

Strategic environmental assessment implementation of transport and mobility plans. The case of Italian regions and provinces

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Abstract

Transport and mobility plans imply strategies and actions that affect the environment. The European Union has introduced in 2001 the strategic environmental assessment (SEA) to take into account and mitigate adverse environmental effects in planning and decision-making. SEA limited implementation has attracted the interest of many scholars that have sought methods able to assess the quality of SEA processes by identifying vices and virtues in practice. In this paper, we measure the quality of eight SEAs for transport and mobility plans of regional and provincial administrations of Italy. Results show that the overall quality level of SEA reports is only barely sufficient, Abruzzo is among the virtuous and Piedmont among the critical administrations. We also stress that the determination of impact significance has received the worse quality score. We finally compare our results to other Italian and British homologous cases finding interesting and generally confirmative evidences.

Introduction

Strategic environmental assessment (SEA) is a mandatory tool to ascertain the impacts of certain plans and programs over the environment. SEA is valuable as it integrates sustainability in decision making and planning. This procedure was introduced by the directive 2001/42/EC (hereinafter, Directive) (European Commission, 2001). In the panorama of the reception of the Directive by Member States, Italy published three legislative decrees: n. 152 in 2006, n. 4 in 2008, and n. 128 in 2010 (Italian Regulation, 2006, 2008, 2010). Furthermore, since the introduction of SEA the Italian planning practice has opened to a number of changes in order to tackle a number of critical issues, such as direct, indirect, and cumulative impact definition, public participation, alternative generation, and monitoring. As a consequence, many researchers have turned their attention to SEA implementation quality in a variety of sectors and administrative levels (De Montis, 2014, 2013).

Transport and mobility plans constitute a prominent and challenging sector of SEA application (Corpade *et al.*, 2012). The design, construction, and management of infrastructures and the implementation of mobility policies interfere with the environment generating impacts that deserve specific analyses above the project level in planning and decision-making processes (Sheate, 1992). Nevertheless, there is still much work to do in order to fully integrate SEA in transport and mobility planning for a number of issues including public consultation and monitoring (Tomlinson, 2011). According to a number of scholars, SEA implementation quality depends on a series of concerns including general context, impact definition, and follow up (De Montis *et al.*, 2014). In many cases, studies investigate SEA focusing on the SEA report, the most important document concerning the integration of environmental concerns into the approval procedure of a plan.

In this paper, we assess the quality of SEA reports developed in eight transport and mobility plans approved by regional and provincial administrations of Italy. We follow a methodology proposed by Fischer (2010) and modified by De Montis (2014) and designed to assess the effectiveness of the SEA reports with respect to a review package that includes questions regarding many relevant implementation issues. The argument unfolds as follows. In the next section, we introduce some reflections on SEA implementation for transport and mobility plans, present the methodology adopted for assessing the quality of SEA reports, describe the legislative context, and introduce the eight transport and mobility plans selected. In the subsequent section, we present and discuss the results of our analysis by comparing our results to other four homologous international cases. In the last section, we summarize and critically review the main findings of this paper.

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See online Appendix for additional Tables.

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Materials and methods

Strategic environmental assessment for transport and mobility plans

The Directive has introduced SEA in Europe with a mandatory deadline of July 21, 2004 for the integration in the juridical systems of Member States (European Commission, 2001). The process of ratification has shown a great heterogeneity in time and procedures across Europe (De Montis, 2014; De Montis *et al.*, 2014). Italy has approved the Legislative Decree n. 152 in 2006, also known as *Environmental code* (Italian Regulation, 2006). Because this act presented many pitfalls and interpretative doubts, the Italian State has later approved two legislative decrees - n. 4 in 2008 and n. 128 in 2010 (Italian Regulation, 2008, 2010) - which have clarified many issues and completed the reception of the Directive in Italy.

SEA introduction in planning processes implies not only a formal adherence to regulations but namely the attainment of a higher efficiency, with respect to environmental concerns, and an effective capacity to influence political decisions, deliberative actions, and plan approval and management (van Doren *et al.*, 2013). In this respect, a good SEA process is based on a wide and open public participation (IAIA, 2002; Fischer and Gazzola, 2006; European Commission, 2009; Van Buuren and Nooteboom, 2010; Gauthier *et al.*, 2011). According to Corpade *et al.* (2012), public participation enhances transparency of both SEA process and its results. According to many authors (Brokking *et al.*, 2004; Diamantini and Geneletti, 2004; Corpade *et al.*, 2012), SEA report is a fundamental document including: i) a description of relevant interactions of the plan under scrutiny with the environment; ii) an analysis of the status *quo ante* of the environmental components (biodiversity, population, health, soil, water, air, cultural heritage, landscape, *etc.*); iii) an evaluation of direct, indirect, cumulative and synergic impacts of the plan on the environment; iv) an indication of measures able to mitigate and compensate the impacts; and v) a prevision on the development of the monitoring phase. In transport planning, some regulations concerning the design of mobility infrastructures in areas not interested by agricultural production and soil protection are specifically addressed to the mitigation of negative impacts (European Commission, 2001; Corpade *et al.*, 2012).

