

Article

The Strategic Environmental Assessment as a “Front-Line” Tool to Mediate Regional Sustainable Development Strategies into Spatial Planning: A Practice-Based Analysis

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Abstract: The 2030 Agenda for Sustainable Development of the United Nations calls upon all signatory countries to localize its goals through National and Regional Sustainable Development Strategies (SDS). As in Italy the SDS constitute the framework of the Strategic Environmental Assessment (SEA) of Plans and Programmes (P/P), the question arises as to whether the SEA can represent a fundamental tool for SDS. Although the mutual relationship between 2030 Agenda goals and SEA is recognized in the literature, there is a lack of focus on SDS and SEA. The SEA monitoring system is an essential instrument to redirect P/P trajectories, although it represents a constant weakness of the SEA process. Opening a discussion about the relationship between SDS and SEA, the present contribution aims at assessing SEA monitoring potential in mediating the 2030 Agenda SDS’s objectives into P/P. To this end, the study delves into the SEA monitoring structure through a qualitative and comparative approach, the feasibility of which is illustrated by an application to a set of spatial plans. Results show both good potential and the criticalities of the SEA monitoring system, which allow us to outline practical inputs to update SEA monitoring guidelines and new paths to foster the mutual relationship between the SDS and SEA.

Keywords: 2030 Agenda; Sustainable Development Strategies; SDS; Strategic Environmental Assessment; SEA; monitoring systems; spatial planning

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1. Introduction

Signed in 2015 by all 193 member countries, the United Nations (UN) General Assembly’s Resolution on the 2030 Agenda for Sustainable Development represents a major milestone in delivering a shared global vision to “create the future we want in 2030” [1]. This vision is conveyed through 17 Sustainable Development Goals (SDGs) and 169 associated targets which are interrelated, universal, and indivisible, and which balance all the dimensions of sustainable development (economic, environmental, social) [1]. Goals and targets are assessed by a global indicator framework developed and monitored by an Inter-agency and Expert Group [2].

As the 2030 Agenda is “global in nature” and multidisciplinary [1], multiple levels of governance and collaboration across sectors are required to reach its goals. For this reason, the Agenda calls on not only the signatory countries to localize their goals, targets, and indicators, but also their regional and subregional frameworks, as these can play a significant role in facilitating the transition of sustainable development policies into concrete action [1].

Based on this call, two complementary and essential efforts are being concentrated on within the UN member states [3–6]: (1) the adaptation and implementation of the

global indicator framework, and the monitoring of the resulting national indicators; (2) the definition of the National and Regional Sustainable Development Strategies (SDS).

Italy is making progress in rooting 2030 Agenda principles. On one hand, the Italian National Institute of Statistics (Istat) has been implementing the UN global indicator framework since 2016 and has been publishing annual monitoring reports at national and regional levels since 2018 [7–12]. On the other hand, in December 2017 the National SDS was approved [13], followed by the Regional SDS. At the end of July 2022, 11 out of 19 Italian regions and the Autonomous Provinces of Trento and Bolzano-Alto Adige had approved a Regional SDS [14–16].

In accordance with the Italian Legislative Decree 152/2006 [17], the “Sustainable Development Strategies define the framework for Strategic Environmental Assessments [...]” (Art.34, comma 5) of Plans and Programmes (P/P) (e.g., spatial and sectoral plans), providing the criteria for aligning new policies to a consistent and systemic vision of sustainable development.

The role of the Strategic Environmental Assessments (SEA) as a mediator of sustainability objectives into P/P does not represent a new topic in literature [18–23]. Only a few years after its introduction by the European Directive 2001/42/EC to support environmental protection in the early decision-making phases of P/P [24], the SEA was already considered a promising tool for integrating environmental, social, and economic issues [23]. More recently, following the 2030 Agenda, the belief has taken shape that the SEA represents a valuable instrument for delivering its vision [22], for practical design, implementation, and aligning plans, programs, and policies to the SDGs [20], in addition to achieving the SDGs’ targets [21]. The SEA could act as a bridge between the SDGs and decision-makers and, particularly in resource-constrained situations, it may facilitate the integration of SDGs offering an implementation framework for monitoring and auditing [20].

Nevertheless, as it is mostly focused on the relationship between the SEA and the 2030 Agenda SDGs, the literature lacks attention to the more site-specific National and Regional SDS. A search performed with Web of Science and Scopus using as search terms the words “SEA” and “Sustainable Development Strategies”, or “Strategic Environmental Assessment” and “Sustainable Development Strategies”, produced a limited number of documents (Table 1, Table 2, Table A1). Despite some results considering the SEA as a valuable instrument for implementing SDS in planning [25,26], these are mostly characterized by a sector-based approach. None specifically addresses the SEA as a tool to support the 2030 Agenda SDS, and hence the review provided no meaningful results (Table 1, Table 2). There is a research gap in the potential of the SEA in mediating the 2030 Agenda SDS.

Table 1. Literature review results on Web of Science database.

Search number	Search terms	Filters			Quantitative results	Meaningful results
		Database ¹	Fields	Years		
1	"SEA" AND "Sustainable Development Strategies"	All	Topics	All	11	0
2	"Strategic Environmental Assessment" AND "Sustainable Development Strategies"	All	Topics	All	2	0

Web of Science allows the search for documents in five different databases: Web of Science Core Collection, KCI-Korean Journal Database, MEDLINE, Preprint Citation Index, and SciELO Citation Index. As the present study has considered all the above-mentioned databases, the label “All” has been specified in the column “Database”.

Table 2. Literature review results on Scopus database.

Search Number	Search terms	Filters			Quantitative results	Meaningful results
		Database ¹	Fields	Years		
1	"SEA" AND "Sustainable Development Strategies"	-	Article title, abstract, key- words	All	51	0
2	"Strategic Environmental Assessment" AND "Sustainable Development Strategies"	-	Article title, abstract, key- words	All	10	0

Unlike Web of Science, Scopus is not structured into further databases. Therefore, no more information needed to be included in the column "Database".

There is a profound difference between the 2030 Agenda and an SDS, and it is in this difference that lies the important role of the letter. Whereas the Agenda sets universal and deeply interrelated goals, not hierarchical by importance, an SDS makes evidence of the political will in setting priority targets in relation to the peculiarities or needs of the context. Therefore, some 2030 Agenda goals may not be deemed feasible [27].

As González Del Campo et al. [20] underline, the 2030 Agenda and the SEA are strongly interrelated; in the same way, the SDS and the SEA should be of mutual support. In a circular dynamic process, on one hand, the effectiveness of the SEA can be strengthened by the formal targets of the SDS, which could bind SEA objectives and prompt the SEA to negatively evaluate whether P/P do not contribute to the SDS, also setting serious compensatory prescriptions to reduce negative externalities and impacts. On the other hand, as stressed in the EU Directive 2001/42/EC [24] (Article 10), the SEA can formally mainstream the monitoring of SDS targets achievement through the monitoring system, and spur coherence of the plans' objectives with the SDS targets through external coherence analysis, pursuing the auditing of plans and SDS's objectives and their constant alignment. A rigorous monitoring measure could help to identify unexpected adverse events at an early stage and be able to undertake appropriate corrective actions to manage plans [24] (Art. 10, Comma 1) and SDS trajectories. For instance, if a regional SDS proposed a net-zero land take by 2040, anticipating the EU ambitious objective that sets the temporal horizon in 2050 [28], the SEA monitoring system and coherence analysis could force the redirection of P/P trajectories.

The relevance of monitoring for the success of the SEA is internationally acknowledged [29]; nevertheless, it has consistently been identified as a weakness [30–32].

