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Cumulative effects in SEA of spatial plans – evidence from Italy and England

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Addressing cumulative effects (CE) has been widely recognized as a key purpose of strategic environmental assessment (SEA). In EU member states, the assessment of CE in SEA is prescribed by the SEA Directive. This paper investigates whether and how CE are currently treated in SEA of Italian and English spatial plans. This is based on the results of (1) a questionnaire survey and (2) a systematic review of SEA reports of local and regional Italian and English spatial plans. It is found that, opposite to what even some experts think, while CE remain unsatisfactorily addressed, there is ample space for improving current practice. In this context, better scoping, future-oriented approaches to SEA and more effective tiering are identified as key elements that can enable more effective CE assessment.

Keywords: cumulative effects; SEA; spatial planning; alternatives; uncertainty; methods

1. Introduction

The consideration of cumulative environmental effects (CE) is of particular importance at strategic decision-making levels (Sadler and Verheem 1996, Cooper and Sheate 2002, Piper 2002, Duinker and Greig 2006, Thérivel and Ross 2007). In this context, interest in how to handle CE has been growing over the last two decades, following the development of strategic environmental assessment (SEA) theory and practice (Fischer 2007, Canter and Ross 2010, Cooper 2011, Gunn and Noble 2011). However, to date the debate has been led mostly by scholars from North America, especially Canada (Noble 2008, Canter *et al.* 2011), where CEA at project level has a long tradition, and the interest for integrating the assessment of CE into regional-level SEA comes from both academic and institutional players (Hegmann and Yarranton 2011, Johnson *et al.* 2011). In EU member states, the assessment of CE is explicitly required through the SEA Directive (42/2001/EC), demanding that particular regard is given to CE when likely effects of plans and programmes are assessed. However, the extent to which CE are considered in European SEA practice has been considered unsatisfactory by many authors (Fischer *et al.* 2009, Wärnbäck and Hilding-Rydevik 2009, Weiland 2010, Cooper 2011), confirming barriers identified earlier (e.g. Piper 2001). Among such barriers are the poor consideration of scale issues (Thérivel and Ross 2007), the limited exploration of reasonably foreseeable future actions and the lack of resource-based thresholds (Thérivel *et al.* 2009, Cooper 2011), as well as the uncertain allocation of responsibilities required to manage CE (Piper 2001, Canter and Ross 2010).

This paper reports on how CE are currently treated in SEA for spatial plans in Italy and England. The selection of these two countries was motivated by their very

different positions in terms of (a) planning culture and systems and (b) contribution to the development of the academic literature on SEA, which is high in the English case but poor in the Italian case (Fischer and Gazzola 2006, Gazzola 2008, Bassi *et al.* 2012). Spatial planning has been selected because it is here that SEA has been most extensively applied in Europe (Jones *et al.* 2005, Thérivel and Fischer, 2012). It is important that spatial planning usually happens within a tiered system at various levels, for instance national, regional and local levels (Jones *et al.* 2005, Fischer 2007). This can be an opportunity for improving the consideration of multi-scale CE, as well as to share responsibility required to manage CE (Cooper 2011). Empirical evidence underlying this paper was obtained, based on (a) a questionnaire survey conducted with six Italian and six English academics and practitioners, and (b) quality reviews of SEA reports for 20 regional and local-level spatial plans (10 in England and 10 in Italy).

The paper consists of five sections. After this introduction, Section 2 provides for an overview of English and Italian spatial planning and SEA systems. Section 3 illustrates the methodology adopted for the expert survey and the review of the SEA reports. Section 4 presents and discusses results. Finally, in Section 5, suggestions for improving current practice are made.

2. Italian and English spatial planning and SEA systems

Fischer and Gazzola (2006) reflected on Italian and English spatial planning and SEA systems, focusing on their different planning cultures and environmental attitudes. An additional distinction was made by Jones *et al.*, (2005) regarding the way the planning systems

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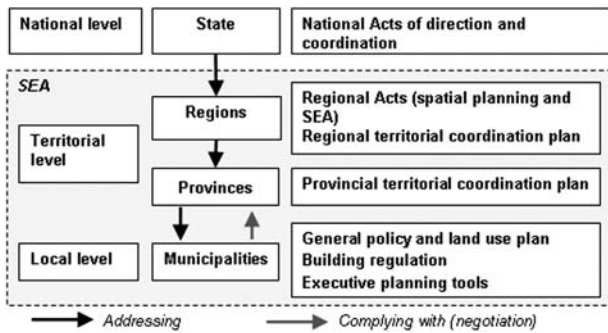


Figure 1. Italian spatial planning system. Modified from Gazzola (2008).

are organized. This has implications for the application of SEA.