The White Paper on the future development of the common transport policy is one of the earliest documents released by the European Commission that takes into consideration the relationships between transport planning and environmental impacts (European Commission, 1992). In this respect, according to Decision No 884/2004/EC amending Decision No 1692/96/EC on Community guidelines for the development of the trans-European transport network (European Commission, 2004), projects of new transport infrastructures are subject to the environmental impact assessment (EIA) procedure introduced by Directive 1985/337/EEC (European Commission, 1985) while plans and programs above those projects must conform to the SEA procedure. The European Commission (1999, 2005) has released specific guidelines concerning SEA implementation in transport planning and designed to: i) prevent the environmental impacts

and delays in transport infrastructure implementation; ii) exclude highly impacting alternatives, which would imply very expensive mitigation measures; iii) prevent social conflicts, generated by the implementation of transport plans, by improving environmental public awareness and by directly and indirectly involving citizens.

According to many authors (Brokking *et al.*, 2004; Fischer, 2006; Corpade *et al.*, 2012), the assessment of environmental effects brought by a new transport infrastructure should develop through different decisional tiers. First, SEA should be implemented on transport policies, plans and programs and provide the framework for succeeding EIA procedures of programmed transport projects (Diamantini and Geneletti, 2004).

In Table 1, we outline the tiers of environmental assessment of the many documents leading to the design and realization of transport infrastructures. At the high level, SEA is used to focus on the valuation of transport European, national or local policies, according to a multi-sector approach involving economic, social, and transport themes. At the Intermediate level, plans and programs are subject to SEA with a finer attention to mobility demand and transport means choice. At the low level, projects of transport infrastructures are evaluated through EIA procedure, where specific local, environmental, social, and economic costs and benefits are investigated.

According to Sheate (1992), SEA is useful especially for the analysis of long-term policies, as it allows planners to choose knowingly by taking into account in a harmonic perspective the interaction between mobility and transport strategies and environmental and landscape components.

Central element in SEA implementation for transport and mobility planning is a correct definition of the environmental objectives. The attainment of those objectives should be assessed through qualitative measures and thresholds (Sheate, 1992).

As reported in Table 2, several authors have studied environmental objectives of SEAs developed for national transport plans in Europe (Sheate, 1992; Fischer, 1999, 2006; Jansson, 1999; Brokking *et al.*, 2004; Diamantini and Geneletti, 2004; Hildén *et al.*, 2004; European Commission, 2005; Corpade *et al.*, 2012; Finnveden and Åkerman, 2014).

According to Brokking *et al.* (2004), Sweden has taken into account environmental effects of transport plans since the 1990s, when a very similar procedure was developed even before the approval of the Directive. Brokking *et al.* (2004) observe that although this procedure was ground-breaking in Europe, it was usually activated in the last stages of the approval process of a plan thus too late for a correct analysis of the environmental concerns. Diamantini and Geneletti (2004) have analysed SEA implementation of the mobility plan approved by the autonomous province of Trento, Italy. They found that the SEA process was based on speculations instead of qualitative analyses. Fischer (2006) has proposed a framework for the assessment of SEA implementation for transport and mobility plans in the United Kingdom. This framework includes descriptive and quantitative measures and constitutes the starting point for drafting guidelines on SEA implementation in the transport sector. In the next section, we present some methods able to assess the quality of SEA implementation.

Table 1. The different tiers in environmental assessment: focus, tool, and key concepts.

| Decisional level | Focus | Tool | Key concepts |
|------------------|-----------------|------|---|
| High | Policies | SEA | Interplay between transport and environment, economics, industrial development, <i>etc.</i> |
| Intermediate | Plans, Programs | SEA | Mobility demand and analysis of transport infrastructures and corridors |
| Low | Projects | EIA | Economic and environmental costs and benefits of transport infrastructures |

SEA, strategic environmental assessment; EIA, environmental impact assessment.

Measuring the efficiency of strategic environmental assessment: methodological issues

Scientific literature on SEA, in general, and on SEA effectiveness, in particular, is very rich. Some authors have scrutinized qualitative indicators for measuring SEA effectiveness. Fischer and Gazzola (2006) propose two groups of criteria for the Italian SEA practice: the first one regards institutional and participative procedures; the second one reliability and control of focussed, iterative, flexible and informed processes. Jiricka and Pröbstl (2008) study SEA implementation on municipal master planning in Alpine states interviewing the public officials involved. They focus on the following SEA stages: screening, scoping, environmental report, consultation, and follow-up. Noble (2009) examines the Canadian SEA system adopting 15 criteria grouped into three areas under these concepts: SEA system, process, and outcomes. De Montis (2013) studies SEA implementation within provincial strategic spatial planning in Italy by developing two questionnaires about general and special aspects.

