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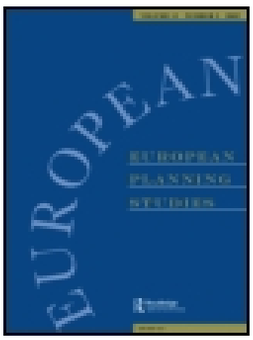

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Strategic spatial planning and efficacy: an analytic hierarchy process (AHP) approach in Lyon and Copenhagen

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ABSTRACT

Strategic spatial planning has been a key planning practice at the urban regional level to support the implementation of local spatial transformations. Previously, qualitative comparative research has revealed the complexity that characterizes strategic spatial planning processes; it is multi-faceted, highly context-dependent and embedded in multi-level governance configurations. However, to date, little effort has been made to quantitatively evaluate the 'planning efficacy' of strategic spatial planning processes comparatively, i.e. to investigate the extent to which strategic spatial plans facilitate or hinder the local implementation of concrete development strategies in different contexts. In this paper, we evaluate the planning efficacy of strategic spatial planning processes by applying the Analytic Hierarchy Process (AHP) in the urban regions of Lyon, France and Copenhagen, Denmark. Analytically, we employ a set of components capturing the governance performance and the impact of external forces that are assumed to contextually influence the efficacy of strategic planning. Our analysis shows that a quantitative approach such as the AHP, is a useful way to compare strategic spatial planning across urban regions.

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Strategic spatial planning; analytic hierarchy process; governance; external forces; spatial planning comparison

1. Introduction

Studies have shown the benefits of comparative research in the field of spatial planning, in particular in understanding the underlying mechanisms in plan-making and plan-implementation (Booth et al. 2007; CEC 1997; Nadin and Stead 2008; Thornley and Newman 1996). Such research has generally been conducted at the national level, focusing on legal and administrative aspects (Reimer and Blotevogel 2012; Reimer, Getimis, and Blotevogel 2014). Other comparative studies have been carried out at the metropolitan level (Elinbaum and Galland 2016; Pagliarin 2018; Pagliarin, Hersperger, and Rihoux 2019) and have shown the importance of the local context for analysing the efficacy of spatial policies (Sykes 2008). Other studies stress the need to develop multi-scale approaches to understanding strategic planning processes in a wider perspective

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(Getimis 2012). However, comparative studies of strategic spatial planning processes at the urban regional level remain scarce.

We define strategic spatial planning as a process by which various actors, such as private groups, citizens and non-governmental organizations, in various institutional settings, come together to prepare strategic plans and develop strategies to support the formulation and implementation of spatial transformation (Albrechts 2004; Albrechts, Balducci, and Hillier 2017; Amin and Thrift 1995; Clifford and Tewdwr-Jones 2013; Healey 2009). Strategic spatial planning therefore develops visions and strategic actions on selected topics, such as new housing settlements, improvement of the transportation network and preservation and expansion of green infrastructures (Hersperger et al. 2019). Strategic planning is a complex process characterized by a myriad of financial mechanisms, negotiations among public and private stakeholders, political leadership, governance arrangements and external forces, and it is supported by a plan (Albrechts 2010; Albrechts and Balducci 2013; Oliveira and Hersperger 2018; Smith 2018). The analysis of the strategic spatial planning processes thus requires a thorough understanding of all its multiple facets and must take the social, economic, socio-political and institutional contexts into account (Ogilvy 2002; Oliveira 2016; Othengrafen 2010).

In this paper, we specifically focus on the concept of 'planning efficacy' in/of strategic spatial planning processes. Drawing from the seminal work by Faludi (1973) '*A Reader in Planning Theory*' who argues that '[i]n a world of scarcity there is a need to conserve resources and also to allocate them in an efficient manner' (1973, 14), and in the same vein as Jullien (2004) who considers that planning efficacy navigates through a necessary process of modelling and plan-making to deal with pre-established goals, we define planning efficacy as the ability of actors in an urban region to pursue their strategic planning goals and development strategies in a social, ecological and economically sustainable manner. Thus, planning efficacy represents the means of reducing the consumption of scarce resources such as land, minimizing waste production or producing the greatest return from employment of natural resources.

Furthermore, Balducci (2010) argues that '[t]he efficacy of strategic planning in fact has to deal with dimensions that aredifficult to verify and quantify, as the changes in actors' behaviours, trust, attitude to cooperation, density of network and complexity of projects and issue afforded. Additionally, Dente (2007) stresses that governance is at stake and is the filtering concept for the evaluation of the efficacy of a spatial plan.

The challenge in comparing the efficacy of planning processes across urban regions lies in their complexity and in the diversity of the pursued and often competing goals. In addition, and due to its context-sensitivity, strategic planning processes require discussions within the specific local conditions in which they have taken place. Strategic planning processes must be examined based on an in-depth analysis and evaluation of the local context in which they have been implemented (Albrechts 2004; Fedeli 2017).

In this paper, we develop a quantitative approach for comparing strategic spatial planning processes in the urban regions of Lyon and Copenhagen, based on multi-criteria evaluation (Coutinho-Rodrigues, Simão, and Antunes 2011; do Carmo Giordano and Riedel 2008: Nijkamp, Rietveld, and Voogd 1990). Several multi-criteria evaluation methods exist, such as ELECTRE-TRI (Chakhar et al. 2005; Joerin, Thériault, and Musy 2001), Ordered Weighted Averaging (Makropoulos and Butler 2006; Malczewski

2006), Compromise Programming (Baja, Chapman, and Dragovich 2007), Objective Programming (Janssen et al. 2008) and the Analytic Hierarchy Process or AHP (Saaty 1980). Among these methods, Saaty's (1980) AHP seems suited for comparing strategic planning processes at the urban regional level. Specifically, the AHP has been used for analysing the purpose of spatial planning (Donevska et al. 2012; Rahman and Saha 2008). It has also been used for assessing the planning process, including collegial decision-making (Saaty 1989), mitigating land-use conflicts (Tudor et al. 2014), used as a planning performance tool (Ngai and Chan 2005), or to assess the planning process (Frei and Harker 1999; Osuna and Aranda 2007).