Italian spatial planning is based on a tiered system, which consists of national Acts, regional and provincial spatial coordination plans, and general policy and land use plans at the level of municipalities (Gazzola *et al.* 2004, Geneletti *et al.* 2007). Except for the national level, each other level must prepare a spatial plan, which has to be subjected to SEA. Figure 1 shows how the Italian spatial planning system is organized.

The implementation of the SEA Directive in Italy occurred four years late (i.e. 2008 rather than the 2004 implementation deadline), and SEA finally emerged during an institutional reform which involved the spatial planning system. However, provisions to perform SEA had been introduced earlier by several regional governments (Geneletti *et al.* 2007). A great variability of SEA experiences is currently characterizing the Italian spatial planning context, ranging from pilot studies to more standard practices (Colombo *et al.* 2008).

In England, the Planning and Compulsory Purchase Act 2004 incorporated the requirements of the SEA Directive into the procedure of sustainability appraisal (SA) which, until 2010 had to be prepared for regional and local development plans. Under the new conservative coalition government, regional planning was revoked in 2010, meaning that planning is now only happening at national and local levels of decision-making. This re-framed the system, leading to some more direct interaction between local and national authorities. National Planning Policy Statements (PPSs) set the context and determine the rules for Local Development Frameworks (LDFs) and the documents prepared within them. Furthermore, an independent inspector checks compliance of related documents with national policy. In this way the system functions in a strictly hierarchical manner. There are some extensive SEA-inclusive SA experiences with possibly over a thousand practice cases having been conducted in England over more than a decade (Fischer 2010).

Generally speaking, in England assessment is mainly based on the question whether proposed plans and policies meet sustainable development objectives, including socio-economic aspects (Thérivel *et al.* 2009). Figure 2 shows the English spatial planning system which was in place when the empirical research underlying this paper was

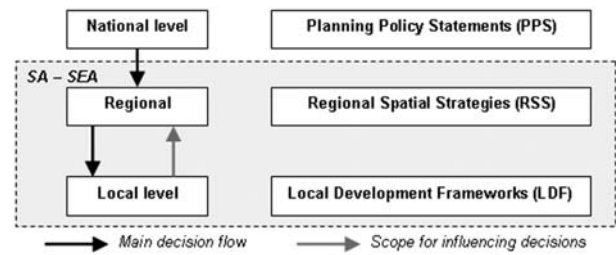


Figure 2. English spatial planning tiered system. Modified from Fischer (2007).

conducted in 2008/2009 (i.e. before the revocation of regional planning).

So, while spatial planning is organized within tiered systems in both Italy and England, the specific way in which planning works and environmental issues are addressed differ between the two countries.

Two differences between the Italian and the English SEA system are of particular relevance here. The first concerns the general approach to SEA. In the case of England, SEA is integrated into a broader SA, placing emphasis upon economic and social issues as well as the environment. English SA has been described as being 'objective led' and 'integrated', whereas SEA based on the European SEA Directive is understood as being 'baseline led' and 'advocative' (Kørnøvn and Thissen 2000, Smith and Sheate 2001). Due to both, SA and SEA being legally required and often overlapping, following a joined SEA/SA process is recommended by government guidance (ODPM 2005b). In Italy, on the other hand, SEA is limited to environmental aspects and SEA reports need to only portray the evaluation of the environmental effects of proposed spatial plans and land use decisions (Geneletti *et al.* 2007).

The second difference concerns the availability of operational guidance for spatial planning and SEA. A strength of the English SEA system has been said to be the availability of various published guidance documents, potentially supporting good practice (Fischer 2007). SEA and SA guidance (e.g. ODPM 2005a, 2005b) set out key points in the assessment of secondary, cumulative and synergistic effects. In addition, PPSs which frame policies and principles for particular spatial planning aspects (e.g. housing, sustainable development in rural areas) further support SA/SEA practice, providing objectives and targets against which the significance of effects can be assessed. In Italy, on the other hand, there are few guidance documents available (Colombo *et al.* 2008). This, together with the limited coordination of SEA processes conducted at the national level, contributes to fragmented planning and SEA practice in Italy.

3. Methodology

The exploration of how CE are considered in SEA of spatial plans is based here on (a) an expert questionnaire survey and (b) a systematic review of SEA reports. The frameworks for both elements were developed starting

from three major shortcomings of SEA identified by a comprehensive literature review. These are:

- the poor consideration of CE in SEA practice (Fischer *et al.* 2009, Wärnbäck and Hilding-Rydevik 2009, Weiland 2010, Cooper 2011);
- the limited exploration of alternatives (Fischer 2010, Zhu *et al.* 2011, Geneletti 2012);
- the limited analysis of uncertainty which characterizes future decisions and predictions (Pischke and Cashmore 2006, Canter and Atkinson 2010).