The quality review package (QRP) of SEA report has been completed by five academic experts in the field (Appendix Table 1). The grading system is based on a quantitative lettered scale from A to G that has been translated in quantitative terms according to a scheme proposed by De Montis (2014) and Fischer (2010) and reported in Appendix Table 2.

The QRP of SEA report has been applied so far in a variety of contexts. Fischer (2010) studied SEA report quality of 117 municipal spatial plans in the UK. Fischer *et al.* (2011) applied the QRP to twenty-five municipal water management plans in the UK. Fischer (2012) applied the same methodology to the assessment of seven local transport plans in the UK. Finally, De Montis (2014) applied a modified release of the QRP of SEA report to measure the performance of eight energy plans in Italy.

Selection of eight transport and mobility plans in Italy

In Italy, the central government has devolved to regional administrations and local bodies the approval of local transport and mobility plans (Osservatorio Città Sostenibili, 2014). In the Italian planning system, the regional transport and mobility plan (RTMP) is the main instrument directed to the definition of public transport policies.

RTMPs' drafting and management obey the principles of current juridical regulations including law n. 151 approved in 1981 (Italian Regulation, 1981) and Legislative Degree (LD) n. 422 approved in 1997 (Italian Regulation, 1997) (Table 3).

Guidelines for the design and management of RTMPs have been indicated at the national level in the general plan of transport and logistic (GPTL) approved in 2001 (Italian Regulation, 2001). The GPTL indicates objectives, constraints, methodologies, and strategies for transport planning over regional administrations and specifies that RTMPs should not be conceived as mere summation of infrastructure designs, but as a systematic plan aiming at integrating a variety of transport modalities and encouraging modalities that lead to lower environmental impacts.

We selected a set of eight RTMPs (Table 4) recently designed and approved according to SEA regulations. We chose those plans that local administrations provided with a complete documentation (including SEA reports) in their institutional websites. Information was collected between May and June 2014.

The SEA sample regards local administrations for an area of about 125,800 square km (roughly 40% of the total extension of Italy) and about 27 million people (about 45% of the total Italian population as of December 31, 2013). In Figure 1, we illustrate the geographical location of the administrations involved.

Following a scheme proposed by De Montis (2014) for the analysis of SEA reports of energy plans, in Table 5 we report on the SEA reports of

Table 2. Environmental objectives of national transport plans in Europe.

| State | Environmental objectives |
|----------------|---|
| Finland | Reduction of transport demand, increase of sustainable mobility, reduction of negative effects of transport on the environment Maintain GHG emissions at 1990's level Reduction of NOx emissions Reduction of PM10 emissions and risks over health Prevent new forms of traffic pollution and reduction of citizens' exposure to dangerous substances Reduction of population living in noisy (>55 dB) areas Rational use of natural resources by containing land use Defence of natural resources (soil, air, water, <i>etc.</i>) preventing their pollution Preservation of biodiversity |
| United Kingdom | Preservation of natural resources minimizing negative impacts over the environment Reduction of pollution in superficial and ground waters Reduction of population exposure to pollution and increase quality of life |
| Austria | Reduction of GHG emission, energy consumption, and air pollution Reduction of land use Reduction of the impact over protected areas Reduction of the impact over recreational areas Annulment the risk of pollution of water resources Reduction of impacts over landscape and diminution of the fragmentation |
| Germany | Reduction of transport costs Reduction of transport time Increase of transport security Increase of infrastructure level Increase of environmental quality Protection of natural resources and landscape |

GHG, greenhouse gas.

transport and mobility plans with respect to the following characteristics. *Year* refers to the date of approval or adoption of the SEA report. *Objectives* concerns the aims declared in that document. *SEA regulation* stands for the law ruling the procedure. *SEA process* informs on the proposed technical procedure, *Landscape and environmental analysis* on the ecological components considered, and *Environmental assessment method* on the most relevant tools adopted in the study. *Alternatives* section verifies the correct development and assessment of different alternative scenarios, and *Mitigation strategies* refers to the explanation of suitable actions for diminishing the impacts over the environment. Finally *Consultation* concerns the description of the measures developed for encouraging experts' and public participation, and *Follow up* the illustration of the monitoring system and report for assessing the impact of plans over time.

