CrossGov

Coherent & Cross-compliant Ocean Governance for Delivering the EU Green Deal for European Seas

Deliverable 1.4

Guidance document for Science-Policy-Society Interfaces analysis in CrossGov research

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ABSTRACT	The report represents the guidance document for Science-Policy-Society Interfaces (SPSI) analysis in CrossGov research, to be used in WP2 and WP3 as a component of the coherence and cross-compliance (C&CC) analysis on EU Green Deal policies.
KEYWORDS	EU Green Deal; Science-Policy-Society Interfaces; Policy formulation; Policy implementation.

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Glossary

A few selected key definitions are reported here to help the reader of this guidance document and the user of the SPSI methodology a full and clear understanding of what is presented and proposed. Some of these definitions come directly from Crossgov D1.2 (Platjouw et al., 2023).

Policy coherence refers to how well different policies work together. Coherence can be defined as the extent to which policies reinforce each other by promoting synergies or reducing conflicts between their objectives and measures both in design and implementation.

Cross-compliance refers to the concurrent achievement/realization of multiple Green Deal policies and their associated goals and targets.

Policy refers to a set of objectives, rules and measures that provide guidance for solving a particular societal issue. In CrossGov, policy encompasses substantive documents such as white papers and strategies as well as specific laws and regulations, or directives.

Policy area refers to a substantive policy cluster that has formed around societal or sectoral interests. Often, a cluster is managed by specialized institutions and subject to sector-specific path dependencies.

Science-policy-society interfaces (SPSI) are defined as social processes which encompass relations between scientists and other actors in the policy process, and which allow for exchanges, co-evolution, and joint construction of knowledge with the aim of enriching decision-making (Van Den Hove, 2007).

A **policy cycle** consists of a series of policy phases that are carried out in series and with internal recursive processes in order to manage all aspects of a policy. Its main phases can be synthesised as: policy design and formulation, policy implementation, policy evaluation and adaptation.

A **Science-Policy-Society system** is defined as the set of actors, including the civil society, and connections through which scientific knowledge is acquired, synthesised, translated, presented for use, and applied in the policymaking process (adapted from Oliver, 2022).

1. Introduction

The objective of the CrossGov activities on Science-to-Policy-to-Society Interfaces (SPSI) in ocean governance is to analyse how efficient and effective SPSIs can contribute to sound policy-making and decision-making, including enhanced C&CC of selected and Green Deal-related marine policies.

When optimal, SPSIs ensure sound policy formulation, implementation, and adaptation processes, and are able to deal with different elements, such as incomplete knowledge, unpredictability, uncertainty, and ambiguity, thus improving coherence and cross-compliance in ocean governance. Science, in this framework, is also responsive to societal needs (including values and concerns), to public engagement, and to the role of society as provider of data, information, and knowledge.

In particular, we aim to investigate:

- The current contribution of SPSI to coherence and cross-compliance in policy formulation, policy implementation and decision-making;
- The way specific policy areas are affected by SPSI;
- The identification of key elements and mechanisms for effective SPSI, as well as the identification of main barriers and enabling factors.

The development of a blueprint to support better informed and knowledge-based decision-making is also planned (WP4 - Credible roadmaps towards enhanced C&CC for the European Seas). The blueprint will include recommendations on how to strengthen SPSI in planning, policy-making and decision-making towards the Green Deal (GD) objectives of relevance for CrossGov.

Deliverable 1.4 represents the guidance document for Science-Policy-Society Interfaces (SPSI) analysis in CrossGov research, to be used in WP2 (Coherence in policy landscapes and design) and WP3 (Case studies of cross-compliance) as a component of the coherence and cross-compliance (C&CC) analysis, whose methodology is developed in task 1.2 (D1.3 - Methodology to assess Coherence and Cross-compliance – The CrossGov Policy Coherence Evaluation Framework). As such, SPSI is not seen as an independent analysis, but as a component (actually, coherence attribute n.8 – Science and knowledge – in D1.3) of the wider C&CC analysis to be carried out in WP2 and WP3, investigating the specific role of knowledge production and use.

2. The Science-to-Policy-to-Society Interfaces (SPSI) analysis in Crossgov

SPSI is a cross-cutting topic in CrossGov and, according to the Description of Actions – Annex 1 of the Grant Agreement, it flows through the project from WP1 (namely task 1.3) to WP4 (mainly task 4.3). Figure 1 summarises the main elements of this process, including related deliverables and milestones.

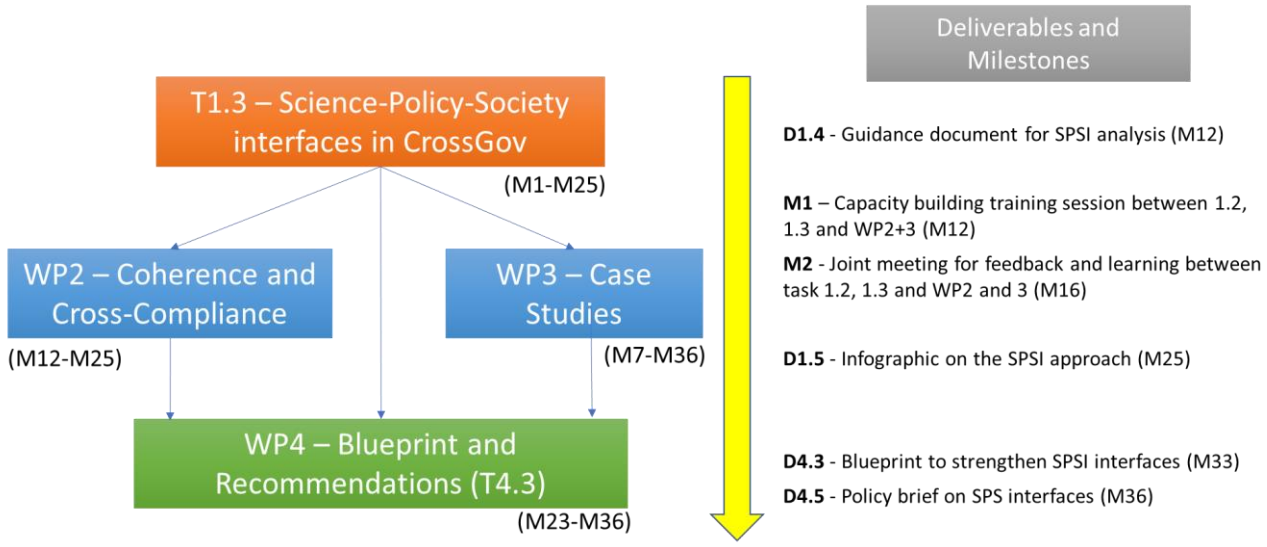

Figure 1. SPSI workflow through CrossGov

In more details:

- In T1.3 we develop the conceptual framework and the detailed methodology. Based on literature review, inputs from WP2 and WP3, and contributions provided at project level, we are setting up a methodology that is designed to be used to assess how SPSI building blocks are contributing to sound policy-making, and to coherence and cross-compliance of selected marine policies and case studies. In this phase, concurrent/connected tasks are mainly 1.1, 1.2, 2.1.
- At month 12, the methodology is passed to WP2 and WP3 for its use, after a capacity-building training session which took place during the second CrossGov consortium meeting (Venice, June 2023). At this stage the methodology should still be considered as a living document, at least until month 16, when it may be partially adapted according to feedbacks and learnings from its initial application, also in connection with the application of the specific methodology on C&CC (D1.3). The methodology contains references to relevant literature on SPSI, aimed at better describing and qualifying the conceptual framework and the different elements of the methodology, as a backdrop for and input to WP2 and WP3 applications.
- The methodology will be used by WP2 teams as part of their C&CC compliance analysis, focusing on policy formulation, thus enhancing the comprehension of the dynamics related to horizontal and vertical coherence of EU policy design, while leveraging potential for their improvement. This will potentially bring updates to the methodology by month 25.