3.1 Expert survey

The survey questionnaire was organized along three main sections (see Box 1):

- (1) Content: exploring the extent to which CE are considered, whether reasonable alternatives are assessed, and how often uncertainty factors are dealt with.
- (2) Methods: exploring the specific methods applied to assess CE.
- (3) Suggestions: establishing what SEA reports can be included in the subsequent review (this included a request to suggest at least three SEA reports for later quality review).

The survey was conducted between August and October 2009 with six Italian and six English experts. These were identified based on both literature references and the lists of participants of two scientific gatherings: the special thematic meetings of the International Association for Impact Assessment (IAIA) on SEA (Prague 2005) and Cumulative Effects Assessment and Management (Calgary 2008).

The questionnaire was sent by email. Experts were free to decide on how to provide answers. The majority preferred to fill in and return the questionnaire by email, agreeing to be contacted later for obtaining additional information. Some also chose to be interviewed by phone.

Experts were mostly environmental senior consultants ($n = 8$) or university academics ($n = 4$). The questionnaire included two questions on expertise, exploring the extent to which interviewees were familiar with SEA practice, by asking how many SEA processes they had been involved in, and how many SEA reports they had read (see questions 1 and 2 in Box 1).

In general, questions focused on the frequency and the methods applied in SEA in terms of dealing with CE, defining alternatives and dealing with uncertainty factors. The frequency classes (occasionally, frequently etc.) were not defined a priori and interviewees firstly filled in the questionnaire based on their perceptions. Subsequently,

Box 1. The questionnaire on SEA and cumulative effects

Name: _____

Position: _____

Country of activity: _____

1) How many SEA processes have you been involved in/commented on/reviewed?

Less than 10 between 10 and 30 more than 30

2) How many SEA reports have you read?

Less than 10 between 10 and 30 more than 30

Based on your experience with SEA:

3) How often SEA reports have considered cumulative effects:

always frequently occasionally never

4) How SEA practices have addressed the definition of alternatives/options:

satisfactory not satisfactory occasionally satisfactory

5) How often in SEA reports uncertainty factors have been addressed (assumptions/impact predictions):

always frequently occasionally never

6) Prediction/assessment methodologies applied in SEA reports have been generally based on:

matrices checklists GIS and overlay mapping
 scenario analysis MCA sensitivity analysis
 modelling causal-effects analysis combination of methods

7) Has any specific technique been applied in order to scope, predict or assess cumulative effects?

Yes not often not at all

Comments _____

8) Has any of the following techniques been applied in order to define alternatives/options?

Workshops Expert opinions Scenario analysis
 SWOT analysis others

Comments _____

9) Has any of the following methods been applied in order to address uncertainty?

Expert opinions Scenario analysis Sensitivity analysis
 others

Comments _____

10) Could you provide at least three examples of SEA reports?

Box 2. Review framework**Section a: Exploration of SEA practices****Does the SEA report:**

1. Include any explicit definition/consideration of CE?
 Yes No Partially
2. Follow any term of reference for the treatment/assessment of CE?
 Yes No
3. Separately treat CE?
 Yes No
4. Describe how reasonable alternatives were identified, considering objectives and scope of the plan?
 Yes No Partially
5. Identify other PPPs (in CEA literature referred to as current and reasonable foreseeable future actions) which together with the plan have the potential for CE?
 Yes No Partially
6. Predict the combined effects of different alternatives/options?
 Yes No Partially
7. Consider ways of mitigating/compensating CE?
 Yes No Partially
8. Predict the effects of their likely implementation?
 Yes No Partially
9. Provide information on uncertainty?
 Yes No Partially

Section b: Approaches and methods**By means of which approaches or methods, does the SEA report:**

1. Identify potential CE?
2. Identify alternatives/options?
3. Predict CE?
4. Uncover uncertainty?

experts were contacted and were asked to comment on each previously provided answer, including their understanding of the terms such as frequently.

3.2 Review of SEA reports

Based on existing approaches, a framework was developed for systematically reviewing SEA documents (Cooper 2011). This included two sections (see Box 2):

- (1) Exploration of SEA practices, aiming at establishing the extent to which CE are considered, whether reasonable alternatives are identified and whether information on uncertainty is provided.
- (2) Approaches and methods, exploring how CE are identified and predicted and how alternatives are explored and uncertainty is dealt with.

Both sections included a set of questions which were answered in a qualitative way for each report.

Twenty SEA documents were reviewed. These had been identified by the experts involved in the survey as

examples of good SEA practice (shown in Appendix 1). Italian SEA reports consisted of five Provincial Spatial Coordination Plans and Five Local Spatial Plans. English SA/SEA reports consisted of two Regional Spatial Strategies and eight Local Plan Core Strategies (among which there were two scoping reports, an issues and options report, three preferred options reports and four final reports).¹

The review framework was completed, based on the information found in each SEA document. When no information was provided at all, the answer was 'No'. When issues were addressed, but insufficient information and/or explanation was provided, the answer to the question was 'Partially'. Finally, when the information provided was comprehensive and deemed to be satisfactory, the 'Yes' answer was chosen.