The eight RTMPs have been recently approved as the dates of approval always fall in the 2010s. The most recent one has been approved by Lombardy region (2014). RTMPs' objectives range from the development of transport infrastructure (for Abruzzo and Friuli Venezia Giulia) to sustainable mobility (for Lombardy) and the enhancement of accessibility (for Emilia Romagna). Each local administration has developed the SEA process according to a specific regional law. In some cases (see Emilia Romagna and Lombardy), these laws rule SEA processes of plans and programs belonging to various sectors including spatial and land use planning. The SEA reports describe a variety of processes involving SEA prescribed phases, such as description of context, impact assessment, generation and analysis of the alternatives, description of mitigation strategies, monitoring, and follow up. The emphasis of SEA reports is mostly directed to the analysis of environmental components (air, water, soil), while some cases (Friuli Venezia Giulia) develop on the impact over landscapes and cultural heritage. The methodologies adopted for the assessment of environmental

impacts are often based on indicators drawn from international guidelines (Abruzzo) and actions/components matrices (Emilia Romagna, Lombardy, and Trento). The authors of the SEA reports have directed the study to the assessment of at least two alternative scenarios, with



Figure 1. Location of the local administrations included in this study.

Table 3. Italian regulation of regional transport planning.

| Act | Tasks of regional administrations |
|-----------------|--|
| Law n. 151/1981 | i) Definition of regional transport and mobility policy according to the National Transport General Plan ii) Design of RTMP according to spatial and regional development principles iii) Adoption of long term programs of investment and local public transport management |
| LD 422/1997 | i) Definition of guidelines for local transport planning and in particular for Provincial Transport Plans ii) Design and update Regional Transport Plans taking into account the needs of local administrative bodies (provinces, metropolitan areas, etc.), and other sector plans iii) Creation of a mobility network based on the integration of various transport modalities and on the diminution of environmental impact |

RTMP, regional transport and mobility plan.

Table 4. Selected regional transport plans by administration and denomination.

| Public administration | Autonomous province | Denomination in Italian (and in English) |
|-----------------------|---------------------|---|
| Abruzzo | | <i>Piano regionale integrato dei trasporti</i> (Regional transport integrated plan) |
| Apulia | | <i>Piano regionale dei trasporti piano attuativo 2009-2013</i> (Regional transport detailed plan) |
| Emilia Romagna | | <i>Piano regionale integrato dei trasporti - PRIT2020</i> (Regional transport integrated plan) |
| Friuli Venezia Giulia | | <i>Piano regionale delle infrastrutture di trasporto, della mobilità delle merci e della logistica</i> (Regional plan of transport infrastructure, mobility, freight, and logistics) |
| Lombardy | | <i>Piano regionale della mobilità ciclistica</i> (Regional cycling mobility Plan) |
| Marche | | <i>Piano Regionale del trasporto pubblico locale</i> (Regional local public transport plan) 2009-2019 |
| Piedmont | Trento | <i>Piano regionale per la logistica</i> (Regional plan of logistics) <i>Piano stralcio della mobilità collegamento San Martino di Castrozza - Passo Rolle</i> (San Martino di Castrozza - Passo Rolle mobility plan) |

Table 5. Comparative synopsis of the strategic environmental assessment reports examined.

| Administration | Year | Objectives | SEA regulation | SEA process | Landscape and environmental analysis | Environmental assessment method | Alternatives | Mitigation | Consultation strategies | Follow-up |
|-----------------------|------|--|------------------------|--|---|--|---|--|---|--|
| Abruzzo | 2010 | Infrastructure network development, sustainable public transport service management | RL 27/2006 | Coherence analysis, description of the context, assessment of the environmental effects, analysis of the alternatives, mitigation and compensation, monitoring | Focus on atmosphere, energy, and waste management | Indicators inspired to the SEA manual (see DG TREN, 2005), TERM (2007), and EEA (2008) | Three alternatives have been referred to four territorial areas | Four mitigation measures including strengthening local public transport and streamlining existing road infrastructures | Consultation performed at the early stages and inside the process | Monitoring indicators adopted in the scoping phase are confirmed |
| Apulia | 2010 | Characteristics, interrelationships, and priorities of (land, sea, and air) transport infrastructures | RL 44/2012 | Description of the context, identification of sustainability goals, internal and external coherence, impact assessment, monitoring | Detailed context analysis based on empirical fieldwork | Environmental indicators able to measure the achievement of sustainability objectives | Two alternatives are assessed with respect to three scenarios | Some mitigation measures regard water and soil | Consultation performed since the early stages | Based on indicators for monitoring sustainability and planning objectives |
| Emilia Romagna | 2012 | Improving accessibility and integrating a sustainable mobility system | RL 9/2008, RL 20/2000 | Coherence analysis, description of the context, impact assessment, monitoring | General environmental assessment, and specific SWOT analysis of environmental components | Coaxial matrices on the relationships between objectives, activities, risks/opportunities, and impacts | No alternative | No mitigation measure | Based on permanent thematic working groups | Monitoring matrix including scores referred to a set of environmental indicators |
| Friuli Venezia Giulia | 2011 | Increasing regional transport system competitiveness through high quality infrastructures and services | RL 11/2005, RL 13/2009 | Preliminary impact assessment, external coherence analysis, description of the context and analysis of zero option (no plan) scenario, monitoring | Focus on environment, landscape, and culture. Adoption of descriptive tables of site of community importance and special protection areas | Adoption of checklists and matrix of impact concerning the study of action/component interplay | Two alternatives: zero option and proposed plan | Water treatment, waste management, construction of green areas | Consultation performed since the early stages | Based on environmental indicators identified in the early stages |
| Lombardy | 2014 | Facilitating and promoting a sustainable approach to transports for work and leisure activities | RL 12/2005 | Coherence analysis, description of the context, impact assessment, consultation, follow up and monitoring | Focus on air, water, soil, landscape and cultural goods | Action/component assessment matrices | Two alternatives: zero option and proposed plan | Mitigation measure introduced in general terms will be detailed later on | Based on evaluation conferences, and a public forum | Monitoring reports to be released every three years |
| Marche | 2011 | Adjusting the supply of regional local public transport to the expected demand for mobility | RL 6/2007 | Consultation, integration of environmental concerns, follow up, and monitoring | Selection of relevant environmental issues, identification of highly vulnerable areas | Actions/components impact matrices. Focus on the assessment of direct impacts on atmosphere | No alternative | Mitigation measures are defined in general terms. Lower level SEA procedures will define the details | Consultation performed since the early stages | Based on three sets of indicators about plan implementation, current and future state of the environment. Monitoring reports are to be released every five years |