- In WP3, the methodology will be used by WP3 teams in their case study analyses, depending on the characteristics of the case studies, the main policies considered and the specific objectives of their analysis, focusing on policy implementation.
- The collection of empirical material for the operationalization of the methodology needs to be done in line with the descriptions included in D5.4 (stakeholder mobilization charter, as well as its associated internal operational guidance), D6.1 (on a plan for managing primary empirical data), and D3.1 (roadmap for implementing case studies in CrossGov). The result from these processes will eventually bring updates on the methodology which will be documented by month 25.
- In WP4, we will consolidate the analysis on how SPSIs contribute to coherence and cross-compliance of the selected marine policies which are explored in CrossGov. A specific workshop will be organised to consolidate and validate final results and recommendations, standalone or as a dedicated session in a larger event/workshop. The analysis will: i) contribute to the roadmaps of T4.1; ii) produce the blueprint and the policy briefs of T4.3 to support better informed decision-making, respectively at month 33 and 36.

3. The SPSI analysis framework

3.1 Main requirements

The proposed fit-for-purpose methodology was conceived and designed to satisfy five main requirements:

- To be based on relevant literature about what constitutes effective SPSI;
- To be somehow specific, to investigate the role of SPSI for C&CC;
- To be flexible, to be adapted to the scope of the analysis in WP2 and WP3, across policies, phases of the policy cycle and different geographical scopes;
- To be feasible and manageable, allowing the user to adapt it to its specific context and goal, while responding substantially to the main research questions that the methodology addresses;
- To be adaptable during its use, embedding new information acquired from documentation and/or stakeholders during the process and lessons learnt from WP2 and WP3 use.

3.2 Main conceptual elements

The methodology considers four main conceptual elements (Figure 2)

- Policies/Policy areas;
- Research questions;
- Science-Policy-Society systems;
- Building Blocks.

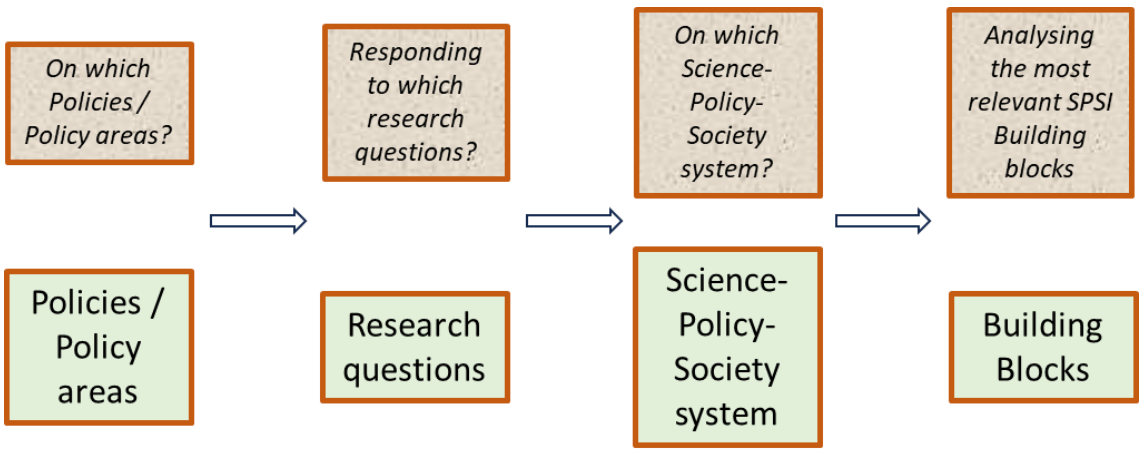

Figure 2. Main conceptual elements of the methodology

3.2.1 Policy areas

The methodology is designed in a way to be flexibly applied to different policies and policy areas, in line with the needs and specificities of WP2 and WP3 activities and case studies.

Therefore, no predetermined policies or policy areas have been identified. The policies and policy areas under specific analysis (either in WP2 or WP3) are expected to be specified in step 1 of the methodology (see chapter 4).

The range of policies to be potentially included in the SPSI analysis, across WP2 and WP3 and in line with D1.3 methodology, includes 5 EU Green Deal Strategies (2030 Climate Target Plan, Climate Change Adaptation, Biodiversity Strategy 2030, Zero pollution, Sustainable Blue Economy) and 10 EU policies (Water Framework Directive (WFD), Marine Strategy Framework Directive (MSFD), Maritime Spatial Planning Directive (MSPD), Habitats Directive, Birds Directive, Strategic Environmental Assessment Directive (SEA Directive), Environmental Impact Assessment Directive (EIA Directive), Renewable Energy Directive, Common Agricultural Policy (CAP, parts that are relevant for the selected EGD objectives in the marine sphere), Common Fisheries Policy (CFP, parts that are relevant for the selected EGD objectives).

3.2.2 Research questions

The objectives of the SPSI analysis in connection with policy coherence and cross-compliance are expressed through selected and targeted research questions, directly derived from WP2 and WP3 views and needs:

1. What type of science, knowledge, and interactions do we need for coherent and cross-compliant formulation and implementation of policies?
2. What type of knowledge is currently provided and used in the different formulation and implementation stages?
3. Which role does science play in planning, policymaking, and decision-making?
4. How is knowledge contributing to horizontal and vertical coherence and cross-compliance of policies?

These questions are ideally answered in all policy analyses carried out in WP2 and WP3. Research questions are answered through the combined analysis of several Building Blocks (see par. 3.2.4 and chapter 4). Other more specific guiding questions are proposed to the user while analysing the different Building Blocks and their attributes.

3.2.3 Science-Policy-Society systems

The ensemble of SPSIs - i.e. “social processes which encompass relations between scientists and other actors in the policy process, and which allow for exchanges, co-evolution, and joint construction of knowledge with the aim of enriching decision-making” - in a certain geographical domain and on certain policies / policy areas constitute a policy-specific and area-specific Science-Policy-Society system.

Defining the Science-Policy-Society system under analysis through the identification of the main actors involved, with their main role and with reference to different phases of the policy cycle and their main interconnections, is seen as a key element, actually the starting point, of the SPSI analysis (Oliver, 2022) (see step 2 in chapter 4 for more details).