4. Results and discussion

Table 1 and Table 2 summarize overall results. As expected, the consideration of CE was generally scarce, particularly in Italian SEA practice. Italian experts replied that usually CE were either not considered at all, or only occasionally mentioned. An explicit consideration of CE was found in only one of the SEA reports.

Generally speaking, most of the experts (7 out of 12) agreed that the assessment of CE was qualitative and based on expert opinions. Moreover, three experts mentioned the application of overlay mapping as the technique applied to treat CE. However, this was only partially confirmed by the reviews of SEA reports. While the use of map overlays was indeed frequently observed, especially in SEA of local-level spatial plans, this was not necessarily connected with the assessment of CE.

The exploration of alternatives was perceived unsatisfactory by 7 out of 12 of the experts and none of the SEA documents reviewed portray a comprehensive description on how alternatives were identified. The techniques applied to define alternatives mostly cited in the survey were: expert opinions (8 out of 12); workshops (7 out of 12); scenario and SWOT analysis (6 out of 12). Again, this was not confirmed by the SEA quality reviews, as 13 out of 20 reports were not clear about how alternatives were defined.

Of the experts 8 out of 12 said that uncertainty was discussed only occasionally. Moreover, three-quarters of them agreed that, if it was discussed, this was generally treated based on expert opinions. This was partially consistent with what SEA quality reviews found (17 out of 20 of the SEA reports). Another inconsistency concerned the methods used. For instance, those identified by the experts to address uncertainty (see Q9 in Table 1) did not match those generally found in SEA (see Q6 in Table 1).

The outcomes of the questionnaire survey and the quality reviews are subsequently discussed further in terms of:

- the consideration of CE;
- definition of alternatives;
- the handling of uncertainties;
- approaches and methods used.

Table 1. Results of questionnaire survey (n = 12, 6 from England and 6 from Italy).

Questions		English experts (number)	Italian experts (number)
Q1. Number of SEA processes the expert has been involved in	< 10	1	3
	10 ÷ 30	3	3
	> 30	2	-
Q2. Number of SEA documents the expert has reviewed	< 10	-	-
	10 ÷ 30	4	1
	> 30	2	5
Q3. Consideration of CE	Always	2	-
	Frequently	2	-
	Occasionally	2	3
	Never	-	3
Q4. Definition of alternatives/options	Satisfactory	1	-
	Not satisfactory	2	5
	Occasionally satisfactory	3	1
Q5. Discussion of uncertainty	Always	-	-
	Frequently	-	2
	Occasionally	6	2
	Never	-	2
Q6. Methods applied in SEA	Matrices	6	4
	Checklists	2	2
	GIS and overlay mapping	4	3
	Scenario analysis	1	2
	MCA	1	2
	Sensitivity analysis	-	-
	Modelling	-	-
	Causal-effects analysis	2	-
	Combination of methods	3	4
	Yes	2	1
Q7. Application of particular techniques for treating CE	Not often	3	4
	Not at all	1	1
	Workshops	4	3
Q8. Techniques applied to define alternatives	Expert opinions	6	2
	Scenario analysis	3	3
	SWOT analysis	1	5
	Others	-	1
	Expert opinions	5	4
	Scenario analysis	1	2
Q9. Methods applied to address uncertainty	Sensitivity analysis	1	2
	Others	-	1

4.1 Consideration of CE

The results of both questionnaire survey and quality reviews indicate that CE are only rarely considered in current SEA practice. While most of the respondents said that CE were occasionally considered, only five reviewed SEA documents were found to explicitly deal with CE, among which four were from England. In Italian practice, CE were mostly indirectly mentioned as 'combined effects' of different planning objectives or as 'interaction of effects' of different activities within the same area. Table 3 provides examples of related statements made in Italian SEA reports.

Generally speaking, local-level CE mainly revolve around the negative effects on air quality, landscape and biodiversity, resulting from the incremental increase of transport activities and land-take associated with small developments. Regional-level CE often focus on climate change issues (e.g. risk of flooding, water availability). Although these are important concerns for spatial planning decisions, the scoping of CE issues was very poor in both English and Italian SEA practice, leading to focus mainly

on those environmental issues listed in the SEA Directive. This was found in both the SEA quality reviews and the opinions of experts, who said that effectiveness of SEA scoping in focusing on relevant cumulative issues was poor (e.g. key receptors, other foreseeable future actions).