We deem the AHP suitable to examine a complex 'object' such as planning efficacy of strategic planning processes as it can be decomposed into a set of analytical items. Operationally, these items can be grouped and linked together, and individually assessed by experts. Moreover, existing literature can guide the decomposition of the planning process. Thus, whilst methods such as the structured interview provide very detailed information on each item, synthesizing the knowledge in terms of weight of items and strength of links is complicated and the interviewer must produce the synthesis afterwards. In the AHP, these links are constructed beforehand in the hierarchical schema, which can take an analytical form as in this paper.

In the following sections, we will first present the case studies. We will then explain how we applied AHP from the making of the hierarchical schema to the data processing. This is followed by the presentation of the findings on the implementation of the AHP. Finally, we will discuss and draw conclusions on the interest in and limits of the AHP for spatial planning research.

2. Case studies

We chose to compare the urban regions of Lyon and Copenhagen because they are similar in size (about 1.8 million inhabitants and 34 municipalities in Copenhagen, see Galland and Elinbaum 2015, and approximately 1.4 million inhabitants spread over 59 municipalities in Lyon). In both urban regions, actors have based their development vision at the urban regional level on a strategic planning document. Copenhagen's strategic spatial plan is the Fingerplan, the first version of which was produced by the Secretariat for Spatial Planning (or *Egnsplansekretariatet*) in 1947 (Palka et al. 2018). This document has been updated several times and the latest revisions were made in 2013 and 2016. After the 1992 Planning Act, regional authorities have been in charge of issuing strategic spatial plans. From 2007 to 2015, the implementation and enforcement of the plan was carried out by the Danish Ministry of the Environment. Since 2015 it has been under the control of the Danish Business Authority's planning service, a national government service (see also Oliveira and Hersperger 2018). The strategic planning strategy for the Lyon urban region is detailed in the document *SCOT 2030 Agglomération lyonnaise* published in 2010 which is an update of the former 1992 Greater Lyon Strategic Land Use Plan. The SCOT 2030 plan has been drawn up and is monitored by a local government association, the Lyon Urban Planning Agency (SEPAL), whose council is composed of elected representatives from local entities (Lyon Urban Region/Grand Lyon, Communities of Communes bordering Grand Lyon in the Auvergne-Rhones-Alpes Region).

However, the evolution of the planning competencies related to strategic planning has developed in opposite directions in these two urban regions. In the Lyon urban region, the 1982 Decentralization Acts marked a shift in the administrative organization of the French planning system. Since this date, urban regional authorities have been granted more power, moving from top-down strategic planning carried out by the French central government, to planning development lead by local actors at the regional and city level (Healey et al. 1999).

3. Methods

The Analytic Hierarchy Process (AHP) is a three-step structured technique for organizing and analysing complex decision situations and processes. The steps taken in the present study were: (1) constructing a hierarchical schema based on a generalized understanding of strategic spatial planning derived from the analysis of planning practices across European urban regions (Hersperger et al. 2018; Hersperger et al. 2019), (2) collecting data on the strengths and weights of items that form the hierarchical schema, (3) calculating the scores of the object under study. Each step is detailed in the following subsections.

3.1. Building the hierarchical schema as an analytical tool

The hierarchical schema was designed to be an analytical model of planning efficacy. Planning efficacy refers to the likelihood of the strategic spatial plan being implemented, given the entanglements of the planning process with its legal context, stakeholder constellations and their relationships. In identifying the set of components that form the AHP model, we follow Hersperger et al. (2018), who identify territorial governance and external forces as key factors for plan-making and plan-implementation in strategic spatial planning processes. In this study, the assessment and comparison of planning efficacy in the selected cases was first analytically divided into the sub-processes of (i) governance and (ii) external forces. This facilitated the analysis as it differentiated the impact of the endogenous elements of the urban region – hereafter referred to as governance performance – from the impact of the exogenous elements of the urban region – hereafter referred to as external forces.

Governance performance (Figure 1) spans the entire planning process and identifies how the strategic plan (represented by the item [plan] in Figure 1) supports governance actors in implementing the plan (see Faludi 2000). Governance performance was simplified into a linear process consisting of two main steps: plan-making and plan-implementation as described in Hersperger et al. (2018). In the presented hierarchical schema, the governance configuration during plan-making and plan-implementation are assumed to influence the likelihood of the implementation of the strategic plan according to the development strategies stated in the plan, i.e. its efficacy. Plan-making and plan-implementation involve stakeholders' dynamics and are shaped by procedures and constraints (Oliveira and Hersperger 2018; 2019). Planning experience, coordination and negotiation among actors are all essential to successfully carry out plan-making (shown in the upper part of the Figure 1). Previous studies highlight that the involvement of a regional leader is key in steering the plan-making phase and coordinating the actors involved. These actors

