is often more long-term and political than comprehensive planning and has fewer ties to statutory planning.

Metropolitan regions often employ strategic spatial planning as a response to economic and social changes, and to support structural shifts from, for example, an industry-based to a service-oriented urban region (Oliveira, 2016). In recent years, sustainable development and environmental concerns have become important objectives in these plans (Oliveira, Tobias, & Hersperger, 2018). Simultaneously, neo-liberal agendas and private economic interests have begun to play a growing role in defining strategies and leveraging the planning processes. To advance sustainable development it is thus important to understand how to strengthen nature-related aspects in the strategic spatial planning of urban regions efficiently.

“Landscapes” – considering its contemporary, encompassing definitions - bear the potential to play an important role in integrative spatial planning processes. "Landscape" means an area, as perceived by people, whose character is the result of the action and interaction of natural and/or human factors (Council of Europe, 2000). Landscape is thus a boundary concept that has the potential to 1) integrate scientific disciplines and 2) to advance cooperation between planning actors. The latter one makes landscapes especially relevant for planning. The contribution of landscape science to inform planning and resource management is a topic of high interest (see, for example, Ahern, 1999; Dale, Brown, Haeuber, Hobbs, Huntly, Naiman, Riebsame, Turner, & Valone, 2000; Opdam, Nassauer, Wang, Albert, Bentrup, Castella, McAlpine, Liu, Sheppard, & Swaffield, 2013; Pedroli, Pinto-Correia, & Cornish, 2006; Wang, Tan, Zhang & Nassauer, 2014; Wu, 2013). We can certainly assume that the inclusion of knowledge from landscape science improves the overall quality of urban planning. For this paper, landscape science is defined as research that seeks to understand the relationship

between people and their environment, with a focus on the landscape scale. It encompasses perspectives from different disciplines including the natural sciences (e.g. Wiens, Moss, Turner, & Mladenoff, 2007), the human sciences through human ecology and human geography (e.g. Steiner, 2008) and humanistic and symbolic approaches (e.g. Cosgrove & Daniels, 1988; Robinson & Carson, 2013).

To date, little research has focussed on how landscape science has been used in institutionalized spatial planning practices and plans. A related, early contribution to the topic by Termorshuizen, Opdam and van den Brink (2007) developed and tested an indicator-based tool to measure how ecological sustainability is incorporated into landscape plans. The tool is based on a framework which encompasses the ecological and planning landscape domains. Other notable recent contributions are studies by Trammell, Carter, Haby and Taylor (2018), who analysed the integration of landscape ecology into natural resource planning in the United States and Bjärstig, Thellbro, Stjernström, Svensson, Sandström, Sandström & Zachrisson (2018), who assessed whether Swedish municipal comprehensive plans are effective landscape planning tools. In related fields, recent studies have evaluated the incorporation of green infrastructure into planning documents (see, for example, Albert & Von Haaren, 2017; Davies & Lafortezza, 2017; di Marino & Lapintie, 2018; Gradinaru & Hersperger, 2018) and have assessed how ecosystem services are dealt with in plans (see, for example, Rall, Kabisch, & Hansen, 2015; Wilkinson, Saarne, Peterson & Colding, 2013; Woodruff & BenDor, 2016). Overall, the topic of plan evaluation has gained a growing interest in planning research and it is broadly acknowledged that evaluation is necessary in order to advance the planning field (Mastop & Faludi, 1997; Rudolf, Grădinaru, & Hersperger, 2017; Wende, Wojtkiewicz, Marschall, Heiland, Lipp, Reinke, Schaal, & Schmidt, 2012).

To address the outlined gap in knowledge, the aim of this paper is to assess the role “landscape” plays in strategic spatial planning in European urban regions. This paper first presents the theoretical framework for evaluating how landscape science can contribute to strategic planning and, then, describes the methods and data. Subsequently, the results of the strategic plan evaluation are reported. The paper concludes with a discussion, recommendations for the future and conclusions.

2 FRAMEWORK FOR PLAN ASSESSMENT

In order to assess the role of “landscape” in the strategic spatial plans, we focussed on how plans took advantage of landscape’s integrative power, how plans are based on knowledge on functioning

of landscape systems, and how plans show the contribution of landscapes to human well-being. The focus on these three aspects represented the expectation that landscape science can strengthen strategic spatial plans by providing an overarching perspective that integrates humans and nature, by accounting for the functioning of landscapes and by specifying the benefits to human well-being provided by landscapes. Additionally, we assessed which plan sections address landscapes.

The framework was expected to support the evaluation of strategic spatial plans and the drafting of recommendations for improved integration of landscape science into strategic spatial plans. For each aspect, a number of items (Table 1) were selected to assist the assessment. These items were selected in order to avoid overlap, confirm a solid base in landscape research, cover a broad spectrum of aspects associated with landscapes, and to strive for a logical and coherent combination. The assessment thus aims to acknowledge the broad meaning associated with landscape in practice and academia. However, we acknowledge that there is some discretionary power in the characterization of the four aspects through items in line with the background of the researchers.

Plans take advantage of the integrative power of landscapes: Landscape is an integrative concept that was expected to be mentioned in context with many environmental and social themes such as agriculture/farming, water management, forestry, nature conservation, biodiversity, green infrastructure, resilience, sustainability/sustainable development, (landscape) aesthetics, place branding, tourism and recreation. This is recognized with the item “Thematic context”. The item “Inclusiveness” represents that a holistic perspective on landscape includes biophysical, socio-cultural and aesthetic aspects. The complexities of landscapes and the multiple meanings associated with them result in a multitude of perspectives on landscapes (Pinto-Correia & Kristensen, 2013).

If during the plan-making process a region takes advantage of the integrative power of the concept of landscape, governance processes during plan-implementation are expected to foster the interconnectedness of humans and their environment. Many different discourses and approaches provided means to use landscape’s integrative power. They are shaped by various geographical, thematic and administrative contexts and include, for example, landscape planning (e.g. Opdam, Westerink, Vos, & de Vries, 2015; Steiner, 2008), landscape sustainability science (Wu, 2013), landscape approach (e.g. Bürgi, Ali, Chowdhury, Heinimann, Hett, Kienast, Mondal, Upreti, & Verburg, 2017; Reed, Deakin, & Sunderland, 2014; Sayer, Sunderland, Ghazoul, Pfund, Sheil, Meijaard, Venter, Boedhihartono, Day, Garcia, van Oosten, & Buck, 2013), integrated landscape management (e.g. Mann, Garcia-Martin, Raymond, CShaw, & Plieninger, 2018), landscape governance (e.g. Beunen & Opdam, 2011; Leibenath & Lintz 2018; Opdam, Coninx, Dewulf, Steingröver, Vos, & van der Wal, 2016) and landscape stewardship (Beunen & Opdam, 2011; García-

Martín, Bieling, Hart, & Plieninger, 2016). One thing all of the above-mentioned approaches have in common is the focus on the participation of multiple stakeholders in collaborative efforts to develop integrated policies and plans with the purpose of achieving sustainable landscapes. These aspects were incorporated into the analysis with the items "Multiple stakeholder engagement in the landscape system", "Participatory monitoring" and "Strengthening capacity of stakeholders" in Table 1. All activities to develop integrated policies and plans are faced with the inherent uncertainty of a landscape's future (Kato & Ahern, 2008). Furthermore, planning and policy definitions must be regularly adapted to the dynamically developing landscapes. Adaptive management is a process suited to address this uncertainty as it aims to reduce uncertainty over time via systematic monitoring and subsequent adaptation of plans and policies. As adaptive management is based on a learning process, it is expected to improve long-term outcomes (Folke, 2005). This adaptive aspect was incorporated into the analysis with the item "Adaptive management" (Table 1).