3.2.4 Building Blocks

The level of support that effective and efficient SPSIs can provide to C&CC of EU Green Deal-related policies is determined by characterising a number of selected Building Blocks.

These Building Blocks have been identified through literature review and discussion with project partners and Advisory Board Members, taking into account their relevance and compliance with main requirements of the methodology (see par. 3.1).

Six Building Blocks have been identified as the main constituent elements of SPSI that are potentially relevant to Green Deal-related marine legislation and policies:

A. Data & knowledge
B. Assessments
C. Models of scientific policy advice and knowledge transfer mechanisms
D. Permanent SPSI platforms
E. Competence framework for researchers and policymakers
F. Funding & resources

They are described in detail in chapter 4. The Blocks have been identified by considering the high level of complexity which is typical of SPSIs and Science-Policy-Society systems. Such complexity could potentially lead to a resource-intensive research effort which is out of the scope of this research. While all Blocks can in theory contribute to the analysis, tasks in WP2 and WP3 can select the Blocks that are most relevant for them, depending on policies under analysis, geographical domain, relevance in the policy cycle, research questions of main interest. To support this selection, figure 3 shows how each Building Block is expected to contribute differently to the four main research questions.

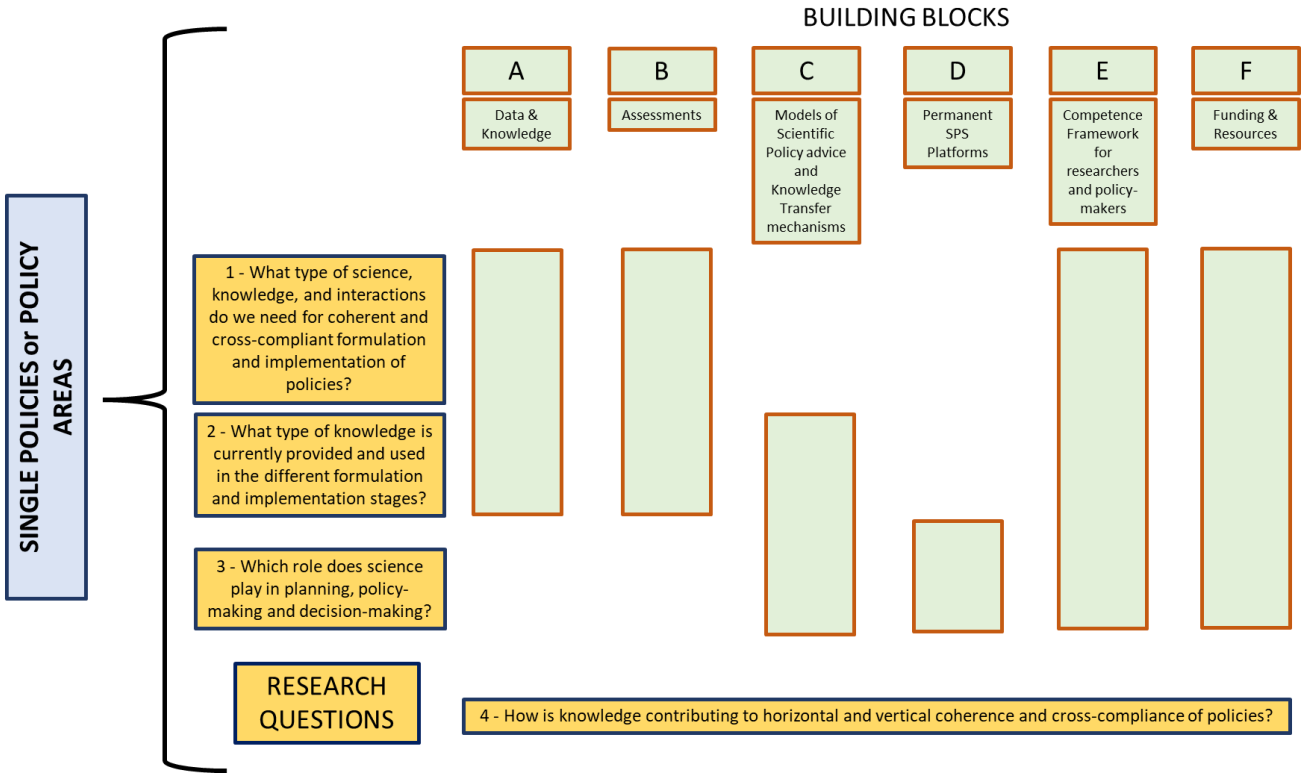

Figure 3. Connection between policies, research questions and Building Blocks

While all Blocks can potentially contribute to the overarching question (research question 4) "how is knowledge contributing to horizontal and vertical coherence and cross-compliance of policies?", specific Blocks to be considered in the analysis are expected to bring a more specific input to selected research questions, as visually shown by the vertical bars in Figure 3:

- Research question 1 (what type of science, knowledge, and interactions do we need for coherent and cross-compliant formulation and implementation of policies?) is mainly dealt with by blocks A, B, E, and F. These blocks are designed to provide a framework on how data, knowledge, and assessments shape the policy process, including the role of capacity, skills, and available resources.
- Research question 2 (what type of knowledge is currently provided and used in the different formulation and implementation stages?) is highly cross-cutting (blocks A, B, C, E, F). For question 2 the analysis of Block C – Translation / Knowledge transfer mechanisms is particularly important, as it explores the way science & knowledge and decision & policymaking can and are actually connected.
- Research question 3 (which role does science play in play in planning, policymaking and decision-making?) is also mainly answered through the analysis of five blocks (C, D, E, F). The focus of this question is on the dynamics, i.e. iterative and mutual relations, between science, policy and society in the different phases of the policy cycle.

To keep the methodology simple and operational, for each Block, a limited number (3 to 4) of key attributes (step 3 of the methodology; see paragraph 4.3) have been selected by recurring to a literature review process.

4. Step-by-step procedure for SPSI analysis

The step-by-step operational procedure for SPSI analysis is structured in 4 steps:

Step 1 – Defining the policy and geographical scope of the analysis and identifying data and information sources.

Step 2 - Defining the Science-Policy-Society system under analysis.

Step 3 – Characterising the Building Blocks of SPSI to answer the research questions.

Step 4 – Synthesis: answering the research questions.