Continued on next page.

Table 5. Continued from previous page.

| Administration | Year | Objectives | SEA regulation | SEA process | Landscape and environmental analysis | Environmental assessment method | Alternatives | Mitigation | Consultation strategies | Follow-up |
|----------------|------|---|------------------------------------|---|--|--|---|---|---|---|
| Piedmont | 2010 | Integrating transport systems, developing regional logistics | RL 40/1998 | Defining planning objectives in relation to environmental concerns, consultation process, construction of alternatives, monitoring, hypotheses of evolution | General overview, description of the environmental characteristics | Environmental component analysis, identification of critical issues. Analysis of positive and negative externalities | Three alternatives: no plan, planning proposal, and intermediate proposal | No mitigation measures | Consultation performed since the early stages | Monitoring and processing a set of environmental and performance indicators every two years |
| Trento | 2010 | Planning and scheduling an alternative transportation system form San Martino di Castrozza to Passo Rolle | Provincial laws 10/2004 and 1/2008 | Context analysis, description of alternatives, impacts assessment, follow up, monitoring | Focus on air, noise, water, soil, vegetation, wildlife, ecosystems, landscapes, energy and waste | Adoption of matrix to assess environmental impacts | Ten alternatives are considered | Seven mitigation strategies are planned | - | Focus on: state of environmental, environmental performance of the plan, environmental effects, and effective achievement of the environmental objectives |

SEA, strategic environmental assessment; RL, regional law; SWOT, strength, weakness, opportunity and threats analysis.

the exception of Emilia Romagna and Marche (no alternatives). In some cases (Abruzzo, Apulia) alternatives have been referred to different geographical areas or scenarios. With the exception of Emilia Romagna and Piedmont, SEA reports indicate mitigations strategies in either general or specific terms. Abruzzo proposes streamlining existing road infrastructure, while Friuli Venezia Giulia the construction of green areas. Consultation has often been activated since the early stages of planning processes (Abruzzo, Apulia, Friuli Venezia Giulia, Marche). Piedmont and Trento have not led any public participation. Monitoring and follow up are prominent activities that have always been developed. In some cases, monitoring has involved the adoption of environmental indicators selected since the scoping phase (Abruzzo, Friuli Venezia Giulia). In some other cases (Lombardy, Marche, Piedmont) SEA reports focus on the opportunity to release periodically monitoring reports (Provincia Autonoma di Trento, 2004, 2008, 2010; Regione Abruzzo, 2006, 2010; Regione Emilia Romagna, 2000, 2008, 2012; Regione Friuli Venezia Giulia, 2005, 2009, 2011; Regione Lombardia, 2005, 2014; Regione Marche, 2007, 2011; Regione Piemonte, 1998, 2010; Regione Puglia, 2010, 2012).

Results

This section focuses on the results of the application of the QRP of SEA reports introduced in section 3 of Appendix Table 2. In Table 6, we present the scores of each question of the package for each RTMP. The average score (5.90) indicates that the quality level of the eight SEA reports is barely sufficient. This value originates from figures ranging from discrete scores (higher than 7) attributed to Abruzzo, Apulia, Friuli Venezia Giulia, and Lombardy, to poor scores (lower than 5) assigned to Piedmont and Trento. The average scores of sections 1 and 2 (premises of SEA report) have values well above the sufficiency level, while the other sections are evaluated well below the sufficiency level (see the case of section 3 regarding the determination of impact significance).