Although the EU Directive 2001/42/CE [24] lays down the obligation to monitor the environmental effects of P/P implementation through the SEA monitoring system, it does not prescribe arrangements and methods, nor responsible bodies and frequencies of monitoring, completely devolving these fundamental aspects to the member states. Moreover, it does not require that the environmental effects are monitored directly, implicitly also allowing indirect monitoring through, for instance, pressure factors [31]. In addition, the guidelines on SEA Directive implementation released by the European Commission in September 2022 stress that "methods chosen should be those which are available and best fitted in each case to seeing whether the assumptions made in the environmental assessment correspond with the environmental effects which occur when the plan or programme is implemented, and to identifying at an early stage unforeseen adverse effects resulting from the implementation of the plan or programme" [31].

In their study, De Montis et al. [29] highlight that the SEA monitoring process is differently addressed by national and subnational guidelines. Some guidelines address the aim of monitoring, some address arrangements and methods, and some others address indicators or suggest the use of existing monitoring systems to avoid duplication and save resources. The general lack of specific guidelines for the SEA monitoring procedure has led to a mosaic of interpretations and actions [29,33,34].

Considering the above-mentioned issues, this paper aims at:

- i. Delving into the structure of the SEA monitoring system to assess its limits and potential in mediating the 2030 Agenda SDS's objectives into spatial planning.
- ii. Verifying the need for SEA-upgraded guidelines at EU/national level to reach an integrated monitoring of the SDGs.

The strength of the present contribution lies in the proposal of a methodological approach of wide applicability that allows the detection of the main criticalities and potentials of SEA monitoring systems, the feasibility of which is illustrated by the application to a set of spatial plans.

Detection of the criticalities and potentials of the SEA monitoring systems may provide new paths for fostering the mutual relationship between SEA and SDS and, therefore, the upgrade of SEA monitoring system guidelines at both the European and national levels.

Enhancing a new awareness of the role of SEA monitoring systems to evaluate the level of implementation of plans/strategies' objectives is fundamental for verifying the consistency of plans' objectives with those of the 2030 Agenda SDS as well as the achievement of the 2030 Agenda SDS objectives themselves.

2. Materials and Methods

For the analysis of SEA monitoring systems, the present exploratory study proposes a qualitative and comparative approach (Table 3).

Table 3. Methodological phases developed and followed in the present study.

Phase	Sub-phase
1. Selection	1.1. Identification of the context to analyze
	1.2. Identification of the policy framework and guidelines related to the SEA procedure
	1.3. Identification of the SDS of reference
	1.4. Identification of the existing spatial plans framework
	1.5. Identification of the spatial plans to analyze
2. Documentation collection and database setup	2.1. Collection of SDS constituent documents
	2.2. Collection of plans and SEA constituent documents
	2.3. Design of a reading grid to have a homogeneous view of the substantial documentation
3. Content analysis	3.1. Design of a yes/no flowchart to draw the profiles of the SEA monitoring systems
	3.2. Comparison among SEA monitoring systems profiles
4. Findings	4.1. SEA monitoring systems limits and potential to mediate SDS into spatial planning
	4.2. Recommendations for implementing SEA monitoring systems

The first phase (Selection) consists of the selection of the territorial and administrative context in which to identify the SDS, the spatial plans, and the SEA to analyze. Sub-phase 1.2 is essential to comprehend whether there are specific guidelines concerning the SEA monitoring system. The work by De Montis et al. [29] provides a useful framework for the analysis of the topics addressed by the SEA guidelines with respect to the monitoring phase. De Montis et al. [29] identify recurring themes: aims, the launch of the process, arrangements and methods, indicators, the release of the periodic report, and recommendations for the use of existing monitoring systems to avoid duplication and save resources. Hence, if available, the SEA guidelines of the selected context are analyzed by considering the above-mentioned themes. Sub-phase 1.4 serves to filter a homogeneous number of spatial plans to include in the study.

The second phase (Collection of documentation and database setup) consists of the collection of the constituent documents of the plans, and respective SEA, selected in the

first phase. The information gathered is organized into a reading grid to produce a homogeneous view of the substantial documentation. The reading grid is divided into two parts: one for the plan and one for the SEA's monitoring system information. Table 4 displays the information to be collected for each plan and SEA.

Table 4. List of information to be gathered about the spatial plans and their SEA.

Plan	SEA
<ul style="list-style-type: none"> • Local authority • Plan's name • Stage of plan's approval process (started, adopted, approved, published) • Brief description of plan's object area (location, territorial extent, population, number of municipalities) • Plan's objectives • Links to sources • Last access to links 	<ul style="list-style-type: none"> • Plan's name • SEA process identification number • Process starting and closing date • Monitoring system's information • Links to sources • Last access to links

The third phase (Content analysis) appraises the documents collected in the second phase through a qualitative approach. The qualitative approach draws a profile of the SEA monitoring systems. A profile is considered here as a characterization of the monitoring system focusing on aspects of interest, each of which is related to a specific question. The profile of an SEA monitoring system is therefore the result of the reading of the SEA document content through a set of questions. The flow-chart with the established questions is shown in Figure 1. In addition, the hierarchical structure of objectives/actions and indicators of some systems have been analyzed, and a comparative reading of the results has been made. By delving into the structure of the SEA monitoring systems, this phase aims at evaluating not only their limits but also their potential to mediate SDS objectives into spatial plans.