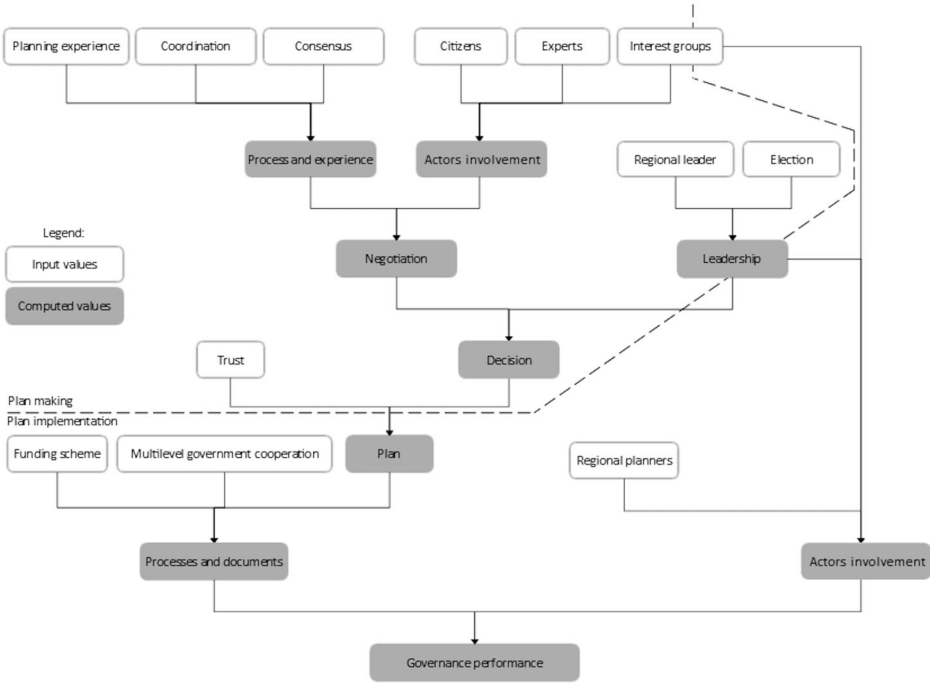

Figure 1. The hierarchical schema of governance performance for plan-making (shown above the dashed line) and plan-implementation (shown below the dashed line). White boxes (hereafter called primary items) refer to items for which the values were gathered using a questionnaire; grey boxes (hereafter non-primary items) refer to items for which the values were computed. In the paper, terms in square brackets refer to the items.

include citizens, experts (from academia, housing, transportation, nature conservation) and interest groups (private firms, associations, real estate companies). In the plan-implementation phase, funding mechanisms are vital, as is the multi-level cooperation needed to distribute resources (for example, between municipalities), where the regional organization and other administrative actors play a role. Regional planners and interest groups (real estate companies, private firms, etc.), supported by the key role of a (political) leadership figure at the regional level, are all major players that contribute to the implementation of the strategic plan (shown in the lower part of Figure 1).

The relative impact of a set of external forces is shown in Figure 2. The main external forces that influence strategic spatial planning and contribute to planning efficacy are: national planning regulations, the devolution of spatial planning competences, political cooperation between the urban region and the national state, the role of national and/or international private actors, economic/resource competition with other urban regions and socio-environmental concerns (see also Hersperger et al. 2019; 2018). External forces can affect the content of strategic spatial plans and can facilitate or hinder the likelihood of their implementation according to the content of the plan. Because strategic spatial planning processes do not occur in urban regions disconnected from their social, economic, cultural and political context, some items included in external forces are similar to items representing governance performance.

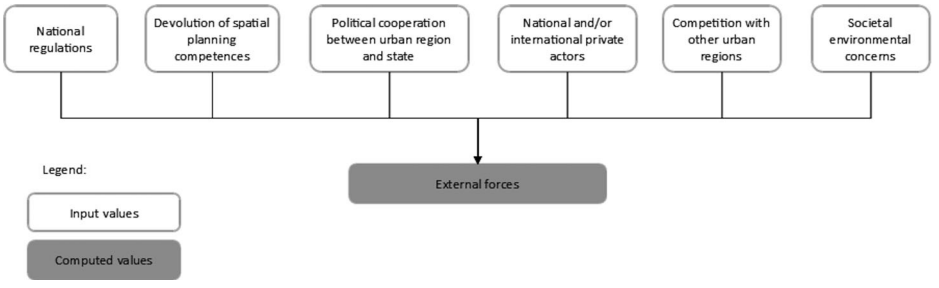

Figure 2. The hierarchical schema of the impact of external forces. White boxes (hereafter called primary items) refer to items for which the values were gathered using a questionnaire; grey boxes (hereafter non-primary items) refer to items for which the values were computed. In the paper, terms in square brackets refer to the items.

By explicitly following on from Hersperger et al. (2019), we assume that external forces are represented by three main aspects influencing the likelihood that the strategic spatial plans will be implemented in a certain urban region according to the planned development strategies included in the plan: (1) national planning regulations and distribution of planning competences, (2) interactions between actors outside the urban region, (3) economic and social context.

First, national planning regulations are key because they structure a frame of distribution of spatial planning competences across subnational administrative levels (regional governments, urban regional authorities, local authorities). Such distribution of competencies can at times be coupled with planning documents on development visions at the national level. The effect of national planning regulations is mediated, as it is possibly best appreciated in the case of national landscape regulations. As these are usually part of the devolution of competences to regional governments or authorities, national regulations on landscape protection pose strict constraints on local actors regarding decisions about local development, for instance, preventing urban land-use transformations in a municipality because of environmental protection. We expect that national regulations influence the likelihood that strategic spatial plans are implemented according to the stated development strategies in two main ways: if a pool of local projects exists that is also considered to be key/strategic at the national level (e.g. in national planning documents or development strategies), and if these key projects are also included in regional strategic spatial plans, then actors at the national level might support the implementation of these projects (e.g. through funding and ad hoc decrees).