The scrutiny of the scores by section provides the reader with a more precise picture. Section 1 has a discrete performance (average score of 7.20), which originates from a good description of environmental concerns and sustainability objectives (Abruzzo and Friuli Venezia Giulia). The average score reported for section 2 (identification and evaluation of key issues/options) is above the sufficiency level (6.57). Abruzzo's report excels among all the other reports, while the other administrations show a lower attention to the alternatives' definition. Marche has been assigned the lowest score in both sections 1 and 2.

The average score of section 3 (determination of impact significance) is below the sufficiency level (4.91). Questions 21, 22, and 23 concerning, inter alia, duration, frequency, reversibility, synergistic nature of the effects on the environment have received the lowest scores (on average, slightly above 3). With the exception of Friuli Venezia Giulia, the SEA reports do not take into account trans-frontal impacts properly. The consultation process (section 4) has not received a sufficient attention (the average score is slightly below the sufficiency threshold, 5.50). Unexpectedly Emilia Romagna, Piedmont and Trento do not pay a sufficient consideration for public consultation albeit their reputation. These performances are partly balanced by the high scores received by Friuli Venezia Giulia, Lombardy, and Marche. Unsurprisingly the presentation of information and results (section 5) is also slightly less than sufficient (5.48). The overall scores' range is remarkable: Marche scores well, while Emilia Romagna and especially Piedmont do much worse. The most critical concerns are on average for question 33 regarding the provision of information on any difficulties and uncertainties encountered in compiling the required information.

In the same way, the average score for section 6 (recommendations on preferred options and monitoring) is slightly below the sufficiency level (5.48). The lowest average score has been assigned to question 39 concerning the maximization of the beneficial effects. In this respect, Abruzzo and Apulia both received 7; Piedmont and Trento only 2 and 1.

In Figure 2, we use a spider graph to illustrate the results of the analysis of the average scores obtained for each of the six sections of the QRP of the SEA reports. The disposition of the lines allows to immediately detecting strengths and weaknesses: sections 1 and 2 receive fairly good scores, while section 3 much lower values. In addition, the extension of the area bounded by the lines is proportional to the overall score attributed to each section in the QRP.

Discussion

This section reviews the results that we have obtained from the application of the QRP with the aim to detect strengths and weaknesses of SEA practice for transport and mobility plans. In addition, because the methodology that we have applied has been put into practice in other sectors and countries, we compare the results obtained in this paper with those elaborated by other scholars for Italian energy plans, British spatial plans, local transport plans (LTP), and municipal waste management plans (MWMP) (Fischer, 2010; Fischer *et al.*, 2011; Fischer, 2012; De Montis, 2014).

Table 6. Quality review package results of the eight strategic environmental assessment reports.