Plans are based on knowledge about landscape functioning*:* Plans based on knowledge about landscape-functioning recognize that planning regions are socio-ecological systems or coupled human-environment systems. Human beings and nature interact within a landscape as part of an interconnected network and form a complex entity at the landscape scale (Antrop & van Eetvelde, 2017; Steiner, 2008). The complexity arises from cross-scale interactions, spatial heterogeneity and multiple uncertainties facing regional social-ecological systems (Hanspach, Hartel, Milcu, Mikulcak, Dorresteijn, Loos, von Wehrden, Kuemmerle, Abson, Kovács-Hostyánszki, & Báldi, 2014). Landscape can be considered as a hierarchically organized dynamic system, involving a number of subsystems. Through planning and design, these systems are intentionally altered in order to improve particular conditions that are deemed lacking (Angelstam, Andersson, Annerstedt, Axelsson, Elbakidze, Garrido, Grahn, Jönsson, Pedersen, Schlyter, Skärbäck, Smith, & Stjernquist, 2013). We recognized the key characteristics of landscape systems in our analysis with the items "Multifunctionality", "Multiple scales", "System-level resilience", "Temporal dynamics", "Landscape connectivity and fragmentation" and "Landscape structure".

Plans show the contribution of landscapes to human well-being*:* Landscapes can greatly contribute to human well-being. The most important contributions often relate to outdoor recreation (Kienast, Degenhardt, Weilenmann, Wäger, & Buchecker, 2012), and places of cultural heritage. We recognized these aspects with the items "Landscape-based recreation" and "Landscape related heritage". Additionally, community-based and collaborative landscape initiatives are activities which aim to sustain the value of landscapes and foster stewardship. They can be projects, platforms, initiatives or a set of activities that foster a broad range of landscape values (Termorshuizen & Opdam, 2009). Drawing from the recent assessment of García-Martín, Bieling, Hart, & Plieninger,

(2016), this study assessed whether or not strategic spatial plans refer to community-based landscape initiatives in terms of landscape stewardship (incorporated by the item “Landscape stewardship”). That is why the planning on all levels, including strategic spatial planning, arts.

Plans’ structural aspects reflects awareness of landscape: We further analysed which parts of the plan refer to landscape (addressed in the item “Plan section referring to landscape”. The sections in which landscape is addressed are expected to reflect the importance of landscape relative to other strategic domains. Moreover, it shows the degree an urban region seeks to manage its landscapes actively. This insight was valuable when developing recommendations for improving the role of landscape in strategic spatial planning.

182 Table 1: **Items used to assess the role of "landscape" in strategic spatial plans, justification of the use of these items, and coding categories.**

Item	Justification	Source	Coding
1. Plans take advantage of the integrative power of landscapes			
Thematic context	This assessment indicates whether landscape is perceived in broad or limited thematic contexts within the urban region.		a) Agriculture/farming b) Viticulture c) Water management d) Forestry e) Nature conservation f) Biodiversity g) Green infrastructure h) Built-up containment i) Resilience j) Sustainability/sustainable development k) (Landscape) aesthetics l) Place branding m) Tourism and recreation
Inclusiveness	Potential perspectives of landscape are biophysical, socio-cultural, aesthetic and holistic (encompassing all three mentioned perspectives). A holistic perspective is thus inclusive; the consideration of only one perspective is least inclusive.	Antrop & van Eetvelde, 2017	a) Biophysical b) Socio-cultural c) Aesthetic d) Holistic
Multiple stakeholder engagement in the landscape system	The European Landscape Convention (ELC) emphasizes the importance of multiple stakeholders in the definition and implementation of landscape policies. Different stakeholders have different values and thus multiple stakeholder engagement can frame and express goals for landscape development in different ways, stimulate complementarity in conservation activities and increase the sense of belonging.	Council of Europe, 2000; Pătru-Stupariu et al., 2016	a) Generally addressed for the entire plan b) Explicitly linked to landscape c) Not addressed at all
Participatory monitoring	To facilitate shared learning and adaptive planning, landscape-monitoring information needs to be widely accessible. Information	Mann et al., 2018; Sayer et al., 2013	a) Generally addressed for the entire plan b) Explicitly linked to landscape

	collected in participative processes ideally supplements the data collected by government entities.		c) Not addressed at all
Strengthening the capacity of stakeholders	Landscape inhabitants require the ability to participate effectively in the planning and management of their region that requires skills and events for participation at the landscape scale.	Sayer et al., 2013	a) Generally addressed for the entire plan b) Explicitly linked to landscape c) Not addressed at all
Adaptive management	Landscape processes are dynamic and adaptive management is a means to adapt to these changing conditions. Adaptive management enables people to learn from the outcomes of management strategies and thus improve future planning.	Folke et al., 2005; Pahl-Wostl, 2007; Sayer et al., 2013	a) Generally addressed for the entire plan b) Explicitly linked to landscape c) Not addressed at all
2. Plans are based on knowledge on landscape functioning			
Multifunctionality	Multifunctionality is a complex concept which refers to the fact that one particular area can serve several purposes or that an area can be comprised of several smaller areas dedicated to specific uses. Multifunctionality is most clearly expressed through the multiple ecosystem services provided by the landscape, in complex land-use forms and in land-use rights. In general, multifunctionality is often considered as positive. Maintaining or developing multifunctional landscapes can thus be seen as one of many strategies towards sustainable development at the landscape level.	Antrop & van Eetvelde, 2017; Brandt & Vejre, 2004; Haines-Young & Potschin, 2004; Hersperger et al., 2012; Vos & Meekes, 1999	a) In a general way b) With specific references regarding problems, goals, tasks c) Not addressed at all
Multiple scales	Landscape systems are hierarchically structured and scale dependent. The scales to consider are: the spatial scale (the extent or area covered), the temporal scale (i.e. years, decades or centuries) and the institutional scale (i.e. municipalities and regions). Landscape systems are best characterized on multiple scales and can be analysed through a hierarchy of nested scales.	Antrop & van Eetvelde, 2017	a) In a general way b) With specific references regarding problems, goals, tasks c) Not addressed at all
System-level resilience	Resilience refers to a system's "capacity for renewal in a dynamic environment" and can be applied to landscape systems. In the context of landscapes, the term resilience is usually used in a positive sense. However, the resilient response of landscapes is not always desirable.	Bürgi et al., 2012; Cumming, 2011; Gunderson, 2000	a) In a general way b) With specific references regarding problems, goals, tasks c) Not addressed at all