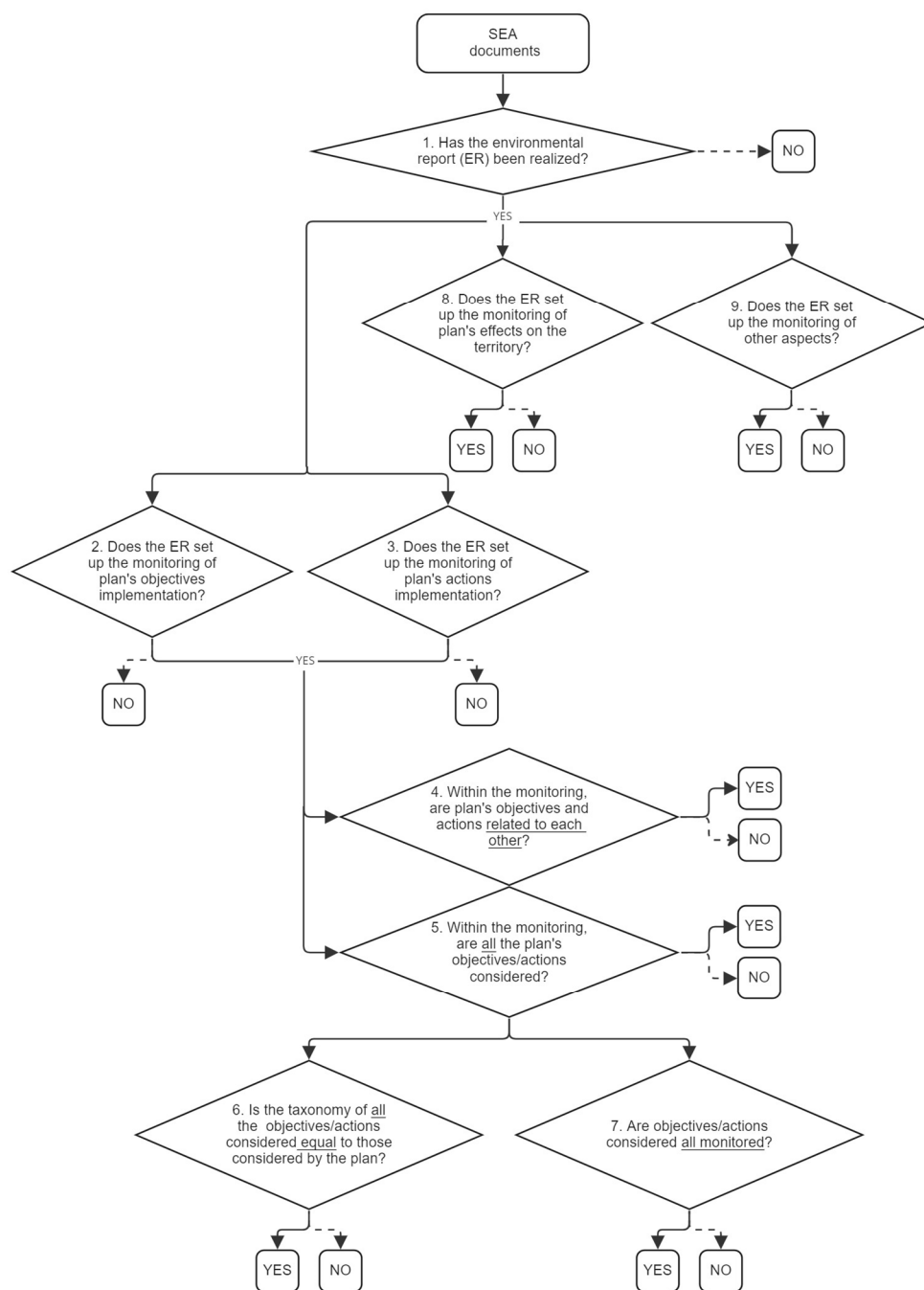


Figure 1. Flow-chart of the questions established for SEA monitoring system analysis. Source: author elaboration.

The fourth phase (Findings) consists of a discussion of the results obtained in the third phase. The aim is to provide useful insights to realize new guidelines for SEA monitoring systems and through them support the mutual relationship with the SDS of reference.

3. Results

Through the application of the above-mentioned methodology, this Section scrutinizes the SEA monitoring system of a set of spatial plans. Following the phases of the methodological approach (Table 3), this Section has been organized into two parts: Section 3.1 (Selection and Collection of documentation) identifies and describes the context and presents the set of spatial plans selected; Section 3.2 (Content analysis) presents and compares the profile of the SEA monitoring system resulting from the content analysis.

3.1. The Context, the Policy Framework Related to the SEA Procedure, the Sustainable Development Strategy of Reference, and the Spatial Plans Selected

3.1.1. Identification of the Context to Analyze

As recently highlighted by the European Commission, in Italy the monitoring system represents the weakest aspect of the SEA procedure [35].

Although the Italian Legislative Decree 152/2006 [17], which transposes the Directive 2001/42/CE [24], addresses the aim of SEA monitoring, it does not provide guidelines on how to structure it, devolving it to the SEA-competent local authorities [35] and leaving freedom of interpretation and action.

Hence, the present study intends to analyze the structure of the SEA monitoring system within the Italian context.

At the administrative level, Italy is structured into 19 regions and the Autonomous Provinces of Trento and Bolzano-Alto Adige (which have regional powers) (NUT 2) [36]. As each of them has adopted its own regulation and guidelines on the SEA procedure [37] (in compliance with the European Directive 2001/42/EC [24] and the Italian Legislative Decree 152/2006 [17]), it was deemed necessary to focus the analysis on one regional case study.

The Lombardy Region was selected to develop the analysis; it is located in northern Italy and extends for 23.863 km² [38] (Figure 2). With 9.97 million inhabitants, Lombardy is not only the Italian region with the largest population [38] but also represents one of the most densely populated regions in Europe [39], with a gross domestic product (GDP) higher than many EU regions and member states [40]. The population is primarily located along a central bend in which the main urban centers (e.g., the Metropolitan city of Milan, and the cities of Bergamo and Brescia) and the most economic and productive activities are concentrated. Intensive agricultural activity and livestock farming characterize the area to the south of the conurbation. As a result, environmental pressures in terms of GHG emissions as well as water pollution and land consumption are particularly high [12]. In such a context, the SEA process represents a paramount tool for environmental protection.

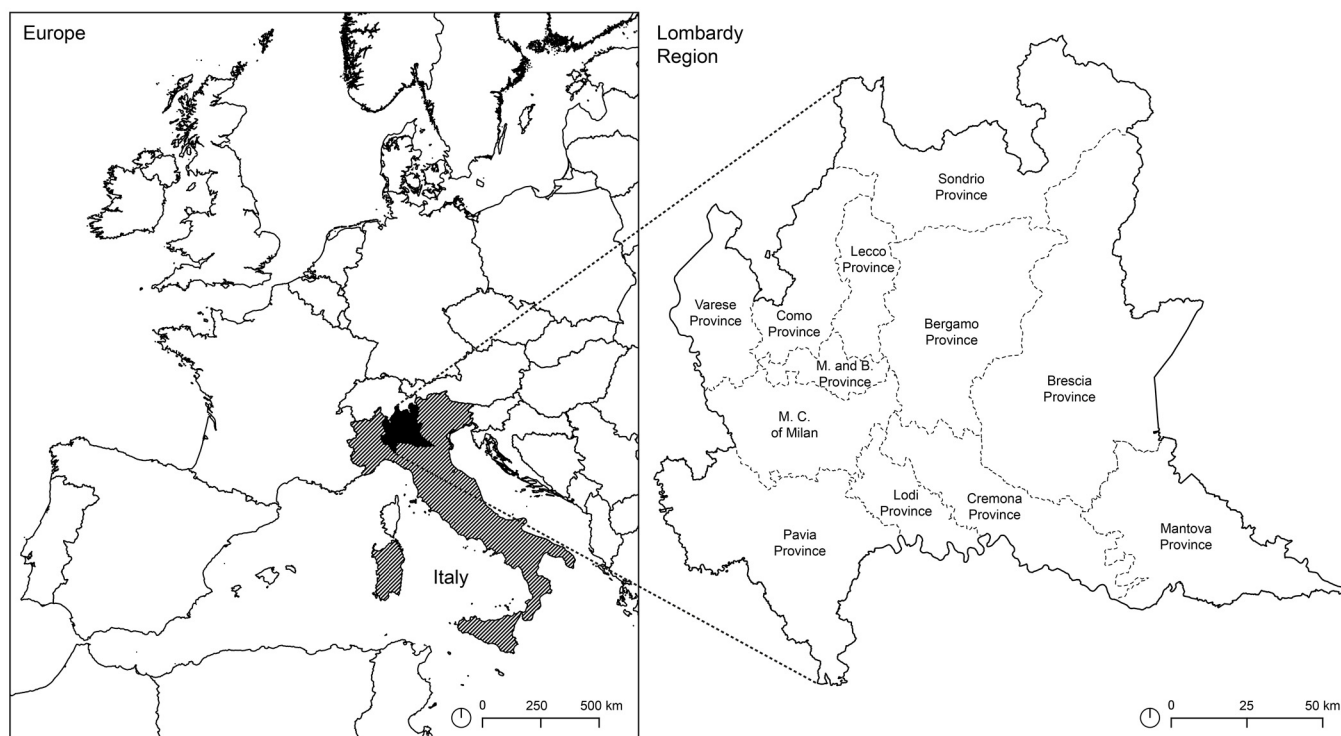


Figure 2. Location of Italy, Lombardy Region, and its provinces. Source: author elaboration on data from Istat and Eurostat.

The Lombardy Region has always been strongly proactive in addressing issues related to sustainable development: it has been among the first Italian regions not only to acknowledge the European Directive 2001/42/CE on SEA [24] (also before the transposition of the Directive by the National Law [17]) and to publish the Regional SDS [37,41], promptly in response to the 2030 Agenda call, but also to be committed in drafting SEA guidelines to support practitioners during the SEA process.