Overall, the consideration of CE was often limited to those effects which result from the combination of different planning developments or generally speaking from the implementation of a spatial plan. Other 'foreseeable future actions' related to specific decision-making tiers (e.g. projects, plans, policies), which together with the plan could contribute to CE, were rarely identified in both English and Italian SEA reports (see Q5 in Table 2). When asked about the main reasons, experts cited the uncertainty associated with the implementation of those actions (see Section 4.3).

Measures to manage CE (i.e. recommendations, suggestions for mitigation and compensation) were only found in regional-level SEA reports (ENG1, ITA3, ITA4). These included suggestions for specific regional policies, objectives and targets, as well as lower-tier targets for addressing small-scale effects. The latter included, for

Table 2. Results of SEA quality reviews (n = 20, 10 from England and 10 from Italy).

Questions		English SEA reports (number)	Italian SEA reports (number)
Q1. Explicit definition/consideration of CE	Yes	4	1
	No	5	9
	Partially	1	-
Q2. Term of reference cited	Yes	5	-
	No	5	10
Q3. Separate treatment of CE	Yes	4	-
	No	6	10
Q4. Description on how alternatives are defined	Yes	-	-
	No	-	5
	Partially	8	5
Q5. Identification of other tiered actions (PPPs)	Yes	2	2
	No	8	8
	Partially	-	-
Q6. Prediction of CE of alternatives	Yes	-	2
	No	8	5
	Partially	-	3
Q7. Consideration of compensations and mitigations for CE	Yes	1	2
	No	-	3
	Partially	7	5
Q8. Prediction of CE of mitigations and compensations	Yes	-	-
	No	7	9
	Partially	1	1
Q9. Information on uncertainty	Yes	-	-
	No	4	6
	Partially	6	4

instance, encouraging sub-regions to adopt strategies that promote concentrated rather than dispersed development, and promoting the allocation of parking opportunities in areas accessible to public transport in order to prevent cumulative increase of road traffic.

4.2 Exploration and comparison of cumulative effects of alternatives

Exploring possible alternatives was seen by 7 out of 12 experts as poorly addressed in SEA, highlighting a potential failure of SEA in supporting proactive planning. Even though the exploration of alternatives was said to be among the most difficult tasks of SEA, English

interviewees mostly perceived SEA as an important driver to help define and communicate options, providing an opportunity to increase plan-making transparency. Italian interviewees stated that planning practice rarely looked at any alternatives and highlighted a less proactive role of SEA in their decision-making context.

SEA report reviews confirmed that alternatives were explored poorly. Both local and regional-level alternatives (when considered) were generally based on the situation without the plan, with the plan and with minor proposed changes, only taking the form of variants or amendments to what could be considered the 'preferred' plan (in ENG2 this corresponds to the policies set out in the adopted plan; see Q4 in Table 2).

The level of detail in the alternatives considered differed between regional and local-level SEAs. Regional-level plans mainly referred to two options: 'do nothing' and 'implementation of the spatial plan'. In this context, assessment was done based on spatial policies or objectives, including for example protection of natural sites, prevention of natural and industrial risks, controlling sprawl and regulating local developments. Spatial options or spatial developments included for example new roads, industrial sites and small housing developments. Local-level alternatives, on the other hand, usually referred to two types of options: those related to the allocation of future developments (i.e. spatial options) and those related to policies (i.e. policy options). Compared with English SEAs, the Italian local-level SEA reports had a stronger zoning-based approach, with 'reasonable' alternatives being mostly those related to different locations of small housing development areas.

Table 3. References to CE in Italian SEA reports.

Statements	SEA reports
Small developments induced by transportation infrastructures or other projects which together with the spatial plan could cumulatively affect open spaces and biodiversity	ITA6, ITA7, ITA10
Small developments which together could cumulatively contribute to an overall deterioration of air quality	ITA1, ITA2
Small developments which together could cumulatively affect landscape character	ITA1, ITA3
Synergistic effects on population and human health due to the interaction of natural and anthropogenic risks	ITA1, ITA8, ITA10

Although the comparison of CE resulting from the implementation of different alternatives was perceived as an important opportunity by most of the experts taking part in the questionnaire survey, no comparisons were found in any of the SEAs reviewed. In English SA/SEA, CE were not considered at all before the appraisal of the preferred options stage (see ENG6, ENG8, ENG9). This tended to be justified by the lack of certainty about the options to be implemented (see Section 4.3). A comparison, though very limited, of CE resulting from the implementation of different planning alternatives was found in ITA2 (aggregate effect of planning policies), ITA5 (incremental effects of alternative sets of planning policies), ITA6 (combined effects of noise, air pollution and electromagnetic radiation on population), and ITA7 (combined effects of plan together with three other relevant projects).

4.3 Addressing uncertainty

Most of the experts taking part in the questionnaire survey said that uncertainties were addressed only to a very limited extent. Although uncertainty was mentioned in 13 reviewed SEA reports, its treatment varied widely from a mere mentioning of the word over the description of issues that are likely to affect future conditions to the analysis of risks associated with unforeseeable issues. Table 4 summarizes the findings for how uncertainty was addressed in SEA reports.