Temporal dynamics	Landscapes change continuously; temporal dynamics are therefore an essential property of landscapes: changes make landscapes. This is also recognized in the formal definition of landscape in the European Landscape Convention. Spatial planning aims to guide the temporal dynamics of landscapes and the resulting spatial patterns in land use.	Clark et al., 2003	a) In a general way b) With specific references regarding problems, goals, tasks c) Not addressed at all
Landscape connectivity and fragmentation	Connectivity is a concept in the scientific fields of landscape ecology and conservation biology, which defines the degree to which the landscape facilitates or impedes the movement of species between habitat patches. Fragmentation refers to hampering processes in the landscape, as a result of subdividing spatial units, which may become too small to function properly.	Antrop & van Eetvelde, 2017; Forman, 1995; Jongman, 2002; Merriam, 1984; Vogt et al., 2009	a) In a general way b) With specific references regarding problems, goals, tasks c) Not addressed at all
Landscape structure	The spatial configuration and composition of land-use are central aspects in the scientific field of landscape ecology. The spatial structure of the landscape interacts continuously with the ecological processes that shape it (Antrop and van Eetvelde 2017).	Bastian & Steinhardt, 2002; Forman, 1995; Turner et al., 2015	a) In a general way b) With specific references regarding problems, goals, tasks c) Not addressed at all
3. Plans show the contribution of landscapes to human well-being			
Landscape-based recreation	Recreation is one of the key services or values of landscapes in many European regions. Typical landscape related recreational activities are walking, hiking, cycling, picnicking, skiing and water sports.	Bastian & Schreiber, 1999	a) In a general way b) With specific references regarding problems, goals, tasks c) Not addressed at all
Landscape-related cultural heritage	Landscapes are important objects of our society's cultural heritage. They are part of our common heritage and integrate a variety of values, both natural and cultural.	Brandt, 2017; Palang & Fry, 2003	a) In a general way b) With specific references regarding problems, goals, tasks c) Not addressed at all
Landscape stewardship	Landscape stewardship refers to the care and maintenance of a landscape. People develop a stewardship role for landscapes and thus landscapes contribute to the formation of local cultures whilst providing ecosystem services. Community-based and collaborative landscape	Bieling & Plieninger, 2017; Garcia-Martin et al., 2016;	a) Nature conservation b) Cultural heritage c) Landscape beauty

	initiatives are a manifestation of this stewardship. These initiatives can be diverse; however, their common aim is to maintain the value of landscapes. They can comprise of projects, platforms, initiatives or a set of activities which foster a broad range of landscape values.	Termorshuizen & Opdam, 2009	d) Sense of place, place identity Social well-being e) Rural livelihood f) Regulating services g) Promotion of tourism h) Organic food production, urban agriculture or community gardens
4. Plans refer to landscape in all main sections			
Plan sections referring to landscape	Main sections of a plan are: Introduction, goals, measures. This assessment indicates if the plans regards landscape within the urban region as a background for other activities (introduction), or as a pillar for the development of the urban region (visions and goals), something that should be actively be managed (measures and policy recommendations) and monitored.		a) Introduction b) Visions and goals, key strategi domains c) Measures or policy recommendations d) Monitoring and evaluation

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3 METHOD

3.1 Selection of case studies

An assessment was conducted to identify European urban regions that have adopted or are in the process of adopting a strategic spatial plan. To refer to strategic spatial plans, urban regions used terms such as “regional plan”, “spatial development strategy”, “strategic plan” or “strategic reflection”. The strategic spatial plans were retrieved from the planning authorities’ websites. Documents addressing one policy domain, such as transport plans or climate change mitigation strategies, were not considered. From a pool of 40 possible case studies, we selected 18 European urban regions to keep the workload manageable but ensure a reliable sample. Case studies were chosen to represent countries with a long tradition in landscape planning (e.g. Germany) and countries that have advanced in this direction after the adoption of the ELC (e.g. Italy), in order to incorporate the diversity of European planning traditions (Newman & Thornley, 1996) and to include urban regions with varying geographic coverage and population sizes. The cases study regions were located in 15 countries, as presented in Table 2 and Figure 1.

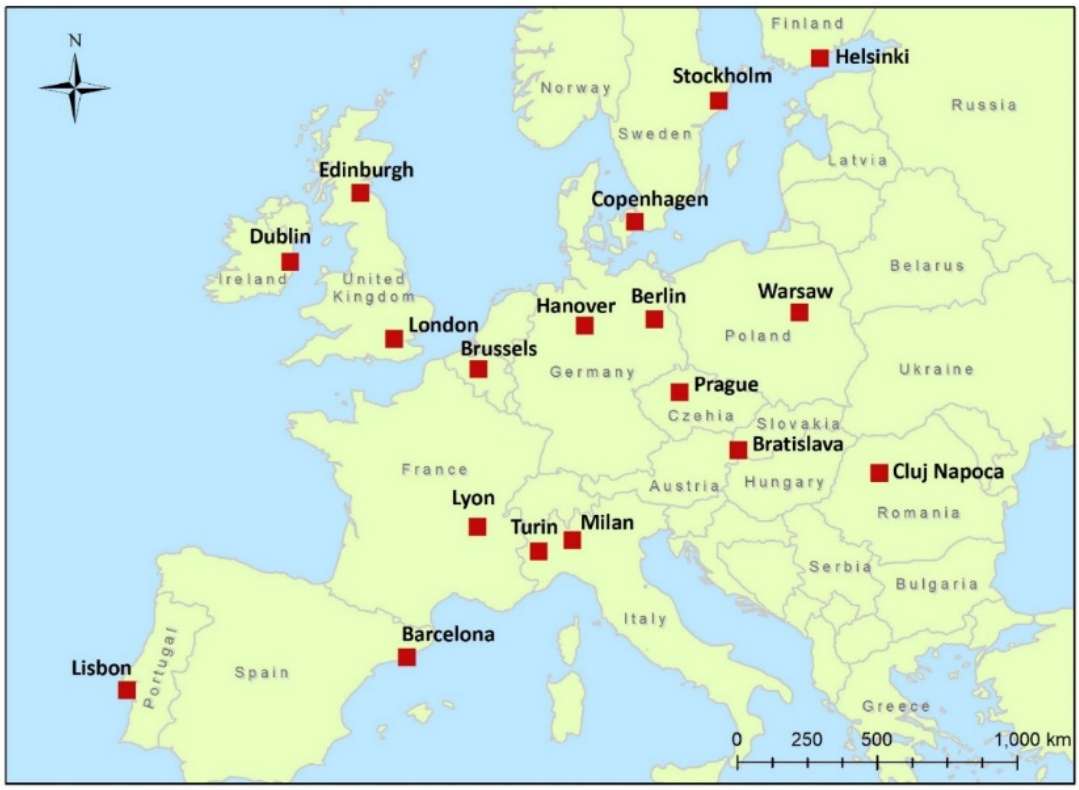

Figure 1. The locations of the 18 studied European urban regions.