| Section | Questions | Administrations | | | | | | | | Average values | | Section |
|----------------|-----------|-----------------|--------|----------------|-----------------------|----------|--------|----------|--------|----------------|---------|---------|
| | | Abruzzo | Apulia | Emilia Romagna | Friuli Venezia Giulia | Lombardy | Marche | Piedmont | Trento | Questions | Section | |
| 1 | 1 | 10 | 10 | 10 | 10 | 10 | 7 | 6 | 9 | 8.86 | 7.20 | |
| | 2 | 10 | 10 | 10 | 10 | 8 | 7 | 4 | 7 | 8.00 | | |
| | 3 | 7 | 10 | 5 | 9 | 7 | 4 | 3 | 3 | 5.86 | | |
| | 4 | 6 | 10 | 5 | 9 | 7 | 4 | 3 | 1 | 5.57 | | |
| | 5 | 10 | 10 | 10 | 10 | 10 | 8 | 6 | 7 | 8.71 | | |
| | 6 | 10 | 10 | 6 | 10 | 7 | 1 | 6 | 8 | 6.86 | | |
| | 7 | 10 | 6 | 6 | 10 | 10 | 10 | 4 | 8 | 7.71 | | |
| | 8 | 10 | 8 | 8 | 10 | 10 | 6 | 8 | 7 | 8.14 | | |
| | 9 | 10 | 8 | 8 | 6 | 6 | 1 | 2 | 7 | 5.43 | | |
| | 10 | 9 | 9 | 7 | 9 | 8 | 5 | 4 | 6 | 6.86 | | |
| 2 | 11 | 10 | 8 | 8 | 6 | 8 | 1 | 8 | 7 | 6.57 | 6.57 | |
| | 12 | 10 | 8 | 10 | 10 | 8 | 10 | 10 | 7 | 9.00 | | |
| | 13 | 10 | 8 | 8 | 6 | 6 | 10 | 6 | 6 | 7.14 | | |
| | 14 | 10 | 10 | 6 | 8 | 9 | 1 | 5 | 7 | 6.57 | | |
| | 15 | 10 | 8 | 8 | 7 | 8 | 1 | 2 | 6 | 5.71 | | |
| | 16 | 10 | 10 | 6 | 4 | 6 | 5 | 8 | 1 | 5.71 | | |
| | 17 | 10 | 8 | 6 | 8 | 7 | 1 | 5 | 4 | 5.57 | | |
| | 18 | 10 | 8 | 7 | 7 | 7 | 4 | 6 | 5 | 6.29 | | |
| 3 | 19 | 7 | 8 | 6 | 9 | 8 | 6 | 8 | 4 | 7.00 | 4.91 | |
| | 20 | 7 | 8 | 6 | 8 | 8 | 10 | 8 | 5 | 7.57 | | |
| | 21 | 6 | 6 | 5 | 2 | 3 | 1 | 3 | 3 | 3.29 | | |
| | 22 | 7 | 2 | 6 | 3 | 7 | 3 | 3 | 1 | 3.57 | | |
| | 23 | 2 | 2 | 2 | 8 | 5 | 1 | 2 | 1 | 3.00 | | |
| | 24 | 7 | 6 | 6 | 8 | 9 | 1 | 2 | 3 | 5.00 | | |
| | 25 | 7 | 8 | 6 | 7 | 7 | 1 | 2 | 6 | 5.29 | | |
| | 26 | 6 | 5 | 5 | 6 | 6 | 3 | 4 | 3 | 4.57 | | |
| 4 | 27 | 6 | 8 | 2 | 7 | 8 | 10 | 2 | 1 | 5.43 | 5.50 | |
| | 28 | 6 | 10 | 2 | 10 | 7 | 10 | 4 | 1 | 6.29 | | |
| | 29 | 5 | 2 | 2 | 9 | 9 | 10 | 2 | 1 | 5.00 | | |
| | 30 | 5 | 6 | 2 | 8 | 8 | 10 | 2 | 1 | 5.29 | | |
| 5 | 31 | 10 | 6 | 6 | 7 | 8 | 8 | 2 | 7 | 6.29 | 5.71 | |
| | 32 | 7 | 6 | 5 | 7 | 9 | 10 | 4 | 6 | 6.71 | | |
| | 33 | 6 | 6 | 5 | 2 | 2 | 10 | 2 | 9 | 5.14 | | |
| | 34 | 2 | 2 | 2 | 8 | 10 | 10 | 2 | 1 | 5.00 | | |
| | 35 | 6 | 5 | 4 | 6 | 7 | 9 | 2 | 5 | 5.43 | | |
| 6 | 36 | 7 | 7 | 5 | 7 | 8 | 1 | 2 | 6 | 5.14 | 5.48 | |
| | 37 | 7 | 6 | 5 | 8 | 8 | 1 | 2 | 6 | 5.14 | | |
| | 38 | 7 | 10 | 7 | 8 | 9 | 6 | 2 | 5 | 6.71 | | |
| | 39 | 7 | 7 | 6 | 6 | 6 | 5 | 2 | 1 | 4.71 | | |
| | 40 | 6 | 6 | 6 | 9 | 9 | 6 | 2 | 4 | 6.00 | | |
| | 41 | 6 | 7 | 5 | 7 | 8 | 3 | 2 | 4 | 5.14 | | |
| Average values | | 7.66 | 7.27 | 5.85 | 7.54 | 7.59 | 5.39 | 3.95 | 4.63 | 5.90 | | |

Table 7. Comparison of strategic environmental assessment report quality review package results obtained in a variety of cases.

| Section | Key word | Sector plan and country TMP, Italy | EP, Italy | SP, UK | LTP, UK | MWMP, UK |
|---------|----------------|---------------------------------------|-----------|--------|---------|----------|
| 1 | Baseline | * | ** | * | * | ** |
| 2 | Evaluation | * | * | * | ** | ** |
| 3 | Significance | *** | *** | *** | *** | *** |
| 4 | Consultation | ** | ** | ** | *** | ** |
| 5 | Presentation | ** | ** | ** | *** | ** |
| 6 | Recommendation | ** | *** | *** | *** | ** |

TMP, transport and mobility plan; EP, energy plans; SP, spatial plans; LTP, local transport plans; MWMP, municipal waste management plans. *Above sufficient; **barely sufficient; ***insufficient average score. Data from Fischer, 2010, 2012; Fischer *et al.*, 2011; De Montis, 2014.

Concerning the first issue, the analysis of the average values of the scores reported in Table 6 indicates that the first two sections concerning the premises of the SEA report receive judgments well above the sufficiency level. Section 3 on the determination of impact significance receives the worst scores, while sections 4, 5, and 6 show barely sufficient average scores.

Secondly, we provide the reader with an overview of the average scores reported in each section of five cases where the QRP of SEA reports has been applied (Table 7). We adopt a qualitative scoring system able to convey synthetic information on the average scores with respect to the sufficiency level.