For all the above-mentioned aspects, some of which will be better addressed in the following paragraphs, the Lombardy Region is a representative case for analyzing the SEA monitoring systems.

3.1.2. Identification of the Policy Framework and Guidelines Related to the SEA Procedure

The Lombardy Region has acknowledged the principles of the European Directive 2001/42/EC [24] in 2005 through the Regional Law 12/2005 [42]. In addition, it has undertaken to define regional guidelines for the SEA process implementation.

The analysis of the guidelines, with particular attention to the monitoring phase, highlights that no monitoring methods, arrangements, or sets of indicators are suggested: they are devolved to the local competent authorities [37]. The only theme satisfactorily addressed is the aim of the monitoring process, although this has been amended over the years (Table 5).

In Annex 1 of the Resolution C.R. 13/03/2007 n. VIII/351 [43], the monitoring phase has been addressed as a “monitoring activity of the significant environmental effects arising from the implementation of plans and programmes, in order to provide the information necessary to assess the environmental effects of the actions implemented by the plan or programme by allowing the early detection of unforeseen adverse effects and being able to take the corrective measures considered appropriate”.

On the other hand, Annex 1 of the Resolution G.R. 10/11/2010 n. 9/761 [44] states that “during the plan management phase, the monitoring ensures the control of the significant

impacts on the environment resulting from the implementation of the approved plan or programme and the verification of the achievement of the fixed sustainability objectives, so as to identify unforeseen adverse impacts in time and take appropriate corrective action.”

Table 5. Themes concerning the SEA monitoring phase addressed by Lombardy Regional Law and SEA guidelines. Key: 😊 fair coverage; 😐 mere mention; 😞 absent coverage.

Document	A	B	C	D	E	F
Lombardy Regional Law 12/2005	😞	😞	😞	😐	😞	😞
Resolution C.R. 13/03/2007, n. VIII/351 and Annexes.						
Annex 1: general guidelines for the environmental assessment of plans and programmes	😊	😐	😐	😐	😐	😞
Resolution G.R. 10/11/2010, n. 9/761 and Annexes.						
Annex 1. Methodological, procedural, and organizational model of the environmental assessment of plans and programs (SEA). General model.	😊	😐	😐	😞	😐	😞

(A) Aims; (B) launch of the process; (C) arrangements and methods; (D) indicators; (E) release of the periodic report; (F) recommendation of use of existing monitoring systems to avoid duplication and save resources.

3.1.3. Identification of the SDS of Reference

Another reason that led to the choice of the region for this study is related to the Regional SDS. The Lombardy Region has been among the first Italian regions to have designed the Regional SDS [41,45], which has been approved in June 2021 and has already undergone an update published in June 2022 [46]. Lombardy Region SDS constituent documents are available online [47].

Moreover, the Region has renewed its commitment to sustainable development by presenting its Voluntary Local Review (VLR) at the High-Level Political Forum of the United Nations held in July 2022 [48].

3.1.4. Identification of the Existing Spatial Plans Framework

In Italy, the spatial and land-use planning system is organized into three main levels: regional, wider area (provinces and metropolitan cities), and municipal (local) [49]. Since the Lombardy is institutionally subdivided into 11 provinces and a Metropolitan City (the Metropolitan City of Milan) (NUT2), and more than 1.500 municipalities (LAU) [50], its main framework of spatial plans consist of: a Regional Territorial Plan (*Piano Territoriale Regionale, PTR*), 11 Provincial Coordination Territorial Plans (*Piani di Territoriali Coordinamento Provinciale, PTCP*), the Metropolitan Territorial Plan (*Piano Territoriale Metropolitan, PTM*) of the Metropolitan City of Milan, and the Local Development Plans (*Piano di Governo del Territorio, PGT*), as defined by the Regional Law 12/2005 [42].

3.1.5. Identification of the Territorial Plans to Analyze

In the first instance the study has selected the regional and provincial Territorial Plans for their strategic, holistic, and coordinating nature, and the territorial extension that they address. Hence, the present contribution focuses on the analysis of the SEA monitoring system of 13 Territorial Plans (Table 6, Table A2).

Table 6. List of the analyzed Territorial Plans.

Territorial Level	Territorial Plans	Approval year
Regional	Piano Territoriale Regionale (<i>PTR</i>)	2022
Provincial	<i>PTCP</i> of Como Province	2006
	<i>PTCP</i> of Varese Province	2007

<i>PTCP</i> of Lodi Province	2009 ¹
<i>PTCP</i> of Sondrio Province	2010
<i>PTCP</i> of Cremona Province	2013
<i>PTCP</i> of Brescia Province	2014
<i>PTCP</i> of Lecco Province	2014
<i>PTCP</i> of Pavia Province	2019 ²
<i>PTCP</i> of Bergamo Province	2020
<i>PTM</i> of the Metropolitan City of Milan	2021
<i>PTCP</i> of Monza and Brianza Province	2022
<i>PTCP</i> of Mantova Province	2022

¹Not yet approved: the adoption year is reported. ²Not yet adopted: the procedure starting year is reported.

As the Lombardy Region requires all the constituent documents of the spatial plans and their SEA procedure to be uploaded online, information for the analysis has been collected by consulting the online databases *PTCPWEB* (provincial planning information system that collects the digital format of the *PTCP* carried out or in place in the Lombardy region) and *SIVAS* (information system that collects the SEA procedures of P/P carried out or in place in the Lombardy Region), as well as the online institutional portals of individual local authorities (Appendix B).

3.2. SEA Monitoring Systems Profiles and Comparisons

Answers to the questions identified in the methodology to draw a profile of the SEA monitoring systems (Figure 3) of the 13 Lombardy Regional Territorial Plans (*PTCP*) revealed a heterogeneous and complex context.

Although mandatory by law, not all the analyzed plans were supported by a SEA. Because the *PTCP* of Como Province was approved before the Legislative Decree 152/2006 [17] that transposed the European Directive 2001/42/CE [24] on the SEA procedure, the Province of Como has not started a SEA process, meaning that neither the SEA environmental report nor the monitoring procedure were designed at that time (question 1 of Figure 1). Not having undertaken any subsequent update of the plan, the Province of Como is the only province of the Lombardy Region that has not realized the SEA of its Territorial Plan. Consequently, only 12 Territorial Plans and SEA have been analyzed (Figure 3).

Substantial differences have been detected regarding what the monitoring systems assess (questions 2,3,8, and 9). On one hand, monitoring systems evaluating the effects of the plans on the territory have been identified (Lombardy Region, Brescia Province, Pavia Province, and Bergamo Province). On the other hand, some monitoring systems evaluate the level of implementation of the plan's objectives/actions (Sondrio Province and Cremona Province), while others assess both the level of implementation of the plan's objectives/actions and plan effects on the territory (Varese Province, Lodi Province, Lecco Province, Milan Metropolitan City, Monza and Brianza Province, Mantova Province). Lastly, some systems evaluate also other aspects (Lombardy Region, Lecco Province, Monza and Brianza Province, Mantova Province). For instance, the SEA monitoring of Mantova Province also assesses the evolution of the environmental context with respect to the sustainability objectives defined by the plan. The SEA monitoring system of the Lombardy Region *PTR*, instead, focuses on: (i) the assessment of the progressive adaptation of provincial and municipal planning to the provisions of the regional regulatory framework concerning land consumption; (ii) the assessment of the environmental impacts of land consumption control; (iii) the verification of changes in the quality of the regional landscape; yet no monitoring process to evaluate the implementation of the plan's objectives/actions has been set up. Also noteworthy is the Province of Lecco's monitoring process which, although assessing various aspects, does not explicate which of its 39 indicators are "effect indicators" (thus monitoring the plan's environmental effects), which are "process

indicators" (monitoring the plan's objectives/actions implementation), and which are "descriptive indicators" (monitoring the evolution of the territorial context).