4.1 Step 1 – Defining the policy and geographical scope of the analysis and identifying data and information sources

According to the specific context of use (in WP2 and WP3), step 1 aims at specifying:

- Which is the geographical scope of the analysis, from local/case study to sea basin to EU-level;
- Which are the policies under analysis and which stages of the policy process need particular attention, from policy design and formulation to policy implementation, evaluation and adaptation;
- Which is the time frame of the analysis, which may vary depending on the policies to be analysed and the focus on the formulation or implementation phase;
- Which are the most important questions to be addressed among the four research questions pre-identified (see par. 3.2.2), and the most relevant Building Blocks associated. Other specific research questions related to SPSI may be added by the user, where relevant for the specific task and not already included among the detailed guiding questions that are associated to Building Blocks attributes (see step 3);
- Based on the above points, which are the most important sources of information: documentation (i.e. websites, scientific publications, project reports, policy and legal documents, communications and reports on policy formulation and implementation processes, environmental assessments, etc.) and input from stakeholders (e.g. through interviews, workshops, etc.). An important role as source of information (within WP3) and results validation (within Task 4.3) through the process should be attributed to co-creation by using, for example:
    - Interviews on SPSI with stakeholders at/from case study sites, as part of WP3 stakeholder engagement activities (for example including questions on SPSI in other planned interviews);
    - Interviews on SPSI with selected key stakeholders, as part of T4.3, mainly to consolidate and validate the analysis results and to define recommendations and proposals for action;
    - A dedicated workshop to consolidate and validate final results and recommendation on SPSI, stand-alone or as a dedicated session in a larger event/workshop as part of T4.3.

This step should ideally proceed in parallel with the similar step of the methodology on C&CC (D1.3).

4.2 Step 2 – Defining the Science-Policy-Society System under analysis

Step 2 is aimed at defining the Science-Policy-Society system under analysis, as a starting point and a reference for the SPSI analysis.

Ideally, a single map will be produced for the policies / policy area under analysis in WP2 or WP3, following step 1. The map will be organised in 8 different compartments:

- Research & Evaluation Funders
- Evidence Generation
- Evidence Pumps
- Policy Design & Formulation
- Policy Implementation
- Policy Evaluation & Adaptation
- Business (Economic & Technological System)
- Civil Society (Understanding, Values and Demands, Advocacy)

Possibly, different maps could also be considered for each of the policies / policy areas under analysis, if needed in the specific context of analysis.

A demonstration map is presented in Figure 4, with reference to the Adriatic Sea case study under WP3 and a policy cluster composed by WFD, MSFD and MSPD.

A short description should be developed accompanying the visual layout, to describe relevant aspects of the different components and of the connections among the components (e.g. roles and responsibilities of key actors).

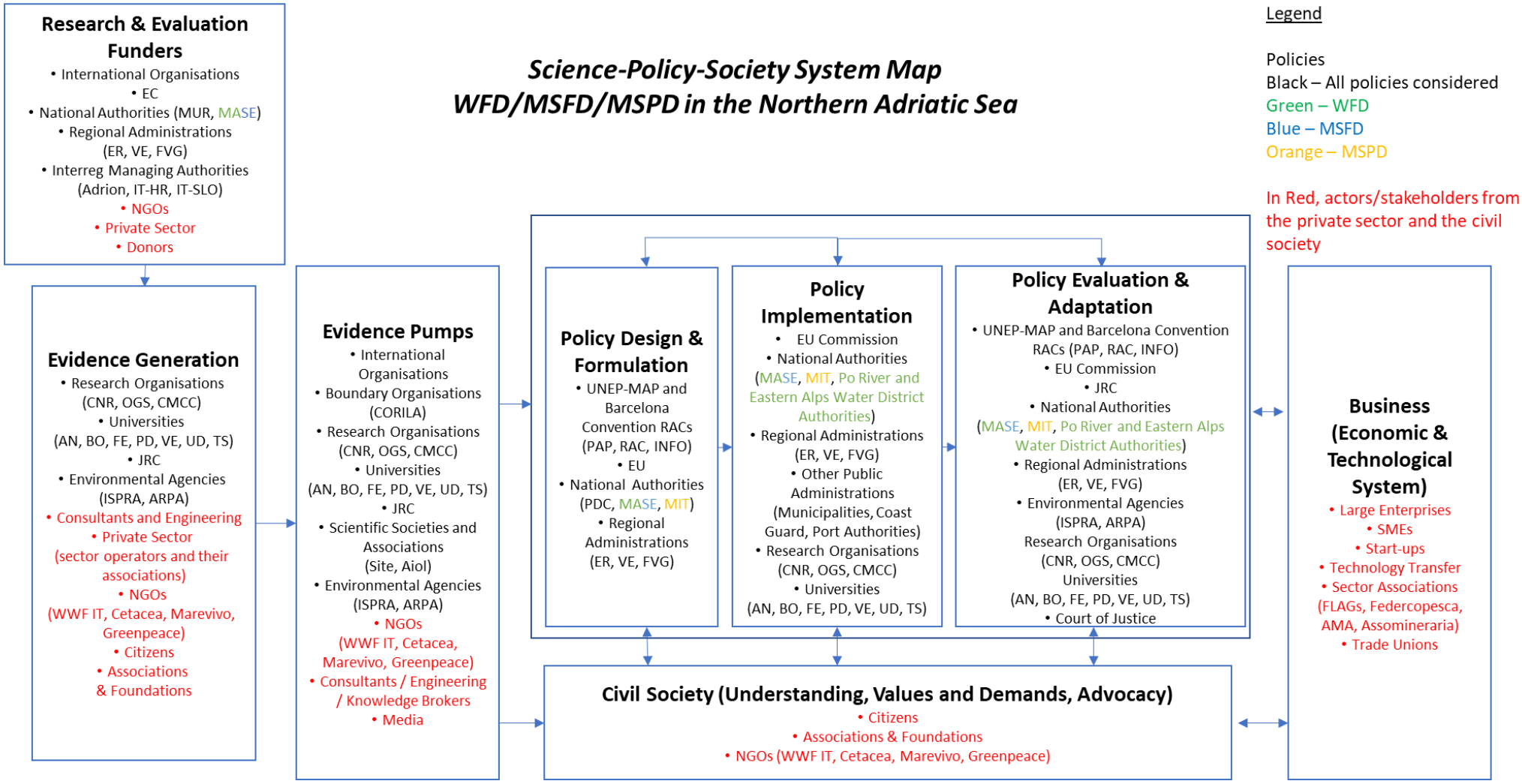

Figure 4. Science-Policy-Society system map: actors and stakeholders involved in the 8 components of the system. Example from the Northern Adriatic sea case study and a cluster of policies (WFD-MSFD-MSPD)

4.3 Step 3 – Characterising the Building Blocks of SPSI to answer the research questions

At the core of the analytical framework and the operational procedure to analyse SPSIs are the 6 Building Blocks introduced in par. 3.2.4.

Each Block is structured in a table that is composed of 3 parts:

i. key attributes of the Block, which implicitly can also be considered as attributes of SPSIs, with associated specific guiding questions (further questions can be eventually set by the user or can emerge during the analysis). These key attributes must be qualified by the user through a narrative description (using the guiding questions) and by attributing a qualitative scoring based on expert judgement (from good to poor). This qualitative scoring is based on the information collected while analysing the attribute and reflects the judgement of how the attribute in the specific case analysed is contributing to effective SPSIs;
ii. a narrative description of the specific contribution of the whole Block to C&CC, derived from the analysis of the attributes and their guiding questions and referring specifically to horizontal or vertical coherence and cross-compliance elements;
iii. sources of information utilised (e.g. reports, papers, websites, interviews with stakeholders).