While the change of external circumstances was among the most frequently cited uncertainties by those contributing to the questionnaire survey, the assessment of likely CE resulting from different future scenarios was only found in five SEA reports (ENG1, ENG2, ITA2, ITA6, ITA7). These considered changes in population growth, different demand/provision for public transportation, and alternative distribution of housing and employment provisions. While the way in which a policy will be implemented was cited as an issue of uncertainty, alternatives did not take implementation of different management measures (e.g. enhancements, mitigations, remedial actions) into account.

4.4 Approaches and methods

Results from the questionnaire survey and from the quality reviews indicate that SEA usually uses qualitative methods to assess CE. Many of these are similar to those applied in environmental impact assessment (e.g. expert opinions and matrix-based assessment). Both Italian and English experts agreed that, when CE were considered, this was mostly done through qualitative expert opinions, which were usually provided by those conducting the SEA process and/or those preparing the SEA report.

In order to assess CE, most of the English SEAs followed the ODPM guidelines (2005a, 2005b). This meant that CE were firstly evaluated qualitatively against the SA objectives (e.g. encouraging the use of previous development lands, improving air quality) for each plan's policy (e.g. town centre expansion, managing growth) and, secondly, the resulting CE of each policy were summarized within a matrix, assuming the combined implementation of plan's policies as cumulative (e.g. Preferred Policy 4 – encouraging movement – could have a positive cumulative impact on air quality in the long term by reducing car dependency). Although this approach allowed CE to be systematically addressed, by summing up the effects for each SA objective it appears that the only negative CE ever predicted were of an environmental nature (e.g. biodiversity and landscape). However, overall a positive cumulative performance of the plan against SA objectives was usually established, as environmental impacts were traded-off against overall positive economic and social impacts.

In Italian practice, a systematic approach to assess CE was only discovered in one of the SEAs (ITA7). This included a definition of CE (i.e. 'impacts of planning actions affecting the same component/receptor'), the identification of direct and indirect planning actions that could potentially affect the same component (e.g. population, local economy, landscape), and the prediction of likely positive and negative CE through a coaxial matrix (e.g. positive synergistic effect on landscape due to new building regulations and urban renewal or incremental increase of traffic due to new skiing areas and housing for

Table 4. Treatment of uncertainty.

Information on uncertainty	SA/SEA reports
External drivers (e.g. lifestyle and personal choice, macro-economy, role of other policies, etc.)	ENG1, ENG2, ENG3, ENG7, ITA3, ITA6, ITA7, ITA8
The way in which a policy will be implemented (including compensation and mitigation)	ENG1, ENG2, ENG3, ENG4, ENG7, ENG8, ITA3, ITA4, ITA6, ITA7, ITA8, ITA9
Speculation (incomplete/missing baseline data, lack of available research, etc.)	ENG2, ENG7, ENG10, ITA6
Land use changes, transportation and spatial distribution of new developments	ENG2, ENG7, ENG8
Borough-wide issues (e.g. climate change, air quality)	ENG4, ENG7, ENG8, ENG10, ITA3, ITA4
Long-term consequences (unemployment, air quality, protected areas, etc.)	ENG3, ENG4, ENG7, ITA4
Indirect consequences (e.g. enhancing green infrastructures may contribute to encouraging cycling and walking and then improve health)	ENG3, ENG4, ENG7, ITA3, ITA4, ITA6, ITA7
Combined effects (increasing of air pollution due to loss of open spaces and increased traffic)	ENG4, ENG7, ENG10, ITA3, ITA7
Spatial distribution of impacts (e.g. noise)	ENG1, ENG4, ENG7, ITA4, ITA6

winter tourism). Other methods were applied to predict indirect and combined effects in other SEAs, varying from qualitative descriptions (ITA1), to semi-quantitative matrix-based assessments (ITA3, ITA4, ITA5, ITA7), quantitative aggregated indices (ITA2, ITA8), and map overlays and spatial multi-criteria analysis (ITA6, ITA9, ITA10).