Of the environmental reports with systems monitoring the level of implementation of plans' objectives/actions (thus 8 out of 11), just 3 monitoring systems consider all the objectives defined in the plans' constituent documents (Lodi Province, Sondrio Province, Mantova Province) (question 5), whereas 3 do not consider all the objectives (Lecco Province, Monza and Brianza Province, and Milan Metropolitan City).

Moreover, in the monitoring systems of Sondrio and Mantova Provinces, taxonomic inconsistencies were detected among the objectives considered in environmental reports and in the plans' constituent documents (question 6). It is noteworthy that, with respect to the coherence of the objectives between plans' constituent documents and the monitoring systems, considerations could not be made for 2 out of 11 monitoring systems (Varese Province, Cremona Province) as documents did not provide enough information.

Nevertheless, all the objectives/actions considered within the environmental reports resulted in being evaluated by all the monitoring systems (question 7).

Delving deeper into the monitoring processes set up by the SEA procedures to evaluate the level of implementation of plans' objectives/actions, further differences in the monitoring arrangement can be detected. In fact, some systems have a hierarchy of objectives/actions and indicators structured into three levels:

- General objectives/specific objectives/priority and support indicators (Province of Cremona);
- Topic/general objective/indicators (Province of Varese);
Other systems are organized into two levels:
- General objectives/process indicators (Province of Lecco);
- General objectives/macro-indicators and sector indicators (Province of Lodi);
- Actions/indicators (Province of Sondrio);
- General objectives/process (or performance or response) indicators (Metropolitan City of Milan);
- General objectives (in some cases, specific objectives)/performance indicators (Provinces of Monza and Brianza);
- General objectives/performance priority and support indicators (Province of Mantova).

It is remarkable the heterogeneity of the nomenclature used not only to define the levels of the objectives but also the indicators, which are all aimed at monitoring the level of implementation of the plan's objectives/actions.

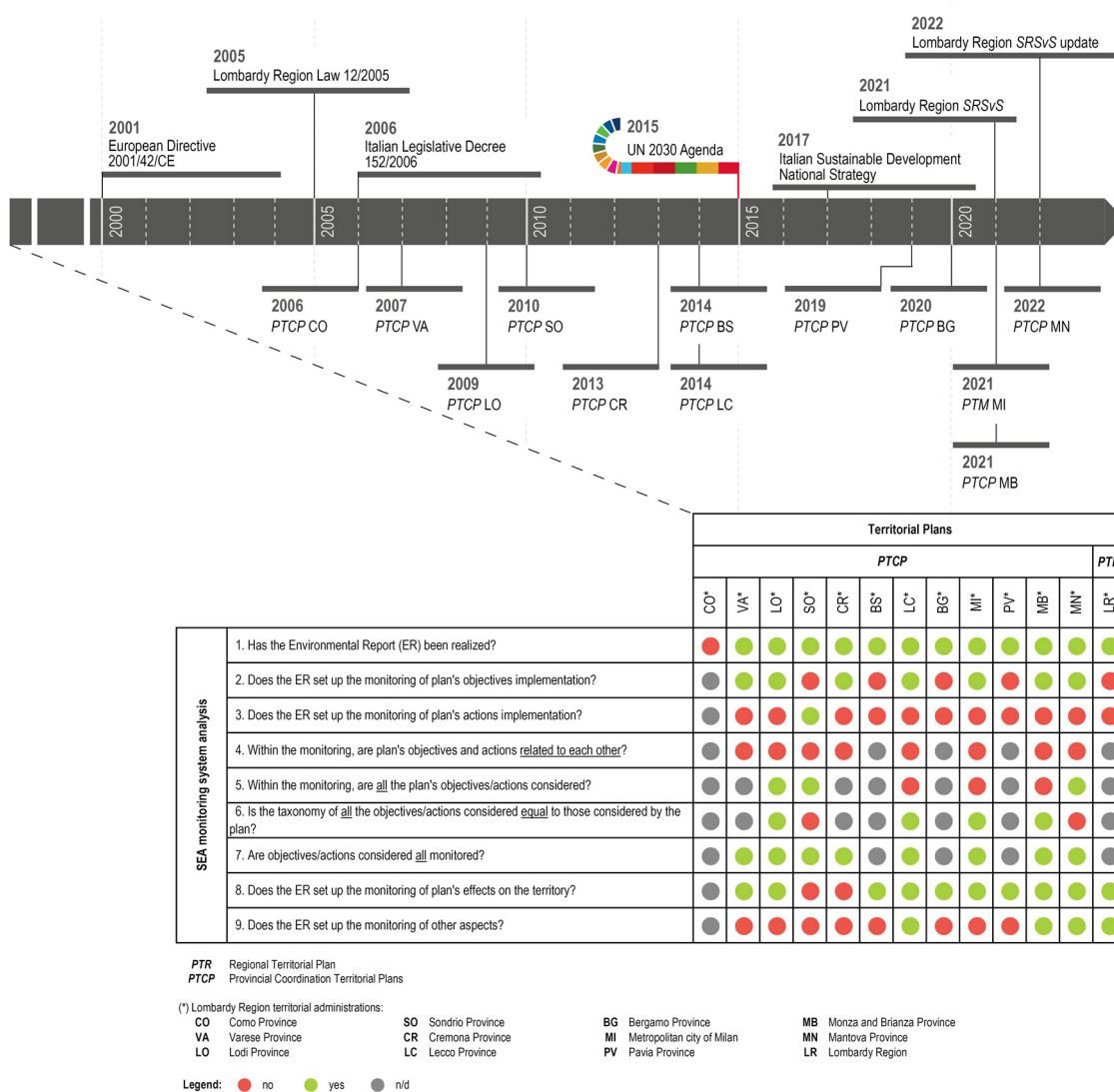


Figure 3. SEA monitoring systems profiles.

4. Discussion

Following the phases of the methodological approach (Table 3), this Section (Findings) has been conceived into two main parts: Section 4.1 addresses the first research question exploring the limits and potential of the SEA monitoring system in mediating the 2030 Agenda SDS's objectives into spatial planning; Section 4.2 addresses the second research question by putting forward key recommendations to implement the SEA monitoring system guidelines and to reach an integrated monitoring of the 2030 Agenda SDS objectives. Section 4.3 stresses study limitations and potentials, and further research paths.

4.1. Limits and Potential of the SEA Monitoring System

Because the Strategic Environmental Assessment (SEA) of Plans and Programmes (P/P) is already in place in all European countries, it is uniquely positioned to incorporate and deliver the 2030 Agenda for Sustainable Development considerations into development planning and decision-making [21,22].

Although particular attention has recently been paid to this issue [20], only a few attempts to align the SEA process with the National and Regional SDS can be found in the literature.

The Government of Canada has recently required its departments to update the SEA procedure of internal policies and operational processes to track and monitor the goals and targets of the Federal Sustainable Development Strategy (FSDS) [51]; nevertheless, P/P are still not mentioned.

To localize the Regional Strategy of Sustainable Development of the Italian Sardinia Region, the municipality of Cagliari developed a procedure that gives high relevance to the assessment, through the SEA monitoring systems, of the impacts of masterplan's actions and their coherence with the Regional Strategy of Sustainable Development [52].

There seems to be a certain inertia in acknowledging the important potential of SEA in mediating the objectives of the more site-specific National and Regional Sustainable Development Strategies (SDS) into P/P.

The present contribution clearly stresses that the SEA monitoring system is still profoundly underestimated. It is quite apparent that the inadequate development of a structured methodological framework has determined a multiplicity of operational responses [33] depending mainly on the skills and competencies of the practitioners to take important methodological decisions.