The analysis of Building Blocks and their attributes shall consider spatial scales and phases of the policy cycle, as also defined in step 1. These two elements are frequently appearing in the guiding questions.

Spatial elements can be relevant in the analysis from different perspectives. On one side, local scale data is necessary to understand and manage larger scale processes, pressures and impacts; on the other, policy-makers often need to be able to understand local impacts of larger scale issues, and how mitigative and adaptive strategies enacted at one scale can constrain or benefit actions at other scales. Challenges for policy-makers might relate to the need to match (1) the scales of bio-geophysical systems and management systems, (2) the scales of assessments and management systems, and (3) understanding the linkages between scales and their consequences for decision-making (Cash, 2000). Moreover, the analysis can reveal significant differences in how SPSIs work in different environments, countries or sea basins, which can be of real added value to the analysis.

All key phases of the policy cycle are informed by SPSIs. Such phases are not hermetically isolated from one another: relevant processes are usually not linear but highly iterative, with phases continuously shaping each other (Van den Hove, 2007). Nevertheless, it is important to consider at which phase and how an SPSI intervenes. In the policy design and formulation phase, issues requiring action are first detected. This can depend, for example, on newly available scientific input, impactful events, or societal transformations. Then, it is defined how the policy is being structured, what its objectives and expected effects are, the resources that need to be used. Stakeholders may be involved at this stage, and evidence-based solutions are required. The Implementation phase requires responsible entities and available resources to turn decisions into actions while ensuring monitoring provisions are met. Evaluation and Adaptation (or Maintenance) refer respectively to the assessments of the degree of success of the policy and of its implementation and to the confirmation, revision, or dismissal policy phase

(Cairney, 2016). SPSIs can have a role in all these steps and it is important to understand where and how, also to identify possible improvements.

A description of the 6 Building Blocks is provided below. When attributes are found across Blocks, an explanation is provided for each of them only if not already described in previous Blocks, while precising how the attribute is specifically related to the Building Block.

4.3.1 Block A: Data and Knowledge

Data are at the base of a knowledge architecture that can produce wisdom and actions (Oliver et al., 2021). Science, policy, and society approach data and knowledge in different ways. With respect to science and policy, scientists produce data and information to explain natural phenomena and to understand how to interact with them. Data and scientific information are translated into knowledge to support policy makers' work towards problem-solving. These two functions are linked, potentially supportive, yet very different. Approaches to questioning, answering, knowledge-building and usage, storytelling, and power relations differ, according to which sphere is being looked at. In science, new data and/or data that contradict hypothesis offer areas for improvement. Political actors instead, in need of consensus, can lean towards supportive data only, to bring forward the policy process. Also, time frames differ, with science projected towards the future and politics dealing mostly with present, pressing challenges (Böcher and Krott, 2016). Society in general is subject to its own dynamics, with data and evidence being interpreted according to different perspectives, sources, occurrences, and so on. This means that specific fragments of information may be cherry-picked for different reasons, while staying connected with scientifically, politically, culturally, and socially backed intelligence (Horton and Brown, 2018). Data and knowledge should be timely, available and accessible. For decision and policy-making processes to be transparent and effective, knowledge gaps and uncertainties also need to be considered explicitly, while accounting for the source of information and the specifics of it. Block A is designed to bring focus to these key characteristics.

The analysis of Building Block A is expected to contribute in responding mainly to research questions 1 (What type of science, knowledge, and interactions do we need for coherent and cross-compliant formulation and implementation of policies?), 2 (What type of knowledge is currently provided and used in the different formulation and implementation stages?) and 4 (How is knowledge contributing to horizontal and vertical coherence and cross-compliance of policies?).

The **key attributes** of Block A are:

- **Availability and access to data:** a cornerstone for well-performing SPSI, data needs to be produced regularly, by using sound, transparent and replicable methodology, and to be both publicly available and intelligible. This is not always the case, as seen, for instance, with regard to SDGs (Breuer et al., 2019) . For example, difficulties in accessing cross-sectoral data on water usage due to technical problems (e.g. formats, data flows and platforms interoperability) may hamper the design of sound river basin management plans (WFD), with consequences also for MSFD (e.g. GES objectives) and MSPD (e.g. permanent or temporary effects on some coastal uses). Limited availability (e.g. mapping of marine benthic habitats) or accessibility (e.g. on munitions dumping at sea) of data on specific aspects/topics can also obstacle the process of policy

implementation (MSP in the case of provided examples). Poor data availability and access have high probability of producing knowledge that is not the best available and the more updated to support policy and decision-making.

- **Gaps and uncertainty:** the management and communication of gaps and uncertainties is a key element in policy-related processes. The scope is not to achieve certainty but rather to reflect on and account for inevitable uncertainties and gaps, to provide stable guidance in the decision-making process. The need to analyse, expose, and communicate gaps and uncertainties represents a complex process in its own, and requires active participation of policy-makers and other stakeholders. For such process to gain in transparency and trust, and eventually to build successful procedures, dedicated provisions and agents may need to be in place (Brugnach et al., 2007). Gaps and uncertainty can be specifically highlighted, also in relation to defined items (e.g. climate change scenarios and projections) and policy stages (e.g., lack of monitoring data), with regard to methodological and data management provisions, to explanations for the reasons behind data gaps, to the adoption of determined principles (best available knowledge, stakeholder engagement), etc..
- **Problem framing:** highlighting and considering interlinkages across sectors, across societal actors, across disciplines, and among different geographical levels is a factor of success in environmental sciences and a booster for policy coherence (Stafford-Smith et al., 2017), since complex systems and challenges are the norm. Defining, framing, addressing a problem, and designing potential solutions pertain to both the scientific and the policy process (Sokolovska et al., 2019). Systemic interpretations may be lacking, to the detriment of coherence and cross-compliance. They should coexist with, and must integrate, sectoral, disciplinary, regulatory, and management-related perspectives. As the specific challenges of ocean governance, and the policies aiming to address them, influence each other in most cases, sometimes with synergic effects and/or, in other instances, implying trade-offs, consideration to the achievement of connected policy objectives should be accounted for. For instance, measures required by and implemented under WFD can be considered relevant to achieve MSFD and MSPD objectives in coastal and marine environments. Or the need for additional/different actions and the consideration of the progress level in comparison with other policy tools may be reported (e.g. for the reduction of impacts due to nutrients and chemical load in coastal areas), as a matter of example.