Second, with regard to the interactions between actors outside the urban region, we expect that the degree of cooperation between regional and local actors and actors 'outside' the urban region, such as actors at the international level, can positively affect planning efficacy. More specifically, if cooperation across actors exists (e.g. cooperation between national and urban region actors along or across political affiliation), stronger support for the planned developments in the urban region will also occur. In this second aspect, we also included the role of international private actors, whose strategies and interests might collide with the local development envisioned by actors in the strategic spatial plan, hence reducing its planning efficacy. In turn, their interests might be in

line with the development strategies included in the plan and thus might offer opportunities to local actors to achieve a higher planning efficacy.

Third, regarding the overall surrounding context of an urban region, we expect that its effect on planning efficacy will occur when there is a stable economic situation in the urban region. Additionally, we also expect that the presence of an (even temporary) advantageous positioning of the urban region as compared with other urban regions in the wider geographical context, can facilitate a higher planning efficacy.

3.2. Data collection

To gain insight into planning efficacy, a total of 17 face-to-face interviews were conducted in English in Copenhagen and in French in Lyon, by the first author of this paper. Interview duration ranged from 60 to 90 min (average: 80 min). During the interview, each participant was asked to complete a questionnaire and to comment on the items forming the governance and external factors components (see above and Figures 1 and 2).

The interview was organized as follows. First, we presented the goal of the interview, and the associated research questions. Then the respondents were reminded the definition of the planning efficacy, given in advance in the contact email and they were asked if the definition made sense to them. Secondly, the respondents were invited to introduce themselves. The interviews were supported by a pre-elaborated questionnaire containing 'closed' questions and organized into four sections: (1) an introduction, (2) questions to obtain the strengths and weights of the items of governance performance, (3) questions to obtain the strengths and weights of the items of the external forces, and (4) questions to gather the relative weights of governance performance and the impact of external forces (see appendix).

During the interview, respondents were asked to quantify the strength of the primary items (white boxes in Figures 1 and 2). In the case of governance performance, respondents answered by using a scale from 0 to 2. The value 0 meant, for example, that a given stakeholder had not participated in strategic planning (e. g., item [interest group] in Figure 1) or that a consensus on the strategic vision was not reached (item [consensus] in Figure 1). In contrast, the value 2 meant, for example, that a given stakeholder had been strongly involved in strategic planning or that cooperation between the different administrative levels had been very effective during the implementation of the plan (item [Multilevel government cooperation] in Figure 1). Intermediate values of 0.5, 1 and 1.5 were also possible.

In the case of external forces, the strength of an item was evaluated by each respondent on a scale from −3 to 3. The value −3 meant that the external force significantly hindered the implementation of the content of the strategic plan (e.g. item [national regulations] in Figure 2), whereas a value of 3 indicated that the external force significantly facilitated the implementation of the content of the strategic plan. A value of 0 indicated that the external force was neutral, neither hindering nor facilitating the implementation of the content of the strategic plan.

Whilst the assessment of the items is very useful, the added value of AHP is that respondents assess the weight of each item on a hierarchical level through a pairwise comparison, for example, a comparison between [planning experience] and [coordination], or a comparison between [process and document] and [actors involvement].

Therefore, the weight of an item (primary or non-primary) represents the assigned importance of this item relative to all other items. The weight of an item was thus determined by the respondents, through comparing pairs of items on the same hierarchical level on a scale of 1–9. A value of 1 indicated that the item on the left of the comparison was much more important than the item on the right. In contrast, a value of 9 indicated that the item on the left of the comparison was far less important than the item on the right. A value of 5 indicated that both items were of equal importance. For example, to determine the weights of the input items for [process and experience], three pairwise comparisons were needed: between [planning experience] and [consensus], between [planning experience] and [coordination] and between [coordination] and [consensus].

It is clear that data collection through AHP is more than a simple survey as it requires some effort on the part of the interviewees. Additionally, we also asked respondents to inform their choices by explaining why they gave the maximum value to an item, or why they considered one item more important than another in a pairwise comparison. Respondents were further asked to illustrate their choices with examples. This qualitative information supported the analysis and the synthesis of the results. Each interview was digitally recorded.

Data collection was structured by including the three main land uses: transport infrastructure, built-up areas and semi-natural areas (forests, agricultural lands). This distinction is important as we assumed that planning efficacy might be stronger for implementing transport goals, but weaker when addressing the protection of forests and agricultural lands.

Respondents were selected according the following criteria. They had to be acquainted with/have a good understanding of (1) the overall strategic planning process (plan-making and plan-implementation phases), (2) transport, urban and natural functions of land transformations, (3) the transformations that occurred over time in the urban region. Additionally, they also had to be (4) a representative actor involved in the strategic planning process, either at the local or regional level (technical or academic). In comparing the two cases, we also checked that the respondents in Lyon and Copenhagen could be considered equivalent. However, these criteria mean that the response rate of our survey was low and therefore the size of our sample was limited (see also the Discussion section).

In Lyon, the nine respondents were either representatives of the urbanization agency (or *Agence d'urbanisme de Lyon*), Grand Lyon (local authority gathering municipalities covered by the SCOT 2030) or the SEPAL (local agency monitoring the SCOT 2030), and one expert from academia. In Copenhagen, the eight respondents were affiliated with the Capital Region of Copenhagen, the Danish Town Planning Institute or the Division of National Spatial Planning of the Danish Business Authority, plus a planner of the Nærheden city district in Hedehusene municipality (a town located on the rail line between Copenhagen and Roskilde in the Capital Region of Denmark). Academic experts in spatial planning at the University of Copenhagen were also interviewed.