The results obtained in this paper are similar to those of the other four cases listed in Table 7. With the exception of baseline and evaluation analyses (sections 1 and 2), the remaining sections receive barely sufficient or worse average scores. In every case study, the worst average scores - below the sufficiency level - are associated to section 3, where SEA reports define, assess and measure the significance of impacts generated by plans over the environment. This is quite a disappointing evidence, as impact evaluation, by definition, constitutes the core of SEA procedures. In particular, SEA report quality level proves insufficient with respect to the definition and measurement of synergic and cumulative effects of impacts occurring simultaneously on the same environmental systems, and of trans-frontal consequences of impacts acting on the environment of a given administration. Average scores for section 1 are above the sufficiency level in three cases and are just on that level for the remaining two cases. The same happens for section 2 but for a different set of plans. The consultation stage (section 4) has been judged as barely sufficient for all the cases with the exception of LTP in the UK, that has been evaluated as insufficient. The presentation of the results and information about the SEA process (section 5) follows the same outline of section 4: with the exception of LTP, in the UK, for all the remaining four cases they are barely sufficient. The last section 6 on final recommendation for decision-making is the second worst section of the package. In three cases, the average scores signal an insufficient attention to the final stage of SEA integration in the planning process.

Conclusions

In this paper we have studied SEA implementation in the sector of transport and mobility plans focusing on the quality of SEA reports. To assess the quality of SEA implementation we have adopted a method, *i.e.*, the Sea report QRP, that has allowed us to indicate strengths and weaknesses of SEAs in an international comparative perspective. We have selected eight SEA reports of transport and mobility plans approved by regional and provincial Italian administrations. After a

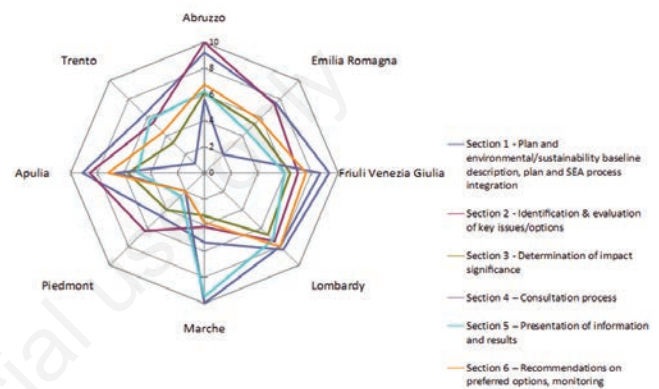


Figure 2. Spider graph representation of the average scores reported by the transport and mobility plans selected in each section. SEA, strategic environmental assessment.

qualitative description of the main characteristics emerging from the sampled SEA processes, we have assessed the SEA reports' quality and found results that generally confirm vices and virtues reported in other Italian and British homologous cases.

Results clearly show that the quality level of SEA reports of Italian transport and mobility plans is barely sufficient (average score is equal to 5.90). Abruzzo, Apulia, Friuli Venezia Giulia, and Lombardy have developed discrete SEA reports, while Piedmont and Trento much worse ones. An analysis of the average values by section points out that only sections 1 (on baseline premises) and 2 (about evaluation) are attributed values well above the sufficiency level. The other four sections are scored below the sufficiency level. Section 3 on the determination of impact significance is the most critical. A quite remarkable evidence, as the identification and assessment of impacts is at the heart of any environmental assessment exercise.

The comparison of our analysis with those of other studies broadly confirms that the results obtained in this study have a general value. Sections 1 and 2 about the preliminaries - *i.e.* baseline and evaluation analyses - represent generally virtuous aspects. The remaining sections are graded with barely sufficient or worse average scores. The worst average scores are again attributed to section 3, where SEA reports define, assess and measure the significance of impacts generated by plans over the environment.

The results of our study can be extended and become general statements on SEA report quality measured by section. In this respect, we

stress that SEA implementation in various sector plans is multifaceted. A first issue regards the variety of bodies in charge of sector plans including regional, provincial, and municipal administrations, which have sometimes completely different institutional frameworks and procedures. Regional administrations address broad strategies over usually wide areas, while municipal bodies are responsible of detailed and operative plans concerning specific actions, areas and communities. A second concern attains the variability of time span spent to develop SEA procedures that ranges from some months for MWMPs to several years for spatial plans or regional energy plans. SEA implementation is time consuming: processes lasting longer may have better chances to achieve a higher quality level. A third issue regards the variability in the number of questions included in the different applications of the QRP of SEA reports (minimum 38 for LTPs and maximum 55 for MWMPs). A fourth concern attains the subjectivity - typical of qualitative inputs - in the attribution of the scores expressed by different panels of experts belonging to a variety of technical and cultural contexts. With respect to subjectivity management, a sensitivity-driven analysis of the interviewees may reduce the outcomes' variability by linking it to interviewees' skills, such as previous institutional involvement in SEA processes, competence and training in SEA theory and practice. In future studies, we will focus on the solution of these critical issues in the perspective of more efficient applications of the QRP of SEA reports.

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