5. Conclusions and recommendations

This paper confirms that spatial planning SEA in Italy and England is currently dealing with cumulative effects only to a rather limited extent. In particular, we found that:

- CE issues were treated poorly in SEA scoping in both England and Italy. Their identification was generally vague both at local and regional level, regardless of the availability of supporting manuals (which, generally speaking, is much greater in England than in Italy). This means there is a risk further down the assessment process that CE will subsequently not be considered for all but only for specific environmental issues.
- The assessment of CE was only partially undertaken when considering options/alternatives in both England and Italy. CE were either identified after preferred options were selected (particularly in England) or not explicitly addressed at all (as was mostly the case in Italy). Moreover, reasonable alternatives were rarely based on assumptions about the likely implementation of management measures envisaged to cope with CE (see Section 4.2). Due to SEA practice not being proactive enough in considering different ways to deal with CE, important options can be missed. This was particularly the case of likely positive CE arising, for instance, from small enhancements (e.g. cumulative effects of enhancement measures), which were found to be completely neglected in current SEA practice, despite an opportunity of spatial plans to deal with individually minor effects in a cumulative manner.
- The objective-led approach generally adopted in order to analyse and predict CE in English SA practice appears to often lead to a disregard of relevant environmental consequences arising from minor issues due to a scarce evidence-base perspective; it also appears to steer the assessment away from relevant environmental components. This seems to confirm the risk of a weaker environmental focus when SEA is integrated into SA (Morrison-Saunders and Fischer 2006, Thérivel *et al.*, 2009).
- CE were rarely identified or assessed in a structured way in Italian SEA practice. This seems to stem from the lack of conceptual and methodological approaches to support their treatment. However, among the wide variability of methods found in Italian SEA reports, aggregated and spatially aggregated indices (e.g. dashboard index, maps), composed by a core set of semi-quantitative

indicators seemed to be particularly useful in predicting and mapping combined effects on a specific issue/area (e.g. mobility, risk, neighbourhood) as well as on the environment. This relied chiefly on the zoning-based perspective of local Italian land use plans, whose SEA mostly concerns the assessment of small future land use changes.

- CE were considered mainly in qualitative ways in both Italy and England. This means that there is a risk that predictions relying upon professional judgement may be affected by greater subjectivity and uncertainty, requiring greater consensus of stakeholders and the public. And this seems to apply more to the flexible and ‘deliberative’ planning contexts found in England.
- The combined effects of small developments on relevant environmental aspects (i.e. air quality, landscape, biodiversity, energy and climatic factors) were among the best addressed CE issue in SEA for spatial planning. This suggests that SEA for spatial planning has the opportunity to improve the treatment of multi-scale CE by addressing their assessment and management at different spatial planning levels and instruments. An important role seems to be played by regional-level SEA, which has the remit to potentially address tiered environmental priorities (e.g. establishment of CE issues for sub-areas); resource-based targets and indicators (e.g. land-take threshold); methods appropriate to scales (e.g. scenario analysis, SWOT, suitability analysis, MCA); and operational measures (e.g. compensation mechanisms, responsibility’s contracts). A better management of CE through more effective coordination between multi-level spatial plans can be achieved for both, Italian and English practice. However, in order to attain a more effective cooperation among different planning authorities and stakeholders, key issues to be considered are likely to be different in Italy and England, as the role played by different planning authorities and stakeholders differ substantially, depending on, for example, the remit of planning issues (e.g. urban development is traditionally determined by the local level in Italy); the administrative organization (centralized in England and federal in Italy); and the decision-making system (more deliberative in England).

Based on these findings, this research has identified three main areas of improvement to the assessment of CE in SEA of spatial plans. These consist of:

- better scoping of CE issues;
- the need for future-oriented approaches;
- more effective spatial planning tiering.

General recommendations are given for each of these below.

5.1 Scoping of CE issues

The scoping phase plays a crucial role for CE assessment, as this is when SEA should integrate environmental thinking early on into plan-making. Only through appropriate scoping are key issues identified early on (Cooper and Sheate 2004, Thérivel and Ross 2007, Fischer and Philip-Jones 2008), including trends (e.g. increased emissions from transport, increased flood risk, loss of biodiversity) and planned future actions (e.g. means of implementation of policies). Resource-based thresholds (e.g. for flooding areas, income-deprived households, or maximum allowable land-take) or potential mitigation and monitoring indicators can also be identified. Finally, scoping allows for other planned actions or other planning levels/sectors that may cumulatively contribute to CE to be considered, and suitable operational mechanisms to manage CE (e.g. compensation schemes, mitigation responsibilities) to be identified early.

As a result, SEA scoping can provide for an early discussion of both, environmental and policy contexts concerning CE issues, in particular through stakeholders' consultation and participation (e.g. environmental agencies, planning authorities, NGOs, public). It may thus play a key role in detecting small-scale effects, defining shared priorities and addressing multi-level responsibilities.