202 **Table 2. Overview of the urban regions studied, plans analysed and key information of each**
203 **analysed plan.**

Urban region	Planning authority in charge of the strategic spatial plan	Analysed strategic spatial plan*	Population in millions	Area in km^2
Edinburgh and South East Scotland Region, UK	SESplan Strategic Development Planning Authority	SESplan - Strategic Development Plan (2013)	1,2	260
Greater London, UK	Greater London Authority	The London Plan - The Spatial Development Strategy for London (2015, consolidated version with alterations since 2011)	8,8	1569
Greater Dublin Area, Ireland	East and Midland Regional Assembly	Regional Planning Guidelines for The Greater Dublin Area 2010-2022 (2010)	1,3	6976
Barcelona Metropolitan Area, Spain	Metropolitan Area of Barcelona (AMB)	REM - Metropolitan strategic reflection (2015)	5,3	4268
Stockholm, Sweden	County of Stockholm	Regional development plan for the Stockholm region - RUFS 2010 (2010)	2,2	6519
Helsinki, Finland	City of Helsinki	From city to city region. City of Helsinki Strategic Spatial Plan (2009)	0,6	715
Copenhagen, Denmark	Danish Ministry of the Environment, the Danish Nature Agency	The Finger Plan: A Strategy for the Development of the Greater Copenhagen Area (2013)	2,4	2778
Berlin Brandenburg, Germany	Joint Berlin and Brandenburg Planning Department	State Development Plan Berlin-Brandenburg LEP B-B (2009)	6,0	30370
Hannover, Germany	Region Hannover	Hannover Region Planning Programme (2016)	1,1	2290
Milan, Italy	Metropolitan area of Milan	Strategic plan of the Milan metropolitan area (2016)	3,2	1575
Turin, Italy	Association Torino Internazionale	Torino Metropoli 2025. The third strategic plan of the metropolitan area of Turin (2015)	1,7	1127
Lyon, France	Union for the study and programming of the Lyon conurbation (SEPAL)	The coherence scheme of the agglomeration of Lyon 2030 - SCOT (2010)	1,5	533
Lisbon Metropolitan Area, Portugal	Lisbon Regional Coordination and Development Commission (CCDR-LVT)	PROT AML - Regional Spatial Plan for Lisbon Metropolitan Area (2010 - draft)	2,8	3015
Brussels Capital Region, Belgium	The Brussels-Capital Region	Regional Plan for Sustainable Development PRDD (2017)	1,2	161
Cluj-Napoca, Romania	Association for development of Cluj Napoca Metropolitan Area	Cluj Metropolitan Integrated strategy for 2014-2020/2030 ((2017)	2,6	1603
Bratislava, Slovakia	Bratislava Autonomous Region	Territorial plan of Bratislava Region (2013)	0.6	2053
Prague, Czech Republic	Prague city Council	Metropolitan Plan for Prague – concept (proposed 2013)	1.3	192
Warsaw, Poland	Mazowieckie Voivodship	Development Strategy of the Mazowieckie Voivodship 2030 (2014)	5,4	35579

204 *adoption year of the plan indicated in brackets

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3.2 Content analysis

Data were collected through content analysis of the strategic plans (see Hsieh & Shannon, 2005). The authors developed a protocol containing 16 questions based on the conceptualization of the four aspects and their subsequent items (for complete protocol see Appendix). Each item was recorded corresponding to the coding system in Table 1. We focussed on the textual part of the plans and used the maps and diagrams to aid analysis; however, no systematic analysis of the graphical parts of the plans were performed.

To understand the terminology used in each plan and obtain information on the planning context, the authors consulted the planning authorities' official websites as well as additional planning documents, such as technical notes and implementation guidelines. The analysis was conducted in English. For plans in foreign languages lacking an English version, the authors translated the plan, consulting the English summary if available or consulting with native speakers during the analysis.

In order to determine whether the results for each entry point and item were sufficiently reliable, a second person was trained to perform a repeated coding of a sample consisting of five plans (30% of the total). Inter-coder reliability was determined by calculating Cohen's Kappa, a measure designed for categorical variables. Kappa values range from −1 to 1, where 1 indicates perfect agreement, 0 indicates completely random agreement and −1 indicates full disagreement. We calculated Kappa for each question in the protocol and reported the average values for the whole sample and per entry point. Values between 0.61 and 0.80 were interpreted as substantial agreement, while values over 0.81 were considered as perfect or almost perfect agreement (Hallgren, 2012). Results of the inter-coder reliability assessment showed substantial agreement between the two coders, with a Kappa value of 0.79 for the tested plans. A substantial agreement (Kappa = 0.69) was reached for items addressing how plans take advantage of the integrative power of landscape and items addressing how plans are based on knowledge on landscape functioning (Kappa =0.7), while an almost perfect agreement was reached on items addressing the contribution of landscapes to human well-being (Kappa = 0.9) and on which plan sections address landscape (kappa = 0.85).

4 RESULTS

The content analysis showed that although strategic spatial plans generally focus on economic development, built areas for housing and economic activities and transport, all plans explicitly referred to landscape. Similarities in how landscape was addressed was observed among urban regions with historical ties. For example, landscape was addressed in the context of a "territorial

system of ecological stability" in both the Czech Republic and Slovakia. Other commonalities resulted with similar instruments to protect open landscapes and green spaces: for example, "green belts" are used in Edinburgh, Hannover and Prague. Nordic and Eastern European countries appeared to pay particular attention to landscapes in terms of their contribution to fostering touristic potential and recreational opportunities.

4.1. Plans take advantage of the integrative power of landscapes

Landscape issues were mainly addressed in the context of green infrastructure, cultural heritage, tourism and recreation (Figure 2). The plans mentioned the capacity of green infrastructure to enhance the landscape setting, support the creation of "landscape corridors" and increase landscape structural functions. Plans also mentioned how green infrastructure can facilitate recreational activities, particularly when addressed in an integrated manner together with cultural heritage. Interestingly, landscape was mentioned in the context of sustainability in less than half of the plans and not mentioned at all in the context of resilience. However, resilience as a theme was either neglected in the plans or mentioned in specific non-landscape related contexts e.g. economy or transport networks. Only very few plans addressed landscape in the context of forestry and place branding. Furthermore, we observed that several themes were often addressed in together, e.g. biodiversity, nature conservation and green infrastructure (see connecting lines in Figure 2). In addition, when landscape was mentioned in the context of water management, it was always addressed in association with green and blue infrastructure and not in regard to other water management aspects, such as flood control.