Table 1. Building block A - Attributes and guiding questions

Building Block A	Data & Knowledge		
Key attributes	Guiding questions (examples)	Narrative description	Synthesis
Availability and access to data	How easy and open is the access to data relevant to the policy process? Are data available in a timely way to support the policy process? Does the governance system foster collection, update, and sharing of data? Are there specific problems with specific data / knowledge providers? To what extent are data intelligible to an extended pool of dedicated non-experts?	…. ….	Good ☐ Medium ☐ Poor ☐
Gaps and uncertainty	Are knowledge gaps identified and declared? Are uncertainties quantified and made transparent? Which topics / disciplines are more important for the policies under analysis (e.g. biodiversity, pollutants, fish and biotic resources in general, coastal morphodynamics) and where are key knowledge gaps?	…. ….	Good ☐ Medium ☐ Poor ☐
Problem framing	Considering specific policies and how they account for each other, is there integration of data & knowledge from different disciplines and across policies? To what extent? Is the spatial scale of data and knowledge, including the transboundary dimension, coherent with policy objectives?	…. ….	Good ☐ Medium ☐ Poor ☐
Specific contribution of the Block to C&CC			
From the analysis of the above attributes and their guiding questions, provide here a description of the specific contribution of this building block to C&CC addressing specifically, where applicable: - Horizontal coherence (within and across Policy Areas) - Vertical coherence - Cross-Compliance			
…… ……			
Sources used to assess Block properties			
List of documents: … … List of stakeholders involved / interviewed (and forms of involvement): … …			

4.3.2 Block B: Assessments

Monitoring and research are the basic tools for understanding what is happening in our watersheds, coastal areas and ocean, how natural systems respond to multiple and cumulative stressors, how resources and uses are at threat, whether response measures are effective. Environmental Assessments assemble this knowledge in a form useful for decision making, while repeated assessments on an annual or multiannual base are an integral part of adaptive management processes that can respond to changing conditions. They may be organised around formal structures, involve distinct sets of stakeholders, and foresee different types of interaction among them. In this case, assessments provide important fora for information sharing and exchange, and for validation of knowledge.

The report from UNEP and IOC-UNESCO 2009, An Assessment of Assessments (UNEP and IOC-UNESCO, 2009), highlights through its findings a number of aspects that are relevant to understand the link between assessments and policy and management processes. They are briefly presented here to inspire the analysis of this Building Block. Coverage varies significantly, depending on the knowledge available on the different disciplines and environmental components and on the areas under assessment. For example, assessment of economic and social effects of some marine policies (e.g. MSFD and MSPD) are relatively poorer if compared to environmental evaluations, while assessments are particularly week in marine areas Beyond National Jurisdictions (BBNJ). Moreover, appropriate integration across sectors, ecosystem components and environmental, social and economic aspects is not that common, although it is required by several marine policies (e.g. MSPD; from the analysis of pressures to a wide range of descriptors, to a pool of measures that may be closely linked with other policies). The design of an assessment process results quite critical in determining central attributes of an assessment, such as relevance, legitimacy and credibility, and its ability to influence the policy and management process.

Similar to Block A, the analysis of Building Block B is expected to contribute to responding mainly to research questions 1 (What type of science, knowledge, and interactions do we need for coherent and cross-compliant formulation and implementation of policies?), 2 (What type of knowledge is currently provided and used in the different formulation and implementation stages?) and 4 (How is knowledge contributing to horizontal and vertical coherence and cross-compliance of policies?).

The **key attributes** of Block B are:

- **Relevance (or salience), legitimacy, and credibility**: three characteristics of knowledge systems that increase the effectiveness of SPSIs (Cash et al., 2003). They are defined as:
  - Relevance (or salience): the relevance of the assessment to the needs of decision makers;
  - Credibility: the scientific adequacy of the technical evidence and arguments;
  - Legitimacy: the perception that the production of information and technology has been respectful of stakeholders' divergent values and beliefs, unbiased in its conduct, and fair in its treatment of opposing views and interests.

  Trade-offs between these three characteristics have been identified in literature. For example, assessments can be more or less accurate in presenting data and knowledge sources informing it, including different and sometimes divergent opinions on the

interpretation of processes, cause-effects relationships and environmental risks, or in describing the uncertainties associated to risks and to the effectiveness of the management measures in place. The need of transparently presenting all different opinions can in some cases result in less clear scientific messages, affecting the relevance of the assessment from the decision making perspective.

Other complementary characteristics that may be relevant and therefore considered in the analysis are: transparency, quality and rigour, integrity, pluralism and honest brokerage of knowledge, trust (Edenhofer and Kowarsch, 2015; Zeigermann, 2021; Oliver, 2022; Strand, 2022).

- **Data and knowledge providers:** there is a recognised need for a wide array of contributors as knowledge providers, in order to move beyond linear models of SPSI and ensure a more comprehensive representation of interests at stake. This attribute also includes an evaluation of the role played by public and private operators and the civil society (e.g. through citizen sciences initiatives) as data and knowledge providers, which anticipates their role in the use of knowledge and in the policy and decision-making process. For instance, data could be produced (and made available) by public agencies at different geographical levels and across mandates, through different degrees of cooperation with societal actors (research, academia, private sector, other stakeholders), while consultation processes can be more or less public, regular, and accessible.
- **Problem framing:** see description in Block A. The attribute is relevant here as it allows to evaluate if and how the assessments are considering and integrating, as discussed in the introduction of the Building Block, all the different sectors, discipline and elements that should be considered in the policy process.

Table 2. Building block B - Attributes and guiding questions

Building Block B	Assessments		
Key attributes	Guiding questions (examples)	Narrative description	Synthesis
Relevance, legitimacy, credibility	How do you qualify relevance, legitimacy and credibility of the assessments considered? Are knowledge gaps and uncertainties made transparent in the assessment? Is the spatial scale of the assessment coherent with its overall objectives?	…. ….	Good ☐ Medium ☐ Poor ☐
Data and knowledge providers	Are all the key providers of data/knowledge identified and involved? Is this considering both the public and private operators as well as the civil society? Are there gaps to be highlighted? Is their role well recognised and valued, both in the knowledge production and in the knowledge use phases?	…. ….	Good ☐ Medium ☐ Poor ☐
Problem framing	Is the assessment considering an extended policy area or is its scope limited? If the latter, why? Can it be seen as having a cross-sectoral approach? Does it look at coherence and/or cross-compliance?	…. ….	Good ☐ Medium ☐ Poor ☐
Specific contribution of the Block to C&CC			
From the analysis of the above attributes and their guiding questions, provide here a description of the specific contribution of this building block to C&CC addressing specifically, where applicable: - Horizontal coherence (within and across Policy Areas) - Vertical coherence - Cross-Compliance			
…… ……			
Sources used to assess Block properties			
List of documents: … … List of stakeholders involved / interviewed (and forms of involvement): … …			

4.3.3 Block C: Models of scientific policy advice and knowledge transfer mechanisms

The way actors in SPSI processes interact has been categorized and is studied by referring to defined models. Here, we refer mainly to the interpretation provided by Koetz et al., 2012.

- Linear models: in these models, objective knowledge and subjective values are clearly separated. Academic science provides objective facts or neutral representations of reality ("speak truth to power") that are used by decision makers, subsequently allowing for implementation of policies by administrators. They are one-way communication processes, with science informing policy making. These models, historically widespread, are not able to deal with complex, uncertain, and controversial problems

such as the ones addressed by environmental governance, where multiple legitimate perspectives, and conflicting interests and values, are often co-existing.