5.2 The need for future-oriented approaches

SEA should adopt a more future-oriented approach in order to be able to deal with uncertainty and cumulative consequences better. This suggests that assumptions on the implementation of alternative management measures could be introduced in SEA practice in order to support spatial plans (a) to explore reasonable alternatives and (b) to compare CE resulting from their implementation. According to Canter and Atkinson (2010) this could further support spatial plans to adopt a more adaptive management approach. Adaptive options can be of an operational, regulatory, or fiscal nature. This could include integrating environmental compensation targets in building regulations in order to control flood risk; promote renewable energy and energy efficiency (as found in ITA3, ITA4, ITA6, ITA8, ITA9, ITA10); or identify planning tools to avoid negative and enhance positive cumulative consequences (e.g. Local Transportation Plan, Building Regulations, Land Reclamation Programmes, as found in ITA3, ITA4, ENG1, ENG2). Finally, in order to improve management of uncertainty, the CE resulting from the implementation of planning alternatives can be analysed under changing external conditions, which are among the most cited sources of uncertainty (see Section 4.3).

5.3 Addressing CE through more effective tiering

Considering other tiered² actions and their contributions to CE on specific aspects has been said to be a methodological challenge (Canter and Ross 2010, Cooper 2011). The findings presented in this paper indicate that

the combined effects of small developments on relevant environmental aspects (i.e. air quality, landscape, biodiversity, energy and climate factors) were among the best addressed CE issue in SEA for spatial planning. In order to support the management of these individually minor but collectively significant effects, SEA should support more effective tiering, by addressing assessment tasks for different levels of the spatial planning hierarchy (see Fischer 2003) and proposing inter-tier frameworks in order to better manage CE across different levels of planning and decisions.

Finally, achieving more effective tiering for the management of CE can contribute to avoiding replications among different assessment levels and tools (e.g. SEA of local spatial plans, Habitats Regulation Assessment) as recommended by the EU SEA Directive.

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Notes

1. These are the main stages at which SEA documentation is prepared.
2. Earlier in this paper, the term 'tiering' was used within the spatial planning realm to mean among different levels of instruments (including SEAs) and governments. Here it is used more in the way usually intended in the environmental assessment literature, namely a way of linking EIA and SEA (see Arts *et al.* 2010).

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Appendix 1. List of English and Italian SEA reports consulted

ID	Plan	SA/SEA document	Date
ENG1	Regional Spatial Strategy for the South East (South East Region)	Final Revisions and Final South East Plan – Sustainability Appraisal Report	May 2009
ENG2	Regional Spatial Strategy for East of England (East of England Region)	Review of the East of England Plan – Integrated Sustainability Appraisal Report	March 2010
ENG3	Local Development Framework of Wigan (North West Region)	Core Strategy ‘Preferred options’ Sustainability Appraisal Report	May 2009
ENG4	Local Development Framework of London Borough of Haringey (London Region)	Core Strategy ‘Preferred options’ Sustainability Appraisal Report	May 2009
ENG5	Local Development Framework of Test Valley Borough (South East Region)	Core Strategy ‘Preferred options’ Sustainability Appraisal Report	January 2008
ENG6	Local Development Framework of Croydon (London Region)	Scoping Report	December 2008
ENG7	Local Development Framework of St. Helens (North West Region)	Core Strategy Publication Draft Development Plan Sustainability Appraisal Report	April 2009
ENG8	Local Development Framework of East Hertfordshire (East of England Region)	Core Strategy ‘Issues and Options’ Sustainability Appraisal Report	April 2010
ENG9	Local Development Framework of Maidstone Borough (South East Region)	Scoping Report	March 2006
ENG10	Local Development Framework of South Cambridgeshire (East of England Region)	Core Strategy Final Sustainability Appraisal Report	January 2006
ITA1	Provincial Spatial Coordination Plan of Forlì-Cesena (Region: Emilia Romagna)	Provincial Spatial Coordination Plan – SEA Environmental Report	2005
ITA2	Provincial Spatial Coordination Plan of Milan (Region: Lombardia)	Provincial Spatial Coordination Plan – SEA Environmental Report	2002
ITA3	Review of Provincial Spatial Coordination Plan of Cremona (Region: Lombardia)	Review of Provincial Spatial Coordination Plan – SEA Environmental Report	2009
ITA4	Review of Provincial Spatial Coordination Plan of Mantova (Region: Lombardia)	Review of Provincial Spatial Coordination Plan – SEA Environmental Report	2010
ITA5	Provincial Spatial Coordination Plan of Foggia (Region: Puglia)	Provincial Spatial Coordination Plan – SEA Environmental Report	2006
ITA6	Local Spatial Plan of Acerra (Region: Campania)	Local Spatial Plan – SEA Environmental Report	2008
ITA7	Local Spatial Plan of Madesimo (Region: Lombardia)	Local Spatial Plan – SEA Environmental Report	2004
ITA8	Review of Local Spatial Plan of Falconara Marittima (Region: Marche)	Local Spatial Plan – SEA Environmental Report	2006
ITA9	Local Spatial Plan of Ferrara (Region: Emilia Romagna)	Local Spatial Plan – SEA Environmental Report	2008
ITA10	Local Spatial Plan of Monopoli (Region: Puglia)	Local Spatial Plan – SEA Environmental Report	2007