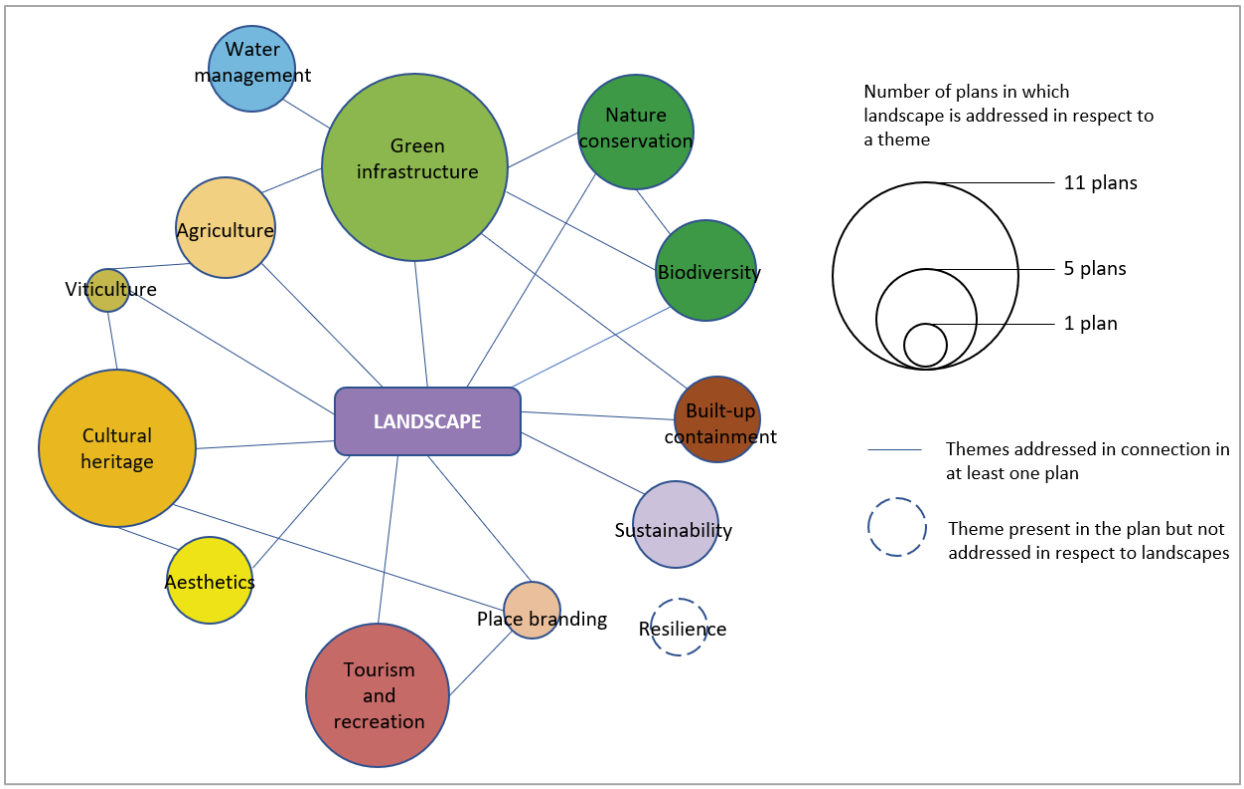

Figure 2. Thematic context in which landscape is addressed

As far as inclusiveness is concerned, the evaluation showed that half of the plans took a holistic perspective on landscapes (Table 3). In such plans, inclusiveness was reflected in the detailed consideration of biophysical aspects, social values, cultural heritage and aesthetic connotations. In some plans, a holistic perspective was created by bridging strategic domains linked to the economic development of the urban region, such as the valorisation of cultural heritage and touristic potential, alongside environmental protection and recreation. Five plans adopted a socio-cultural approach to landscapes, particularly addressing cultural landscapes, heritage and the importance of landscape in identity building. Furthermore, with the exception of the strategic plan for Warsaw, which emphasizes the socio-cultural dimension, we observed that all plans with a holistic understanding of landscapes use the ELC as a frame of reference. However, overall, only six plans referred to the ELC. The plans that adopted a biophysical perspective tended to have a stronger link to the legal framework on nature conservation, environmental protection and environmental impact assessments or they reflected strong consideration for the spatial aspects of land uses. Only two plans referred to the aesthetic aspects of landscapes by addressing aspects of cityscape and urban design, or by allocating a particular importance to the scenic character.

Table 3. Perspectives on landscape in the analysed regions.

Perspective	Holistic	Socio-cultural	Biophysical	Aesthetic

Case study	Lisbon, Dublin, London, Copenhagen, Stockholm, Hannover, Brussels, Lyon, Bratislava	Milan, Turin, Helsinki, Berlin, Warsaw	Barcelona, Edinburgh, Cluj-Napoca, Prague	Helsinki, Edinburgh

Overall, few plans took advantage of the integrative power of landscapes in governance processes (Figure 3). The engagement of multiple stakeholders in collaborative efforts was the most referenced governance aspect. However, only the plans of Lisbon, Turin, London and Copenhagen provide details on past, existing or future involvement of stakeholders in fulfilling landscape visions. Adaptive management was reflected by references to progress in the implementation of previous plans and experience gained from this process and by examples of how landscape governance has improved through the creation of dedicated agencies. Only the plan of Turin focuses on strengthening the capacity of stakeholders, by creating a formal means of integration, while adaptive management was encouraged only in the plan of Milan through the adoption of collaboration and participatory practices.

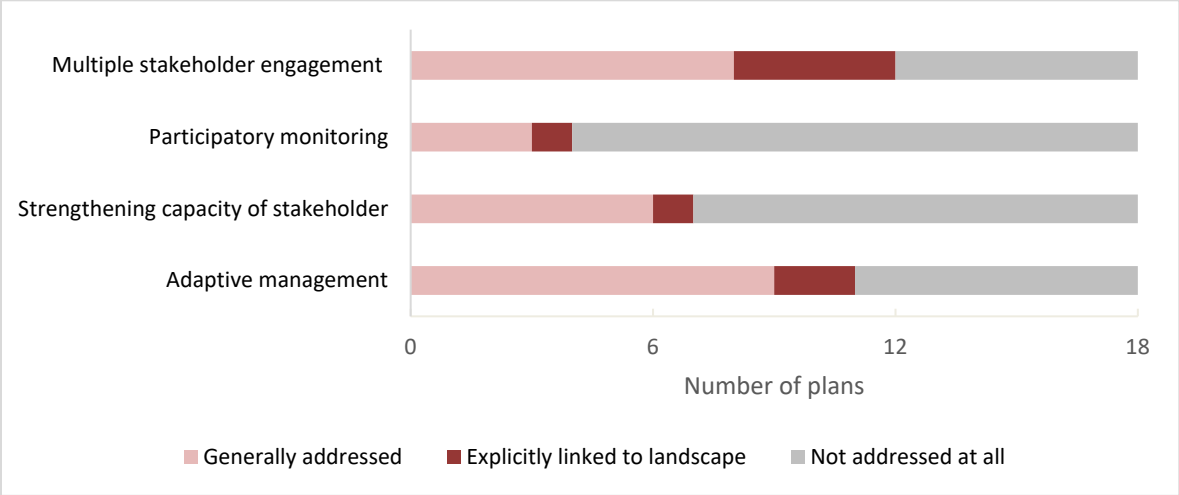

Figure 3. How plans take advantage of the integrative power of landscapes in governance