- Collaborative models: a number of alternatives to linear models exist in which facts and values are not necessarily separated and that are utilising complex interrelations between science and policy and collaborative evaluations and critiques. The linear model's aim of 'speaking truth to power' is replaced by the collaborative aim of 'reasoning together'. Collaborative models are characterised by two-ways or multiple-ways communication and may include scientists, policy-makers and civil society, for instance in the form of multi-stakeholder deliberation platforms (Sokolovska et al., 2019). As such, collaborative models involve scientific and non-scientific stakeholders and integrate science and other types of knowledge. Collaborative models can support equal or more balanced opportunity of political influence for all actors.

  Collaborative models also imply that communication, translation, and mediation functions are in place. Communication needs to be regular, active, iterative, and inclusive. Participants from different backgrounds must understand each other. For this reason, translation practices need to be systemically in place to ensure an effective communication (i.e. between different languages, interests, cultures, etc.). Lastly, understanding alone cannot prevent conflicts among stakeholders: mediation through appointed entities or activities is needed. It is important to consider the three functions (i.e. communication, translation, and mediation) to be managed in an accountable and structured manner, and to highlight the important role that boundary organisations (i.e. intermediary organizations that produce information that is useful in policymaking and at the same time qualify as scientific) can play here (Sokolovska et al., 2019).

There is a significant consensus in the research community that these models, which in reality coexist in hybrid practices, have been evolving over time (Sokolovska et al., 2019), with room for improvement widely observed when it comes to leveraging the potential of SPSI for present day challenges.

Even if collaborative models are nowadays preferred in most cases, it is worth noting that linear models can represent a valid option in some instances, such as:

- when scientific and technical knowledge applies to issues that are well framed, and consensus has been reached, in particular with regard to questions of safety and efficacy;
- where evidence-informed input is not expressly sought by policymakers, but targeted communication could raise awareness of an issue and create more demand for evidence or expert advice;
- when directed funding and commissioned research incentivize the engagement of the research community (United Nations Department of Economic and Social Affairs, 2021).

Tools, methods, and arrangements that connect knowledge producers and consumers and help make data and knowledge useable in policy-making are defined as transfer mechanisms. Clearly the distinction in the two categories of knowledge producers and consumers oversimplifies the reality, where multiple roles are played by the same actors (Kettle et al., 2017).

The transfer mechanisms in place and their characteristics contribute in determining relevance, legitimacy and credibility of data and knowledge in policy formulation and policy implementation and its utilisation, i.e. actual usage of knowledge and scientific advice in policy and practice (Böcher and Krott, 2014).

Effective transfer mechanisms can overcome main barriers to knowledge exchange between scientists and decision-makers, such as cultural differences, institutional barriers, science in-accessibility, conventional approaches to knowledge exchange (e.g. linear and uni-directional knowledge transfer processes) and personal perceptions and worldviews (Cvitanovic et al., 2015; Oliver et al., 2022).

The analysis of Building Block C is expected to contribute to responding mainly to research questions 2 (What type of knowledge is currently provided and used in the different formulation and implementation stages?), 3 (Which role does science play on planning, policy-mapping and decision-making?) and 4 (How is knowledge contributing to horizontal and vertical coherence and cross-compliance of policies?).

The **key attributes** of Block C are:

- **Type of model:** even if further categorizations exist, for the scope of this methodology the types have been divided into linear and collaborative, according to the above descriptions. The specific features of the models analysed will be described in the table below, also by answering to the guiding questions.
- **Relevance, legitimacy and credibility:** see description in Block B. In this case the attribute refers to the role played by transfer mechanisms in determining the relevance, legitimacy and credibility of research to support policy making.
- **Type of transfer mechanisms:** knowledge transfer mechanisms (i.e. tools, methods and arrangements) in place may have very different characteristics, which can affect the overall effectiveness of SPSI processes. For example, mechanisms can be formally established (e.g. by laws or regulations), well planned and implemented (e.g. with a clear agenda, a secretariat, regular and transparent feedbacks) and permanent (including periodic monitoring of results and adaptation if needed); or mechanisms can be voluntary, extemporary or triggered by specific events and/or occasional. What is positive/negative and how much this affects C&CC depends on case-by-case conditions and evaluations. Permanent SPSI platforms (Block D) can be in place to support the work of transfer mechanisms.
- **Utilisation:** this attribute refers to the actual and transparent usage of knowledge and scientific advice in policy and practice, carried out by citizens, stakeholders, political actors, media public, and during the implementation stage.

Table 3. Building block C - Attributes and guiding questions

Building Block C	Models of scientific policy advice and knowledge transfer mechanisms		
Key attributes	Guiding questions (examples)	Narrative description	Synthesis
Type of model	Are existing models closer to linear or collaborative models? For collaborative models: are there institutional structures, favouring translation of knowledge into meaningful SPSI outputs and open collaboration? Are proper communication, translation, and mediation mechanisms in place? How effective is the role of society in co-producing knowledge and informing policy and decision making?	…. ….	Good ☐ Medium ☐ Poor ☐
Relevance, legitimacy, credibility	How are transfer mechanisms linked and how much they affect relevance, legitimacy, credibility?	…. ….	Good ☐ Medium ☐ Poor ☐
Type of transfer mechanisms	Are there transfer mechanisms in place and which obligations and procedures do they follow? How formal/informal and permanent/occasional are existing mechanisms?	…. ….	Good ☐ Medium ☐ Poor ☐
Utilisation (actual usage of knowledge and scientific advice in policy and practice)	How effective are knowledge transfer mechanisms effective in informing policy and practice? Which challenges are possibly encountered? At which stages of the policy cycle are these transfer mechanisms used and show their effectiveness?	…. ….	Good ☐ Medium ☐ Poor ☐
Specific contribution of the Block to C&CC			
From the analysis of the above attributes and their guiding questions, provide here a description of the specific contribution of this building block to C&CC addressing specifically, where applicable: - Horizontal coherence (within and across Policy Areas) - Vertical coherence - Cross-Compliance			
…… ……			
Sources used to assess Block properties			
List of documents: … … List of stakeholders involved / interviewed (and forms of involvement): … …			

4.3.4 Block D: Permanent SPSI platforms

Knowledge transfer mechanisms often use permanent SPSI platforms. Different types of platforms have been established to deal with the challenges related to sustainability. They can take the form, for instance, of expert panels, Communities of Practice, SPSI networks, research outreach associations, co-developed web platforms, etc. They play a key role in increasing science-policy-society cooperation through coordination and engagement of different communities, by integrating science and knowledge into policy and public action. Existing bodies, also as foreseen by specific policy measures, can actively seek dialogue, cooperation, and establish links with corresponding structures across key sectors/policies, in order to increase synergic efforts at the Green Deal level. Beyond being interfaces for integration, they also work towards coherence and cross-compliance promotion (European Commission, 2021).

The analysis of Building Block D is expected to contribute to responding mainly to research questions 3 (Which role does science play on decision-making, policy-mapping and planning?) and 4 (How is knowledge contributing to horizontal and vertical coherence and cross-compliance of policies?).