In fact, results reveal a profound heterogeneity of the structure of the SEA monitoring systems of the 13 Territorial Plans analyzed for the Italian Lombardy Region (Section 3.2).

Issues detected through the development of the SEA monitoring systems profiles are discussed below:

1. A first major limitation concerns what the monitoring systems assess. Different aspects are monitored: the plan's environmental impacts, the level of implementation of the plan's objectives/actions, or other topics. It is interesting that, although mandatory by law, some monitoring does not measure the environmental impacts of the plans and, instead, assesses only the level of implementation of their objectives/actions (Sondrio Province and Cremona Province).

Despite the heterogeneity, eight monitoring systems clearly manifest the will to evaluate the level of implementation of the objectives/actions of the plans (Sondrio Province, Cremona Province, Varese Province, Lodi Province, Lecco Province, Milan Metropolitan City, Monza and Brianza Province, Mantova Province), stressing the potential ability of the SEA monitoring system to mediate SDS objectives into P/P.

2. Nevertheless, it is important to stress that the above-mentioned monitoring systems assessing the level of implementation of the objectives/actions of the plans present criticalities.

There is a lack of consistency between objectives and action: beginning with the higher-level objectives (the more general ones), if one asks the question "How this objective is achieved?", a clear answer cannot be given in any of the monitoring systems. An approach that formulates a clear priority ranking of more specific objectives is preferable in the monitoring of a P/P. This because the hierarchy gives a sense of logical interconnection and mutual consistency, allowing identification of the interrelationships between general objectives of different levels and specific objectives and actions, and to systematically establish the priorities [53].

Furthermore, there is strong heterogeneity in the articulation of the objectives and indicators set within the monitoring procedures. Some monitoring systems are articulated into three levels (Cremona Province and Varese Province), and others into two (Lecco Province, Lodi Province, Sondrio Province, Metropolitan City of Milan, Monza and Brianza Province, Mantova Province). Within the two above-mentioned clusters, there are differences in terms of content. For instance, although both are articulated into three levels, the SEA monitoring process of the Province of Cremona is structured into general objectives, specific objectives, and priority and support indicators; however, the monitoring of the Province of Varese is structured into topics, general objectives, and indicators, and no specific objectives are mentioned.

Moreover, with no explanation provided by the documents, sometimes not all of the plan's objectives are considered by the monitoring system (Lecco Province, Monza and Brianza Province, and Milan Metropolitan City).

Taxonomic inconsistencies can also be found among the objectives considered in the monitoring and in the plans' constituent documents, denoting a certain superficiality in designing the monitoring.

Lastly, there are differences in terms of indicator usage. Although all measure the level of implementation of the plan's objectives, in some cases the indicators are "performance indicators" (Provinces of Monza and Brianza, Province of Mantova, and the Metropolitan City of Milan); in other cases, they are "process indicators" (Province of Lecco, Metropolitan City of Milan), "response indicators" (Metropolitan City of Milan), or simply "indicators" (Province of Cremona, Province of Varese).

4.2. Key Recommendations to Implement SEA Monitoring System Guidelines and Reach an Integrated Monitoring of the 2030 Agenda SDS Objectives

The introduction of the 2030 Agenda and its goals, which stresses the importance of coherence between sustainable development policies, makes this a historical moment which is particularly suitable for acting on the integrated monitoring of sustainability objectives.

The recent update of the Italian Legislative Decree 152/2006 [17], which in 2021 introduced within the SEA process the monitoring of the level of implementation of plans' objectives/actions and the evaluation of their contribution to the achievement of the environmental sustainability objectives defined by the National and Regional SDS (Art. 18, comma 3-bis), and the publication in July 2022 of the latest update of the Lombardy region SDS, which is aware of the potential of SEA monitoring process to support the SDS [46], may find adequate responses in new SEA monitoring guidelines. Nevertheless, no recent operational guidelines on how to arrange the SEA monitoring process have been yet provided at the Italian or Lombardy regional level.

As stressed by de Montis et al. [29], guidelines should be regularly updated to reflect changes in planning and SEA experience; thus, it is now an imperative obligation to draft revised documents, for which the analysis carried out within this contribution may be of great support.

Considering the limitations and the potential of the SEA monitoring system stressed in Section 4.1, future guidelines should address the following main issues:

1. They should clearly outline which aspects the SEA monitoring system must monitor. The SEA monitoring system should always assess not only the plan's impacts on the environment, but also the level of implementation of the plan's objectives. All plans' objectives and actions should be monitored. In addition, it is paramount that the integrated reading approach introduced by the 2030 Agenda also roots in the SEA monitoring system to provide a homogeneous reading of the contexts, and to assess the achievement of the SDS objectives.

As financial limitations always restrict the scope of a monitoring program and data collection, it is necessary to simplify and minimize the existing monitoring tools, thereby integrating them. Integrating the assessment of the 2030 Agenda and the related SDS within the SEA monitoring system would avoid the design of new procedures that could cause not only excessive costs but also the unnecessary layering of tools.

2. They should also clearly outline how the considered aspects should be monitored. As it is already recognized that SEA monitoring can be realized using standard indicators (set out by legislation or otherwise) as well as using indicators defined at the sub-national/regional level [32], it would seem appropriate to seek the standardization of the monitoring process. Despite the fact that contexts can vary deeply and can require different processes for implementing the actions of the plans, the methods to interpret them could be the same: some monitoring indicators can be common to all the SEA

monitoring systems applied to the same type of P/P. Common sets of indicators may serve to evaluate the territorial context and the achievement of the Regional SDS objectives, allowing useful comparative readings. These could be considered “priority indicators”, while “support indicators” may be added depending on the plan, giving enough flexibility to the process. The “priority indicators” could be then subdivided into “context indicators” and “distance-to-target indicators”. The first would provide a reading of the contexts through the monitoring of those sets of indicators defined at national and regional levels, preferably using indicators set up by the national statistics institutions to localize the 2030 Agenda global indicator framework. The second would assess the achievement of the Regional SDS objectives, drawing from the principles recently proposed by the Organisation for Economic Co-operation and Development (OECD) to measure the distance to the SDG targets [54]. Guidelines should therefore educate about the role and aim of “priority indicators”, “support indicators”, “context indicators”, and “distance-to-target indicators” in order to avoid misunderstandings and the personal interpretations of practitioners. Such action would also help to homogenize monitoring, avoiding the swarm of different contents and taxonomies.

Undoubtedly, as the SEA is applied to policies, plans, and programs with different levels of definition and at different territorial levels, methods should vary [55]. Nevertheless, a guideline structured around a flow of questions and answers [33] could, at the same time, give enough flexibility and guide the practitioner through a “typical” monitoring process. We agree with Noble et al.’s [33] view that the SEA guidance needed at the practitioner level should be beyond the generic SEA frameworks.

4.3. Study Limitations and Potentials, and Further Research Paths

The application of the proposed methodology to only a narrow set of spatial plans certainly provides a limited representation of the reality.

On the other hand, the methodology has two strengths: the outline of the SEA monitoring systems profiles, which allow to arise issues of the SEA monitoring important for implementing SEA guidelines and to reach an integrated monitoring of the 2030 Agenda SDS objectives, and the potential widespread application. The flow-chart of the questions established for SEA monitoring system analysis (Figure 1) could be easily exported to SEA processes of other realities. The application to other regional, national, and international contexts would allow the realization of useful and interesting comparisons.

As mentioned in the introduction, SEA monitoring systems are not the only tools to mediate SDS’s objectives into P/P. The SEA external coherence analysis may also be an important instrument to spur coherence of the plans’ objectives with the SDS targets: it could compare the SDS objectives with plan objectives and serve as a specific tool to align them. Such integration could stimulate the continuous alignment between plans and SDS objectives, supporting the design of dynamic documents, which are essential to deal with the constantly changing territorial systems.