4.2. Plans are based on knowledge on landscape functioning

About half the plans are based on knowledge about landscape functioning, as measured with the respective items (Figure 4). Landscape connectivity and fragmentation were most widely addressed, with strategic plans treating them in problems, goals and tasks. Many plans aimed at increasing

connectivity for humans through walking and cycling paths. Designing landscape corridors was considered a way to assure ecological connectivity and mitigate habitat fragmentation. However, less than half of the plans accounted for landscape structure, particularly in qualitative ways (e.g. indicators, metrics). Multifunctionality also played an important role in the plans. As competition for space is high in urban regions, plans promote landscapes that deliver a range of economic (tourism), social (recreation, quality of life) and environmental benefits (climate change amelioration). Plans addressed the multiple scales, by focussing on the multiple institutional scales involved in planning the landscape. Most strategic plans provided recommendations for the local level, but some of them also made reference to national landscape objectives. However, temporal and spatial scales were not explicitly mentioned in the sampled plans. Temporal dynamics, although acknowledged by the majority of plans (Figure 4), was addressed as in respect to problems, goals, and tasks in only 5 out of 18 plans. Landscape temporal dynamics was addressed in respect to the conservation of historic landscapes and guiding the development of built-up areas. System level resilience was the least often mentioned landscape functioning characteristic, only briefly mentioned in three plans. Landscape resilience was understood in these plans as a means to increase the general resilience and habitability of the metropolitan area, or as a way of maintaining or increasing a habitat's resilience to climate change impacts.

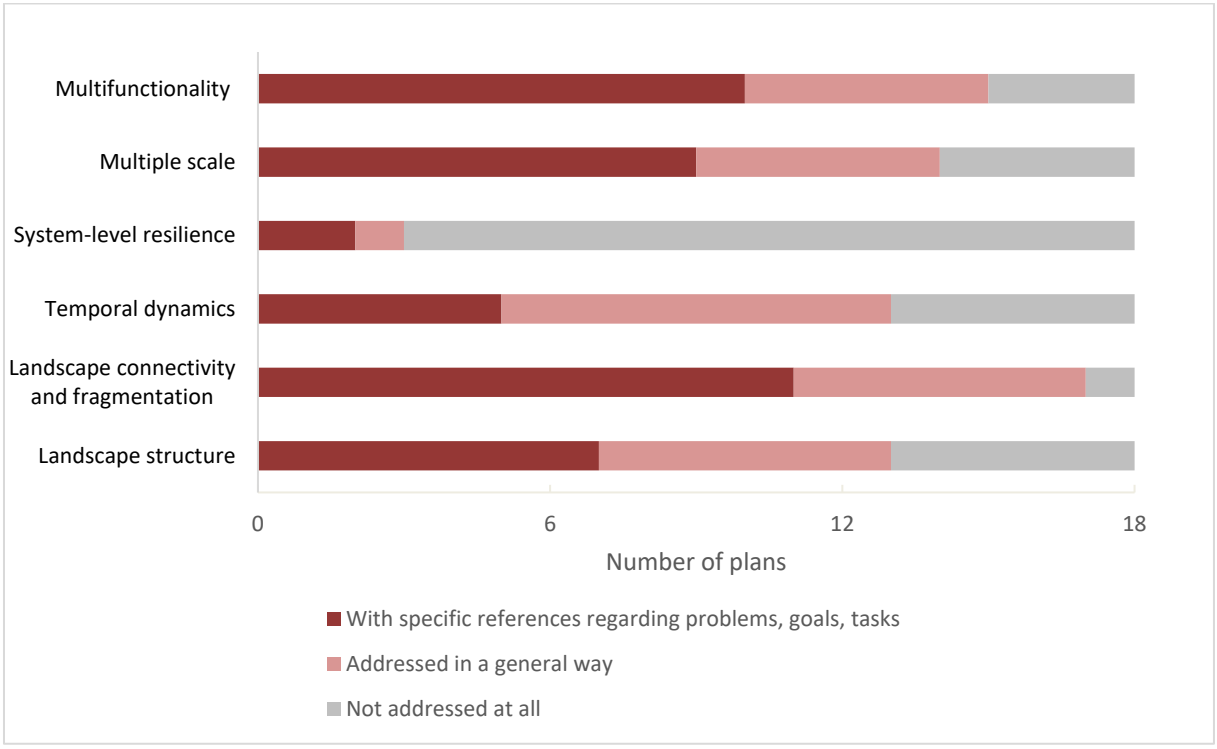

Figure 4. Aspects of landscape functioning accounted for by the plans

4.3. Plans show the contribution of landscapes to human well-being

The most emphasized contribution to human well-being was the landscape`s use as places of recreation, with plans containing specific goals, objectives and measures to address recreation (Figure 5). Plans also addressed landscape-related cultural heritage, for example, by including specific measures to recognize the importance of archaeological features at the landscape level or to maintain and restore registered historic parks and gardens.

Only four of the 18 plans referred to community-based landscape initiatives: one plan referred to an existing initiative and three plans mentioned future ones. The main aims of the planned initiatives were nature conservation (three plans), cultural heritage (two plans), the promotion of tourism (one plan) and regional and organic food production (one plan). For example, in the plan of Lisbon, three of the future measures regarding landscape issues were: (1) ensuring the collaboration of local communities in initiatives for nature conservation and heritage protection; (2) promoting strategic partnerships with public or private entities designed to capture support, sponsorship or funding for the management of protected areas; and (3) equipping secondary areas of the metropolitan ecological network with recreational infrastructure.