3.3. Data analysis

As the AHP requires weights between 0 and 1, the collected values for the primary items (white boxes, i.e. [experts] in Figure 1 and [national regulations] in Figure 2) were first

normalized using a simple linear transformation (range 0–1). For the items in the governance performance, the scores of primary items were divided by two to rescale the range 0–2 into the range 0–1.

The transformation of the weights from the pairwise comparison into the weight for each item on the same hierarchical level, was performed according to Saaty's method (1980). The weight obtained varied between 0 and 1. For example, weights of 0.50, 0.25 and 0.25 for [planning experience], [coordination] and [consensus] items respectively, mean that [planning experience] accounts for 50% of [process and experience]. Thus, as weight of [planning experience] is higher than the weight of [coordination] or [consensus], a change of 0.1 in the value of [planning experience] has a greater impact on [process and experience] than the same change in [consensus] or [coordination]. The strength of a non-primary item is the result of the sum of the products of the values and the weight of its constitutive items (items linked from above in Figures 1 and 2). If [planning experience], [coordination] and [consensus] have strengths of 0.8, 0.4 and 0.5 respectively and their weights are the same as in the example above, the strength of the [process and experience] item is 0.5*0.8 + 0.25*0.4 + 0.25*0.5 = 0.4 + 0.1 + 0.125 = 0.625.

The calculated strength values are presented as follows: 'v' represents the value of the component without distinction of the land use concerned, 'vtra' represents the value of the transport infrastructure components, 'vbui' represents the value of the built-up area components, 'vnat' represents the value of the semi-natural area components, and 'w' represents the component weight.

4. Results

After presenting the difference in [planning efficacy] for Lyon and Copenhagen, we analyse which items of the governance sub-process determine the governance performance in the two case study areas and how the role of external forces differs. Within the 'governance performance' sub-process, we first identify whether a weakness of governance is present in the plan-making or the plan-implementation phases (through their outputs: [plan] and [governance performance], respectively). Then, we examine the performance of governance in terms of [process and experience] and [actors' involvement] (Figure 2, second level from top). Next, we compare the [leadership] of the regional leader with the contributions of the other actors involved (i.e. citizens, experts, interest groups) through [negotiation] during plan-making. Finally, in the 'impact of external forces' sub-process, we identify how six prime external forces affect strategic planning.

The reader should note that the AHP results are based on a small-sized sample. Therefore, the values obtained may be subject to sample variability and are valid for the experts interviewed. For this reason, we highlight below the patterns expressed by these values.

4.1. Planning efficacy

The strength of [planning efficacy] appears to be lower in the Copenhagen urban region than in the Lyon urban region for all three land uses assessed (transport infrastructure or TRA, built-up areas or BUI, and semi-natural areas or NAT). The values for [planning efficacy] range from 0.59 for built-up area development to 0.66 for transport

development in Copenhagen, and from 0.75 for semi-natural development to 0.79 for built-up area development in Lyon. The differences in scoring between the regions range from 0.1 for transport infrastructure and semi-natural areas to 0.2 for built-up areas (Figure 3).

The differences between the case studies originate from lower strengths for both governance performance and the impact of external forces in the Copenhagen region. The difference between the case studies is slightly larger for external forces (with differences of 0.14, 0.20 and 0.16 for transport, built-up, and semi-natural land uses, respectively; on average v=0.17) than for governance performance (with differences of 0.06, 0.20 and 0.11; on average v=0.12). These differences are amplified by the higher weight of the [external forces] in Copenhagen (w=0.40) than in Lyon (w=0.20). Planning efficacy in Lyon is less sensitive to external forces than in Copenhagen case. This result is in line with the fact that in Lyon, strategic planning is managed by local representatives, whilst a national government authority is decisive in Copenhagen.

4.2. The sub-process 'governance performance'

4.2.1. Strength of the [plan] and [governance performance]

When comparing the results of the output of the plan-making phase (i.e. the values of [plan]) with the output of the plan-implementation phase (i.e. the values of [governance performance]) we see similar overall differences between the regions. The values for [plan] are greater in Lyon (0.85, 0.85 and 0.81 for transport, built-up, and semi-natural land uses, respectively; on average v=0.84) than in Copenhagen (0.78, 0.70 and 0.72 for transport, built-up, and semi-natural land uses, respectively; on average v=0.73) for all three land uses assessed. The respondents thus consider the strategic plan in Lyon to be stronger. In both urban areas, respondents acknowledged that the strategic spatial plan (SCOT 2030 in Lyon, and Fingerplan in Copenhagen) could be improved, but that the plan generally fulfils its assigned role: it presents a vision of credible and sufficiently consensual development in a contemporary context. However, a particularly notable difference between the two areas in terms of built-up development for [governance performance] can be seen (Table 1).