Nevertheless, planning with a sustainable viewpoint requires coordinated actions that go far beyond administrative limits and a sectorial approach. Authorities themselves should aim for coherence among sectors and offices with respect to the objectives of the National or Regional SDS. Such an approach would facilitate the implementation of actions to achieve the SDS objectives, strengthening internal governance as well as the capacity-building actions of the administrations, increasing the collaborative attitude between offices of the same authority and between different authorities [56].

5. Conclusions

It is widely acknowledged that the Strategic Environmental Assessment (SEA) could serve as a tool to support and deliver the 2030 Agenda for Sustainable Development principles [20,22]. By contrast, there is a lack of research addressing the mutual relationship between the National and Regional Sustainable Development Strategies (SDS) and the SEA. The present contribution has opened a discussion on this topic, focusing on the role of the SEA monitoring system.

Recognized as a fundamental tool to redirect P/P trajectories, the SEA monitoring system also represents a constant weakness of the SEA process. For this reason, to detect its potential in mediating SEA objectives into spatial planning, the study proposed a qualitative and comparative approach. Applied to the SEA monitoring systems of a set of 13 Territorial Plans, the approach was able to highlight several criticalities and potentials.

A word that effectively describes the context that arose from the analysis is “heterogeneity”. Heterogeneous are the aspects monitored by the systems, and the hierarchies of objectives, indicators, and the nomenclatures used. Nevertheless, the analysis also showed that the SEA monitoring system could serve as a “front-line” tool to formally mainstream not only the monitoring of the achievement of the 2030 Agenda SDS objectives, but also the set of 2030 Agenda indicators localized by the national and regional statistical institutes, mediating their principles into spatial plans.

Most importantly, what the profiles of the analyzed SEA monitoring system reveal is a profound difficulty for SEA practitioners to structure the SEA monitoring without specific recommendations. Yet, it must be recognized that the lack of guidance has given rise to significant creativity and adaptability, which are skills needed now more than ever.

New structured and standardized guidelines on the SEA monitoring process are needed and should clearly outline the aspects that the SEA monitoring system must monitor as well as the monitoring methodology, avoiding misinterpretations by practitioners. In order to root the 2030 Agenda and SDS objectives in P/P, it is paramount that SEA monitoring evaluates not only the individual P/P but also the SDS and the 2030 Agenda objectives and indicators.

Nonetheless, there must be awareness of the fact that such a reform in SEA monitoring structure needs the strong support of communitarian and national regulations and guidelines.

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Appendix A

Table A1. Literature review results on Web of Science and Scopus databases.

Search terms	Total results
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- Search 1: "SEA" AND "Sustainable Development Strategies"
- Buzoianu O.A.C. *et al.* Analysis of the romanian sites from the perspective of the relationship strategies on the tourism market. 2019. <https://www.proquest.com/openview/38911c03e5e40405130302226f2c931/1?pq-origsite=gscholar&cbl=1046413> (Accessed on 7 December 2022)
- Grofelnik H. A regular annual sea transport carbon footprint for the islands of Cres and Lošinj. *Croatian Geographical Bulletin* 2015, 77/2, 73-83, (ISSN 1331-5854), A1-Q3.
- Search 2: "Strategic Environmental Assessment" AND "Sustainable Development Strategies"
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Appendix B

Table A2. Links to the sources of the analyzed Territorial Plans and SEA.

Local authority	Lombardy Region
Plan analyzed	Revisione generale del PTR, comprensivo del Progetto di Valorizzazione del Paesaggio (PVP) ai sensi della l.r.31/2014
Links to Plan information	https://www.regione.lombardia.it/wps/portal/istituzionale/HP/DettaglioRedazionale/servizi-e-informazioni/enti-e-operatori/territorio/pianificazione-regionale/revisione-ptr-piano-territoriale-regionale (Accessed on 9 February 2022)
Links to SEA information	https://www.sivas.servizirl.it/sivas/#/login/schedaProcedimento?idProcedimento=1&idPiano=120889 (Accessed on 9 February 2022)
Local authority	Como Province
Plan analyzed	Piano Territoriale di Coordinamento Provinciale 2006
Links to Plan information	https://www.provincia.como.it/piano-territoriale-di-coordinamento-provinciale-ptcp-e-varianti (Accessed on 6 May 2022)
Links to SEA information	-
Local authority	Varese Province
Plan analyzed	Piano Territoriale di Coordinamento Provinciale 2007
Links to Plan information	http://www.provincia.va.it/code/75161/PTCP (Accessed on 7 February 2022) https://cartografia.provincia.va.it/ (Accessed on 7 February 2022)
Links to SEA information	https://cartografia.provincia.va.it/maps/link/link_valutazione.html (Accessed on 9 February 2022)
Local authority	Lodi Province
Plan analyzed	Variante del PTCP in adeguamento alla l.r. 12/05
Links to Plan information	http://provincia.lodi.emaxy.org/templatef416.html?pag=1924 (Accessed on 31 January 2022) https://www.provincia.lodi.it/gli-uffici/pianificazione-territorio/ptcp-vigente/ (Accessed on 31 January 2022) https://www.sivas.servizirl.it/sivas/#/login/schedaProcedimento?idProcedimento=1&idPiano=6346 (Accessed on 31 January 2022)
Links to SEA information	https://www.multipan.servizirl.it/ptcpweb/pub/ptcp?execution=e1s2 (Accessed on 31 January 2022) https://www.sivas.servizirl.it/sivas/#/login/schedaProcedimento?idProcedimento=1&idPiano=6346 (Accessed on 31 January 2022)
Local authority	Sondrio Province
Plan analyzed	PTCP 2009
Links to Plan information	https://www.multipan.servizirl.it/ptcpweb/pub/ptcp?execution=e1s2 (Accessed on 1 February 2022) http://www.provincia.so.it/pianificazione%20territoriale/PTCP/ (Accessed on 1 February 2022) http://www.provincia.so.it/pianificazione%20territoriale/PTCP/elaborati/default.asp (Accessed on 1 February 2022) http://www.provincia.so.it/pianificazione%20territoriale/PTCP/VAS/default.asp (Accessed on 1 February 2022)
Links to SEA information	http://www.provincia.so.it/pianificazione%20territoriale/PTCP/elaborati/default.asp (Accessed on 1 February 2022)
Local authority	Cremona Province
Plan analyzed	Variante del PTCP in adeguamento parziale al PTR ai sensi della l.r. 12/2005 (2° Variante)