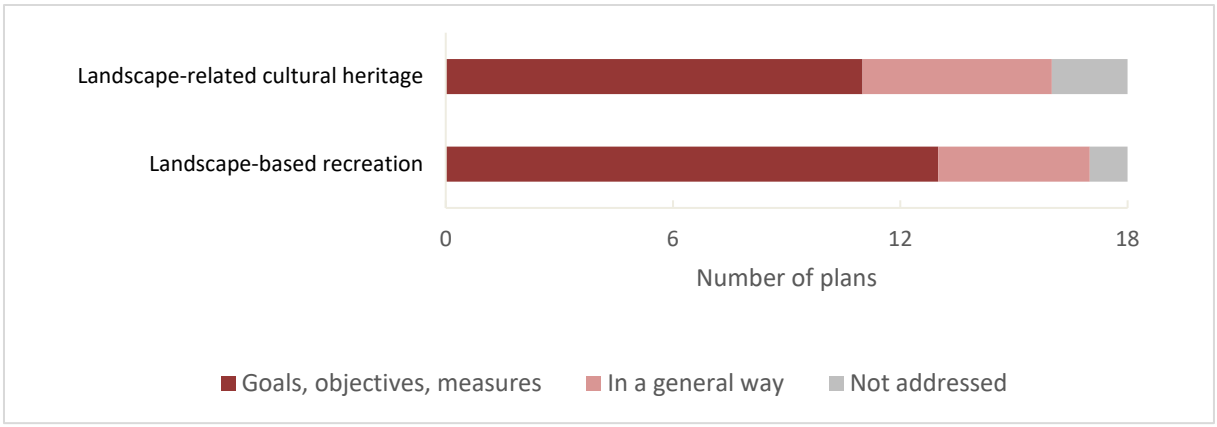

Figure 5. The perspectives on landscapes and how they were considered in strategic plans.

4.4. Plans refer to landscape in all main sections

Plans vary in organization and the way they approach landscape, ranging from well-structured plans with extensive sections dedicated to landscape assessments and planning (such as Dublin) to rather short plans (50 pages), which seldom refer to landscape. Plans that were specifically designed to provide a territorial development model for the urban region tended to address landscape issues in a more systematic way (e.g. with dedicated sub-chapters).

Half of the plans referred to “landscape” in the urban region’s visions, goals, or key strategic domains. For example, in the plan for Brussels, strengthening the natural landscape is one of eight strategic goals in fulfilling the vision of a sustainable and attractive urban environment (Brussels

Capital Region, 2017, p 65), while the plan for Helsinki mentions that the "preservation of natural diversity and cultural landscape" would be a key feature of the plan (City of Helsinki, 2009, p. 33). Most plans addressed landscape issues in the measures and policy recommendations sections (70% of the plans). Plans had targeted policies on, for example, the preservation of historic landscapes, the prevention of excessive suburbanization to reduce pressure on open landscapes, or included recommendations on landscape classification and character assessments. Landscape monitoring or evaluation using indicators or metrics was rare, as only four plans explicitly proposed such assessments (Lisbon, Dublin, London and Lyon).

Often, the same plan referred to landscape in multiple ways, a fact that can lead to inconsistency. Specifically, we found that a mix of terms and concepts implemented in plans can lead to a situation in which the role of landscape is somewhat hidden, hindering a stringent landscape agenda.

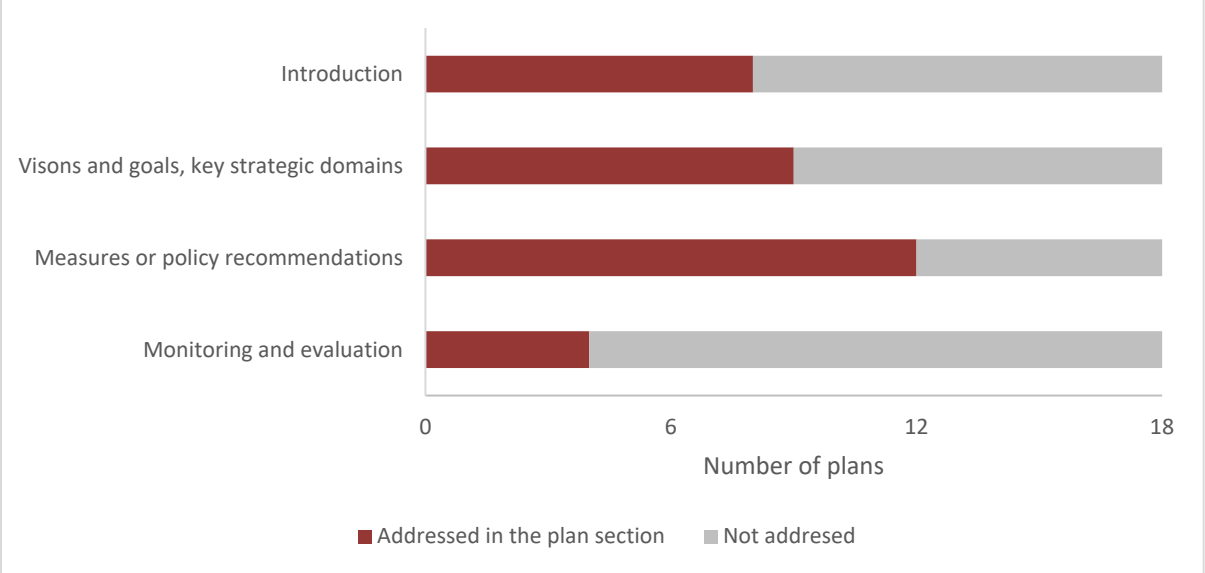

Figure 6. Plan sections in which landscape is addressed

5 DISCUSSION

The analysis of the plans shows that in the 18 European urban regions, landscape science contributes considerably to strategic planning. As shown by our study, most of the strategic plans of European urban regions are based on knowledge about landscape functioning, show the contribution of landscapes to human well-being, and use the integrative power of landscapes in bridging planning issues and perspectives**.** However, only few use the full potential of the integrative power of landscapes in terms of governance processes. Many plans integrated a holistic approach towards landscapes, but surprisingly only a third referred to the ELC. Generally, the plans had a strong anthropocentric perspective and focussed on human uses of the environment. Few community-

based landscape initiatives were mentioned, which may be due to the fact that these initiatives are a rather recent phenomenon or that they are local and small and thus do not appear in strategic plans. Our findings contrast with Trammell et al. (2018), who studied two landscape plans in the US and found that connectivity and fragmentation were reflected less frequently than multi-scale perspectives. Our findings might reflect the European context, where fragmentation and connectivity are subject to multi-level policies on landscape and biodiversity conservation (e.g. ELC, EU Biodiversity Strategy 2020). However, our findings concur with Termorshuizen, Opdam and van den Brink (2007) who found little awareness for quantitative aspects regarding land-use configuration, connectivity and fragmentation.

Our analysis reveals that green infrastructure plays an important role in an urban regions' landscape planning. It is common to include natural aspects within the concept of green infrastructure in the strategic planning of European cities (Davies & Lafortezza, 2017; Gradinaru & Hersperger, 2018). Studies suggest that the concepts of green infrastructure and multifunctional landscapes emphasize both the generation and delivery of landscape services to urban residents (Albert & von Haaren, 2017). Furthermore, the green infrastructure concept seems to facilitate a stronger link to economic aspects (Thomas & Littlewood, 2010), thus providing an attractive approach to combine green and environmental considerations with development aspirations in strategic spatial plans.