In both urban regions, scores for [governance performance] were lower than the scores for [plan] in a similar way (differences between −0.06 and −0.11), which indicates that a part of the strategic plan was not implemented as envisioned in the document. This

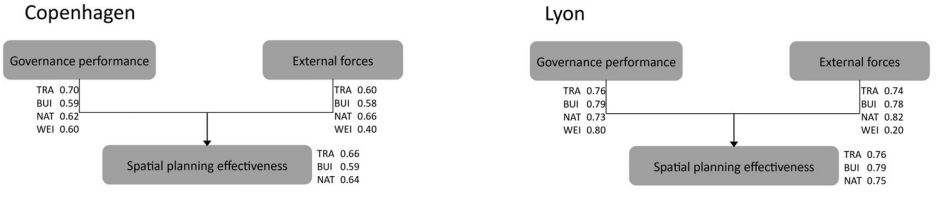

Figure 3. Values of planning efficacy in the urban regions of Copenhagen and Lyon, values represent scores for the three different land-use types, i.e. TRA = transport infrastructure, BUI = built-up areas, and NAT = semi-natural areas and their weights (WEI) and range between 0 and 1.

Table 1. Values for the 'plan' and 'governance performance' for the urban regions of Copenhagen (Cop.) and Lyon (Lyo.), derived from AHP assessment of the strategic spatial plan of these areas.

	Plan		Governance performance		Difference between Plan and Governance performance		Difference between Copenhagen and Lyon	
	Cop.	Lyo.	Cop.	Lyo.	Cop.	Lyo.	Plan	Governance performance
vtra	0.78	0.85	0.70	0.76	−0.08	−0.09	−0.07	−0.06
vbui	0.70	0.85	0.59	0.79	−0.11	−0.06	−0.15	−0.20
vnat	0.72	0.81	0.62	0.73	−0.10	−0.08	−0.09	−0.11

is not surprising since: (1) a strategic plan is rarely fully binding (goals and objectives are not strictly enforced or legally binding), and (2) the implementation phase is bound to include uncertainty. According to Faludi (2000), the strategic plan serves as a framework to be followed, but the details, which may differ from the content of the plan, are further defined during its implementation.

4.2.2. Process and stakeholder involvement

In both urban regions, actors are strongly involved in the making and implementation of the plan (see Table 2, [stakeholder involvement] items in plan-making and plan-implementation, values over 0.66). However, in Lyon, actors are less involved with environmental issues (i.e. conservation issues related to semi-natural areas) during plan-implementation (values over 0.82 except for natural areas during plan-implementation). This is partly justified because across France, environmental conservation issues have recently been included in development policies and are often discussed in more detail in specialist documents. The situation is different in Copenhagen. The main actors are more involved in plan-implementation, particularly regarding transport and environmental issues (0.78 and 0.72, respectively), which are important structural components of the historical formation of the Copenhagen urban region. In Copenhagen, transport-oriented development (TOD) has significantly influenced urban development, such that it is a distinctive feature of Copenhagen's Fingerplan.

The analysis of the processes during plan-making (the [process and experience] item) and plan-implementation, (the [process and documents] item) show different patterns for the two urban regions. The quality of the process decreases to varying degrees from the plan-making phase to the plan-implementation phase in both urban regions (Table 3). In Copenhagen, the decrease is small, except for semi-natural areas in which weak cooperation between the different administrative levels on semi-natural

Table 2. Values for stakeholder involvement during plan-making (PM) and plan-implementation (PI) in strategic spatial planning in the urban regions of Copenhagen (Cop.) and Lyon (Lyo.).

	Stakeholder involvement (during PM)		Stakeholder involvement (during PI)		Difference between PM and PI		Difference between Copenhagen and Lyon	
	Cop.	Lyo.	Cop.	Lyo.	Cop.	Lyo.	PM	PI
vtra	0.67	0.82	0.78	0.82	−0.11	0.00	−0.15	−0.04
vbui	0.66	0.85	0.63	0.86	0.03	−0.01	−0.19	−0.23
vnat	0.66	0.85	0.72	0.73	−0.06	0.12	−0.06	−0.01

Table 3. Values for processes of the two phases of governance, plan-making (PM) and plan-implementation (PI), for the strategic spatial plans of Copenhagen (Cop.) and Lyon (Lyo.).

	Process and experience (during PM)		Process and documents (during PI)		Difference between PM and PI		Difference between Copenhagen and Lyon	
	Cop.	Lyo.	Cop.	Lyo.	Cop.	Lyo.	PM	PI
vtra	0.69	0.84	0.62	0.69	0.07	0.15	−0.15	−0.07
vbui	0.58	0.88	0.55	0.71	0.03	0.17	−0.30	−0.16
vnat	0.69	0.92	0.51	0.70	0.18	0.22	−0.23	−0.19

areas gives rise to this difference (0.07, 0.03 and 0.18 for transport, built-up, and semi-natural land uses, respectively). In Lyon, the decrease is more important in all three of the major land uses (0.15, 0.17 and 0.22 for transport, built-up, and semi-natural land uses, respectively) due to limited knowledge on the available funding mechanisms. Thus, during plan-implementation, the content of the plan is not applied as intended in the document.

The differences in stakeholder involvement and the processes – [process and experience] during plan-making and [process and documents] during plan-implementation – for Copenhagen and Lyon, are probably due to poor cooperation between political stakeholders at different administrative levels. In Copenhagen, the difference is mainly due to poor cooperation between the strategic regional leader and the municipalities during plan-implementation. The Danish Business Authority is most active during the plan-making phase and municipalities (in consultation with neighbouring municipalities), are responsible for the implementation of the strategic plan within their territory. This distance from the regional leader during implementation can result in reduces vertical cooperation (i.e. cooperation between the regional leader and subsidiary levels of government), which leaves more room for horizontal cooperation, which in turn can result in lower levels of implementation.