Links to Plan information	<p>https://www.provincia.cremona.it/territ/?view=Pagina&id=5651 (Accessed on 29 July 2022)</p> <p>https://www.provincia.cremona.it/territ/?view=Pagina&id=5127 (Accessed on 29 July 2022)</p> <p>https://www.provincia.cremona.it/territ/all/Rapporto_Ambientale.pdf (Accessed on 29 July 2022)</p> <p>https://www.provincia.cremona.it/territ/?view=Pagina&id=5651 (Accessed on 29 July 2022)</p> <p>https://www.provincia.cremona.it/territ/?view=Pagina&id=5651 (Accessed on 29 July 2022)</p> <p>https://www.provincia.cr.it/territ/?view=News&id=678&da=100 (Accessed on 29 July 2022)</p> <p>https://www.provincia.cremona.it/territ/?view=Pagina&id=5668 (Accessed on 29 July 2022)</p>
Links to SEA information	<p>https://www.provincia.cremona.it/territ/?view=Pagina&id=5195 (si veda documento "Dichiarazione di sintesi finale") (Accessed on 29 July 2022)</p> <p>https://www.provincia.cremona.it/territ/?view=Pagina&id=5195 (Accessed on 29 July 2022)</p>
Local authority	Brescia Province
Plan analyzed	Variante del PTCP in adeguamento al PTR e al PPR ai sensi della l.r. 12/2005 (PTCP Vigente)
Links to Plan information	https://www.provincia.brescia.it/istituzionale/pianificazione-provinciale-ptcp-vigente (Accessed on 22 November 2021)
Links to SEA information	<p>https://www.sivas.servizirl.it/sivas/#/login/schedaProcedimento?idProcedimento=1&idPiano=45660 (Accessed on 1 December 2021)</p> <p>https://www.provincia.brescia.it/istituzionale/pianificazione-provinciale-ptcp-vigente (Accessed on 1 December 2021)</p> <p>https://www.multipan.servizirl.it/ptcpweb/pub/ptcp?sessionid=62E0D0071C3CEC7BC9B4C218E9F047FA?execution=e1s3 (Accessed on 1 December 2021)</p>
Local authority	Lecco Province
Plan analyzed	Variante di revisione del PTCP (Revisione 2014)
Links to Plan information	<p>https://www.provincia.lecco.it/documento/piano-territoriale-di-coordinamento-provinciale-ptcp/ (Accessed on 21 January 2022)</p> <p>https://www.provincia.lecco.it/pr-lecco-media/2020/11/2014_VAS_Rapporto_Ambientale.pdf (Accessed on 21 January 2022)</p> <p>https://www.multipan.servizirl.it/ptcpweb/pub/ptcp?execution=e1s4 (Accessed on 21 January 2022)</p> <p>https://www.provincia.lecco.it/documento/relazione-illustrativa-ptcp/ (Accessed on 21 January 2022)</p>
Links to SEA information	<p>https://www.provincia.lecco.it/documento/valutazione-ambientale-strategica-vas-ptcp/ (Accessed on 21 January 2022)</p> <p>https://www.multipan.servizirl.it/ptcpweb/pub/ptcp?execution=e2s2 (Accessed on 21 January 2022)</p> <p>https://www.sivas.servizirl.it/sivas/#/login/schedaProcedimento?idProcedimento=1&idPiano=40842 (Accessed on 21 January 2022)</p>
Local authority	Pavia Province
Plan analyzed	Revisione del PTCP in adeguamento al Piano Territoriale Regionale (PTR) integrato ai sensi della LR n. 31/2014
Links to Plan information	<p>https://www.provincia.pv.it/it/page/revisione-ptcp?force_preview=true (Accessed on 3 December 2021)</p> <p>https://www.sivas.servizirl.it/sivas/#/login/schedaProcedimento?idProcedimento=1&idPiano=116260 (Accessed on 3 December 2021)</p>
Links to SEA information	https://www.sivas.servizirl.it/sivas/#/login/schedaProcedimento?idProcedimento=1&idPiano=116260 (Accessed on 3 December 2021)
Local authority	Bergamo Province
Plan analyzed	Variante del Piano Territoriale di Coordinamento Provinciale in adeguamento al PTR e al PPR ai sensi della l.r. 12/2005 e l.r. 31/2014 (Vigente)
Links to Plan information	<p>https://www.multipan.servizirl.it/ptcpweb/pub/ptcp?execution=e1s2 (Accessed on 3 December 2021)</p> <p>https://www.provincia.bergamo.it/cnvpbgrm/zf/index.php/servizi-aggiuntivi/index/index/idtesto/2256 (Accessed on 3 December 2021)</p> <p>https://www.provincia.bergamo.it/cnvpbgrm/zf/index.php/servizi-aggiuntivi/index/index/idtesto/815 (Accessed on 3 December 2021)</p>
Links to SEA information	<p>https://www.sivas.servizirl.it/sivas/#/login/schedaProcedimento?idProcedimento=1&idPiano=86100 (Accessed on 9 May 2022)</p> <p>https://www.provincia.bergamo.it/cnvpbgrm/zf/index.php/servizi-aggiuntivi/index/index/idtesto/815 (Accessed on 9 May 2022)</p>
Local authority	Metropolitan City of Milan
Plan analyzed	Piano Territoriale Metropolitan (PTM) ai sensi della L.56/2014

	<p>https://www.cittametropolitana.mi.it/PTM/iter/(Accessed on 1 February 2022)</p> <p>https://www.cittametropolitana.mi.it/PTM/iter/PTM_vigente/https://www.multipan.servizirl.it/ptcpweb/pub/ptcp?execution=e1s2(Accessed on 1 February 2022)</p> <p>https://www.cittametropolitana.mi.it/PTM/index.html(Accessed on 1 February 2022)</p> <p>https://www.cittametropolitana.mi.it/PTM/contenuti_PTMI/index.html(Accessed on 1 February 2022)</p> <p>https://www.cittametropolitana.mi.it/PTM/contenuti_PTMI/obiettivi_generali.html(Accessed on 1 February 2022)</p> <p>https://www.cittametropolitana.mi.it/PTM/contenuti_PTMI/Agenda2030.html(Accessed on 1 February 2022)</p> <p>https://www.multipan.servizirl.it/ptcpweb/pub/ptcp?sessionid=8A186FC59626BA5E55535F82235DDDF51?execution=e1s3(Accessed on 1 February 2022)</p>
Links to Plan information	
Links to SEA information	<p>https://www.sivas.servizirl.it/sivas/#/login/schedaProcedimento?idProcedimento=1&idPiano=94660(Accessed on 1 February 2022)</p> <p>https://www.cittametropolitana.mi.it/PTM/iter/PTM_vigente/(Accessed on 1 February 2022)</p> <p>https://www.multipan.servizirl.it/ptcpweb/pub/ptcp?execution=e1s2(Accessed on 1 February 2022)</p>
Local authority	Monza and Brianza Province
Plan analyzed	Variante del PTCP in adeguamento alla l.r. 31/14
Links to Plan information	<p>https://www.provincia.mb.it/conosci_provincia/amministrazionetrasparente_foia2016/pianificazione_territoriale/varianti/variante-in-adequamento-alla-soglia-regionale-di-riduzione-del-consumo-di-suolo-ai-sensi-della-l.r.-31-2014/elaborati-del-ptcp-ricondotti-alla-volonta-compressivamente-espressa-dal-consiglio-provinciale/(Accessed on 29 July 2022)</p> <p>https://www.multipan.servizirl.it/ptcpweb/pub/ptcp?execution=e1s2(Accessed on 29 July 2022)</p>
Links to SEA information	<p>https://www.provincia.mb.it/conosci_provincia/amministrazionetrasparente_foia2016/pianificazione_territoriale/varianti/variante-in-adequamento-alla-soglia-regionale-di-riduzione-del-consumo-di-suolo-ai-sensi-della-l.r.-31-2014/elaborati-del-ptcp-ricondotti-alla-volonta-compressivamente-espressa-dal-consiglio-provinciale/(Accessed on 29 July 2022)</p>
Local authority	Mantova Province
Plan analyzed	Variante del PTCP in adeguamento al PTR ai sensi della l.r. 31/2014
Links to Plan information	<p>https://www.provincia.mantova.it/context_docs.jsp?ID_LINK=1338&area=8(Accessed on 16 May 2022)</p> <p>https://www.sivas.servizirl.it/sivas/#/login/schedaProcedimento?idProcedimento=1&idPiano=3610051(Accessed on 16 May 2022)</p>
Links to SEA information	<p>https://www.sivas.servizirl.it/sivas/#/login/schedaProcedimento?idProcedimento=1&idPiano=3610051(Accessed on 16 May 2022)</p>

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