Some differences in the role that landscape played in strategic planning for urban regions could be linked to their history of landscape planning. Differences were observed in the emphasis on aesthetic aspects and cultural heritage in Italy, traditional agricultural cultivation in Germany and on nature areas in Nordic countries. Some plans explicitly referred to similarities between national landscape-characterization approaches and the ELC, i.e. in the context of landscape classifications (i.e. Sweden) and character assessments (i.e. Ireland, United Kingdom).

The evaluation framework and method of content analysis used in this study can easily be implemented for plans worldwide. The plans assessed in this study were written in different languages, but this small challenge did not hinder the present assessment. The different connotations landscape has in different cultural contexts should however be considered in future research. Landscapes can, for example, be scenery, refer to background-settings for the development of human activities, be the result of relationships established over time between natural and human factors or refer to settings outside the built environment, such as the countryside or recreation areas. When such aspects are taken into account, the authors consider the framework and method as suitable to assess strategic plans worldwide.

Whether the findings for the European urban regions assessed in this study can be transferred to a global perspective remains an open question and an area for further research. Urban regions worldwide differ in cultural, environmental and institutional contexts and this requires context-specific strategic planning responses. However, recent studies pointed out a possible convergence of themes in strategic spatial planning (Elinbaum & Galland, 2016). We therefore expect that plans from outside of Europe are similar to European plans in terms of a strong anthropocentric perspective on landscapes, the focus on human uses of the environment and the connection of landscape with green infrastructure, cultural heritage and tourism.

Some urban regions might engage in additional activities to plan for landscapes, such as landscape planning or comprehensive planning (Bjärstig et al. 2018). In this case, the evaluation should not be interpreted as a ranking of the urban regions, but as an assessment of the practice as represented in the studied strategic plans. Landscape planning (e.g. Selman, 2012; Steiner, 2008) is practiced in many regions and pursues similar goals to strategic spatial planning insofar as it is an integrated, collaborative practice carried out on a similar scale (i.e. the region). It differs from strategic spatial planning since its focus is often on rural areas or open landscapes, where conflicts between agricultural production and nature conservation, renewable energy production and aesthetics or agricultural abandonment, sprawl and recreational landscape values dominate (Mann et al., 2018). Landscape planning greatly varies from place to place and can be institutionalized (e.g. Germany), can provide an input into regional planning and strategic spatial planning (e.g. Switzerland), can be conducted as an ad hoc initiative (e.g. USA) or be largely absent (e.g. Romania). It is crucial to integrate all of these landscape-planning activities into strategic spatial plans.

Based on our analysis of the role of landscape in the strategic plans of 18 European urban regions we suggest some general recommendations, which aim to strengthen nature-related aspects in strategic spatial planning. A clear definition of landscape would provide a solid starting point, especially because strategic spatial plans generally serve planners and politicians in their deliberations and negotiations and they tend to have limited expertise in the fields of landscape and environmental science. Furthermore, building the vision and strategies around the regional landscapes is expected to be more promising than referring to landscapes only in specific measures. The items of the framework (Table 1) can serve as a general guideline for strengthening nature-related aspects in strategic spatial planning. More generally, we suggest that strategic spatial plans worldwide should refer to relevant higher-level concepts and conventions, which foster a landscape perspective. As strategic spatial planning is a strongly context-dependent and site-specific activity an appropriate

perspective, whether biophysical, socio-cultural, aesthetic or holistic, should be selected depending on the situation. The perspective should take into account the social, cultural and institutional context of the region, the objectives pursued by the plan, the legal framework and the complementary environmental and landscape planning instruments. We propose that all themes relevant for the human-environment context in a planning region should be linked to landscapes. Whereas recreation, tourism and cultural heritage are topics commonly connected to landscapes, the role of landscape in improving sustainability and resilience should be addressed to improve the plans. Natural landscapes, for example, could play a role in resilience to climate change. We further recommend that all European urban regions develop a link to the ELC particularly as it encourages a focus on both the quantitative and qualitative aspects of landscapes. Landscape evaluation and monitoring could also benefit from innovative qualitative and quantitative landscape indicators. We recommend that the capacities of interest groups be taken into account, e.g. through participatory monitoring.

Our analysis shows that future research is necessary in several areas: (1) plan-evaluation research is required to identify shortcomings and potentials in terms of how landscape science can best contribute to other types of plans (such as land-use plans, comprehensive plans and climate adaptation plans) and in other locations. In addition (2), the review of good practice examples of strategic spatial plans with exemplary application to landscape science is necessary. This could serve as a basis for an urgently needed list of recommendations for planning practice. Therein (3), the role of landscapes as meeting point for various actors in collaborative planning practices should be emphasized. Other authors have already recognised investigating the role and impact of scientific knowledge in landscape planning as a research priority (e.g. Beunen & Opdam, 2011; Yli-Peltonen & Niemalä, 2006). Since plans hold a key position in urban regions' strategic planning (Hersperger, Oliveira, Pagliarin, Palka, Verburg, Bolliger, & Grădinaru, 2018; Oliveira & Hersperger, 2018b), it is fundamental to (4) understand the use of landscape science in the preparation of plans. Furthermore, it is crucial to (5) address the entire planning process, i.e. to collect evidence on how landscape-related arguments are used in negotiations during plan-making and plan-implementation, as well as how key actors, including scientists, operate and perform during the planning process to support landscape issues. Performance and conformance evaluation research in planning, though very challenging, has gained increasing attention in recent years. For example, a study on German landscape planning indicates that key actors were crucial for the implementation of high numbers of landscape measures (Wende et al., 2012) and the usefulness of indicators has also been explored (see, for example, Gradinaru et al., 2017; Hersperger, Mueller, Knöpfel, Siegfried, & Kienast, 2017; Wende & Walz, 2017).

5 CONCLUSIONS

Landscape science can contribute to spatial planning in general, and strategic spatial planning in particular, by providing an overarching perspective that accounts not only for natural-ecological characteristics of a landscape, but also its socio-cultural identity and sense of place. Current developments in strategic spatial planning provide opportunities for landscape science: as the practice of strategic spatial planning is maturing (Albrechts, Balducci, & Hillier, 2017), environmental aspects are increasingly acknowledged as core resources for attracting and supporting the knowledge economy. Regions are planning and governing their territory with institutionalized procedures and ongoing activities. Many regions also refer to landscape quality as a component of region branding. Within these activities, landscape science should be recognised and have its place.

An important step towards improving the contribution of landscape science to strategic planning should be taken by raising awareness of the potential outside the landscape planning community. This is particularly relevant for countries that do not have a tradition in landscape planning and are in search for tools to address the social and environmental challenges of the Anthropocene in strategic and comprehensive planning. Books, articles and policy briefs that inform planners and policy makers about the potential of landscape science and show with best practice examples how planning processes and plans can benefit from landscape science could be particularly useful.

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