4.2.3. The importance of leadership and negotiation in the development of plans

Our results confirm that the main difference observed in the strategic planning processes in Lyon and Copenhagen urban regions originates from the role and status of regional leaders during the development of the plans. In Lyon, the urban regional leader is strongly involved in planning processes, regardless of the type of land use in the plan, whereas in Copenhagen, the Danish Business Authority is perceived to have less [leadership] (Table 4). Although the Danish Business Authority ensures that urban development does not take place at the expense of the consumption of natural areas, the implementation of strategic plans is the competence of municipalities and other local economic

Table 4. Values for leadership and negotiation of the regional leader in the strategic spatial planning of the urban regions of Copenhagen (Cop.) and Lyon (Lyo.).

	Leadership		Negotiation	
	Cop.	Lyo.	Cop.	Lyo.
vtra	0.77	0.86	0.68	0.81
vbui	0.58	0.86	0.61	0.84
vnat	0.58	0.77	0.68	0.87
w	0.61	0.71	0.39	0.29

stakeholders, such as property or land developers. Differences in the assessment of the [leadership] of a regional leader are reinforced by the way in which a regional leader is designated (selected by the State or elected indirectly by the inhabitants).

A similar pattern is visible for [negotiation] where values are higher for the urban region of Lyon. This difference reflects the dissimilar role of the two planning leaders during the planning process. Negotiation during the plan-making phase revealed two different approaches based on the distance between the regional leader and local stakeholders. While the two urban regions follow a formalized process based on discussion to reach a consensus, negotiation is perceived differently in the two urban regions. Negotiation is considered to be fully integrated in Lyon. In this urban region the planning process is managed by representatives of Grand Lyon, which encompasses the core-city and the surrounding municipalities. In Copenhagen, since responsibilities for strategic planning were transferred from a regional authority to the national Danish Business Authority, negotiation has been perceived as less coordinated, in favour of a regulatory approach (Galland and Enemark 2015). It seems that the presence of an intermediate authority in charge of strategic planning could bridge the gap between a regulatory approach and individual visions of development via less constraining modes of negotiation. The stronger role of the regional leader in Lyon, together with strong leadership and negotiation, translates into a greater weight of leadership in plan-making.

4.3. The sub-process 'impact of external forces'

External forces appear to facilitate the implementation of strategic plans in both cases, as the observed values for [external forces] are greater than 0.50 (Figure 4), which is the

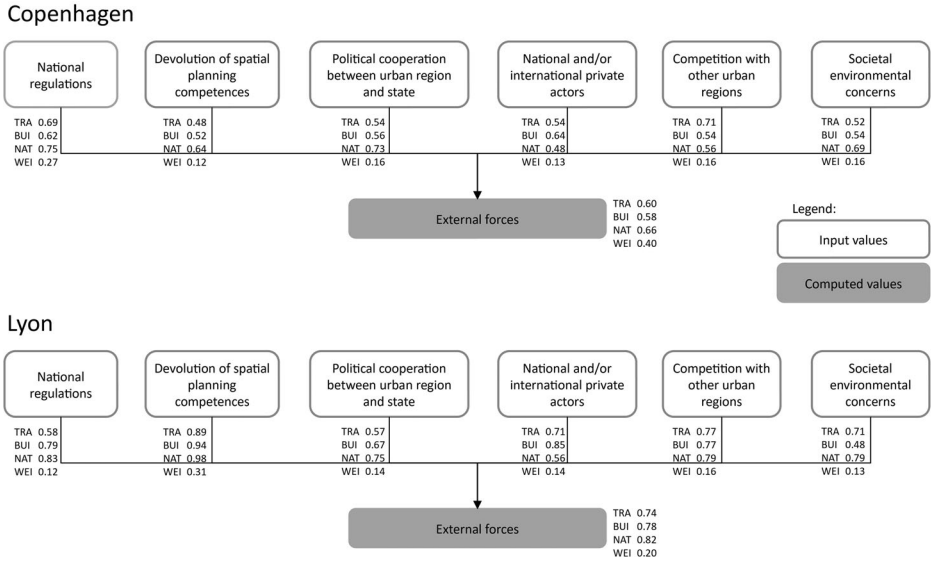

Figure 4. The strengths and weights of the external forces, which play a role in the strategic spatial planning in Copenhagen and Lyon. The strengths of each of the land uses assessed are displayed as follows: TRA = transport infrastructure, BUI = built-up areas, and NAT = semi-natural areas. WEI corresponds to the weight of the external forces.

threshold value above which these forces are considered to be facilitators. However, our analysis also highlights considerable differences.

One of the most visible differences between Copenhagen and Lyon is in the devolution of spatial planning competences. In the French case, since the 1982 Decentralization Acts and the strengthening of the inter-municipal cooperation law in 1999, the state has given more power to subsidiary stakeholders such as metropolitan authorities for territorial development. Thus, the state has only retained responsibility for the verification of the compliance of planning documents to national regulations. In contrast, in Copenhagen strategic planning has shifted from a three-level hierarchy process (national, metropolitan, and local), to a two-level hierarchy process (national and local) (Reimer, Getimis, and Blotevogel 2014). For local actors, this change has created a gap by transferring the responsibility for strategic planning to the Danish Business Authority's planning department. Although national regulations have similar effects in both case studies, for example, on urban densification, the protection of natural spaces and the promotion of public transport, these regulations are perceived differently when they are applied by a state as in Copenhagen or by a local authority as in Lyon. In Lyon, the regional leader ensures compliance with the regulations and carries the local strategic vision. In Copenhagen, the regulations are adopted by the Ministry of Environment and Food of Denmark and are perceived as a regulatory framework. Thus, although national regulations have similar scores in the two case studies, the difference in the perception is reflected in the computed weights: one of the lowest in Lyon and the highest in Copenhagen.

Although the relationship between the urban region and the state is different in the two cases, the cooperation between the local authority of the urban region and the national state is similar. A variation is visible for the build-up infrastructures for which the score is lower in Copenhagen due to a weaker interaction on this aspect (0.56 in Copenhagen and 0.67 in Lyon). Furthermore, the impact of national and/or international private actors show different patterns. A dynamic of economic development in the provincial metropolises provides Lyon with a favourable development context. The envisioned development of Lyon urban region is oriented towards the creation of an appealing local environment to attract national and international private players. An example is the project of Part-Dieu Station as a central transportation hub. It is valued by national and international private actors, particularly because it ensures the necessary mobility to the Part-Dieu central business district in Lyon. Similarly, semi-natural areas form a green infrastructure. This is an asset for the living environment, as well as a constraint to urban expansion. In Copenhagen, the economic structure has always focused on the city of Copenhagen. The historical spatial structure has been supported by successive versions of the Fingerplan, but now the associated transport infrastructure has reached its limitations. Whilst national and international private actors require complex transportation networks the metropolitan vision supports travel along the plan's fingers.

The geographical position of Copenhagen and Lyon in the network of other urban regions appears to be more favourable for Lyon. The positioning of Copenhagen, close to other metropolises with similar activities (seaport-related activities, for example), leads the city to take these other metropolises into account in order to remain attractive. In contrast, Lyon has a more favourable situation as it is one of the main provincial

metropolises in France and is surrounded by more rural inter-municipalities with which it develops interactions to ensure more development perspectives.

5. Discussion and conclusion

The use of a quantitative method such as the AHP, coupled with qualitative data from the interviews, brings new insight into the efficacy of strategic spatial planning. In this discussion, we present the main advantages and disadvantages of our method and conceptualization of the efficacy of strategic planning.

Our conceptualization of planning efficacy is based on items that have been established in the literature (actors, negotiation, etc.) and their interactions (in particular, see Hersperger et al. 2019). The AHP facilitates the evaluation of these items and groups of linked items through the hierarchical schema. The schema requires prior organization regarding how these items interact and to define what, in these items, leads to a good strategic planning efficacy. The AHP, through the hierarchical schema, also makes it possible to analyse the efficacy of strategic planning on several levels of detail. While it is possible to analyse efficacy by comparing the results of the items [external forces] and [territorial governance], it is also possible to analyse which of these two items explains the results. Thus, our application makes it easy to understand why, in an urban region, strategic planning remains effective, while the strength of an item, that is consensually considered important in the literature, is assessed as low.

However, the use of AHP to evaluate strategic planning efficacy has revealed several constraints such as the difficulty in constructing a sufficiently large sample of respondents available to answer all the questions. In order to evaluate our version of efficacy, respondents must have a very broad knowledge of the planning process, such as the actors involved, the sequence of key stages, knowledge of the territory and its positioning in the national and international societal context, and knowledge of various themes such as transport and natural areas. Furthermore, the sequential character of the value-computation means that only completed questionnaires can be used to calculate the scores of the hierarchical schema. The completion of the questionnaire is extremely time-consuming and respondents must have a sound understanding of the overall strategic spatial planning process of the urban region in order to sufficiently complete the questionnaire. These constraints limit the number of experts available to take part in the survey, which generally causes difficulties for quantitative analyses. To mitigate this limitation, we supported the AHP by including qualitative information about the respondents' replies. However, the AHP provides usable results even on a small sample of respondents and the small sample of our study thus proved sufficient to compare the two urban regions. The qualitative information obtained during interviews facilitated a better understanding and a more accurate interpretation of the quantitative scores. A larger sample of respondents could facilitate comparisons of how different stakeholder groups (such as plan makers, plan users, and academic experts) assess the planning process. Thus, depending on the research question for which this method is used, the profiles of the respondents should be taken into particular consideration.

Quantitative approaches, such as AHP, offer new opportunities for research in spatial planning. The comparison of spatial planning systems is one area in which these methods could be of particular benefit. In an effort to classify European planning systems, Nadin

and Stead (2008) used several studies (CEC 1997; Davies et al. 1989; Farinós Dasí 2007; Thornley and Newman 1996), to analyse how planning systems diverge or converge. However, the existing typologies are mainly descriptive and as such, differences between different planning methods cannot be quantified. Integrating quantitative tools such as AHP into this type of research would facilitate a quantitative analysis. It would then be possible to determine which planning systems are most similar and create a global taxonomy of planning systems. This would also open up new research opportunities, for example, in cross-border contexts.

A quantitative approach, as presented in this paper, also offers new opportunities for research on a more effective integration of spatial planning into land-change science and land-change modelling. Koomen, Koekoek, and Dijk (2011), for example, highlight the lack of methods to facilitate the integration of spatial policies into land-change models, which could be used as prospective tools to assess the impacts of spatial policies (e.g. scenario analyses). Although this observation has been expressed primarily for documents (i.e. plans), it could be extended to include plan-making and implementation. As Faludi (2000) emphasizes, what is recorded in planning documentation is not what necessarily defines spatial transformations. As a result, models that rely solely on these documents can only simulate the effects of planning to a limited extent. Thus, the quantitative-qualitative mixed approach used in this study could serve as a starting point to bridge the gap between spatial planning research (which usually uses qualitative methods that are unsuitable for producing data for computation-based models) and land-change science (which requires information from policies to produce more accurate simulations).

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