The **key attributes** of Block D are:

- **Type and role of platforms:** often, the establishment of SPSI platforms follows formal processes, driven by institutional bodies and connected to governance systems at various scales. Institutional arrangements include SPSI platforms that are intergovernmental, non-governmental, independent, or subsidiary to existing bodies. Platforms can also emerge through the work initiated by the communities involved at scientific, sectoral, thematic or disciplinary level, or that are affected by the challenges being dealt with. The levels of involvement of SPSI platforms in policy advice and decision-making can vary greatly. For example, platforms can have an informing role while being excluded from the decision-making process. Or, they can be composed of both representatives from the policy sphere and other stakeholders, with these groups having either similar or highly differentiated status (e.g., stakeholders as observers only), according to the specific platform. Overall, SPSI platforms can have an active or passive role in policy advice. It is also important to look at the type of information and output the platform produces, that can range from knowledge & data to defined policy measures.
- **Participants:** the effectiveness of a platform will largely depend on its participants. For example, an enlarged set of public and private players and stakeholders taking part in the operations of the platform is expected to be important, while implying more iteration, negotiation, and dialogue (needing more time and resources).
- **Problem framing:** see description in block A. The attribute is relevant here as it allows to evaluate if and how the SPSI platforms identified are directly contributing to an adequate problem framing.

Table 4. Building block D - Attributes and guiding questions

Building Block D	Permanent SPSI platforms		
Key attributes	Guiding questions (examples)	Narrative description	Synthesis
Type and role of platforms	What type of platforms are in place (e.g. formal and institutional, research oriented, business oriented, informal and voluntary)? What is their role and specific mission? In which phase of the policy cycle do they play a role?	…. ….	Good ☐ Medium ☐ Poor ☐
Participants	Which type of actors are involved (e.g. Research and academia, Administrations/Agencies, Consultants and Private Sectors, Society)? Are all relevant stakeholders regularly engaged? What is their role within the platforms? Are there any challenges reported (e.g., efficiency loss, lack of transparency, access to or understanding of information, etc.)?	…. ….	Good ☐ Medium ☐ Poor ☐
Problem framing	Are the platforms considering an extended policy area or is their scope limited? If the latter, why? Can they be seen as having a cross-sectoral approach? Do they look at coherence and/or cross-compliance?	…. ….	Good ☐ Medium ☐ Poor ☐
Specific contribution of the Block to C&CC			
From the analysis of the above attributes and their guiding questions, provide here a description of the specific contribution of this building block to C&CC addressing specifically, where applicable: - Horizontal coherence (within and across Policy Areas) - Vertical coherence - Cross-Compliance			
…… ……			
Sources used to assess Block properties			
List of documents: … … List of stakeholders involved / interviewed (and forms of involvement): … …			

4.3.5 Block E: Competence framework for researchers, policymakers, and stakeholders

SPSI requires different types of skills and expertise of technical, scientific, institutional, and generally knowledge-related nature. Capacity building is important to empower the different SPSI actors to deal with complex thematic interlinkages, reduce fragmentation of information and perspectives, and to understand different and potentially competing sets of values and decisional trade-offs. Furthermore, capacity building enables access to and usage of information, while driving stakeholder engagement in SPSI. It relates to all stages of the policy process (Hrabanski and Pesche, 2016; Schwendinger et al., 2022).

This block represents the main characteristics of skills & capacity-building tools for SPSI. It is intended to look at SPSI actors (e.g. scientists, practitioners, policy and decision makers), more than civil society in the wider sense. Nevertheless, should capacity-building initiatives being addressed to society at large be identified, this can be flagged and considered (attribute "Training & capacity-building activities and targets").

The analysis of Building Block E is expected to contribute to responding to all four research questions.

The **key attributes** of Block E are:

- **Type of competence:** capacity-building can be directed at increasing overall and systemic expertise or can be tailored to particular knowledge needs. Both dimensions are relevant and may be case specific and actor specific. A modern scientist involved in SPSI is expected to heavily interact with societal stakeholders, through transdisciplinary knowledge co-production and participation. Societal stakeholders shall be trained to grasp and properly use the transdisciplinary knowledge made available through SPSI.
- **List of competences:** ideally, the list of competences includes subject-specific knowledge, skills (i.e. acquired abilities and expertise) and attitudes (i.e. personal beliefs and values, gained through personal experience and socialization). These competences are usually the result of the specific and specialized input of single experts and actors, but it is quite important that all the single actors involved in SPSIs have common skills and attitudes and have a grasp of all the main disciplinary/thematic elements that an interface deals with.
- **Training & capacity-building activities and targets:** starting from a shared awareness of existing competence gaps, different types of activities can be designed, according to the needs of an SPSI, under the responsibility of different academic and non-academic organisations and targeting specific phases of the policy cycle. Training and capacity building activities are expected to be co-designed by those involved in the SPSI; they can take different forms, e.g. including workshops, use cases (e.g. of permanent platforms), more traditional lectures on needed competences, etc. Effective SPSIs would require all actors to have adequate competences and be able to access capacity-building schemes, for awareness, dialogue, and mediation to happen towards problem solving. The analysis can reveal policy and area specific differences in the targets of capacity-building activities (e.g., scientists/researchers, policymakers, private sector, society, youth, etc.) and identify future needs.

Table 5. Building block E - Attributes and guiding questions

Building Block E	Competence framework for researchers, policy-makers and stakeholders		
Key attributes	Guiding questions (examples)	Narrative description	Synthesis
Type of competence	Is capacity-building directed at increasing interdisciplinary and systemic expertise or is it tailored to particular knowledge needs and disciplines? Is this considered adequate, or are gaps present?	…. ….	Good ☐ Medium ☐ Poor ☐
List of competences	Which subject-specific knowledge is being addressed by capacity-building activities (e.g., environmental & marine science, IT, institutional & regulatory setup, politics & policies, economics, leadership & engagement, communication, etc.)? Is this responding to existing needs?	…. ….	Good ☐ Medium ☐ Poor ☐
Training & capacity-building activities and targets	Is there enough awareness and attention to identify and build adequate competence frameworks on SPSI for researches and policy-makers? Which type of activities are being carried out or planned (e.g., courses, fellowships/internships/secondments, workshops/events/other short training, etc.)? Are there organisations in charge of, and promoting initiatives and activities to build such competence frameworks? Who are the targets of capacity-building activities (e.g., scientists/researchers, policymakers, private sector, society, youth, etc.)? Who should be targeted mainly and/or additionally? What are main stages of the policy cycle that could benefit more from these competence frameworks?	…. ….	Good ☐ Medium ☐ Poor ☐
Specific contribution of the Block to C&CC			
From the analysis of the above attributes and their guiding questions, provide here a description of the specific contribution of this building block to C&CC addressing specifically, where applicable: - Horizontal coherence (within and across Policy Areas) - Vertical coherence - Cross-Compliance			
…… ……			
Sources used to assess Block properties			
List of documents: … … List of stakeholders involved / interviewed (and forms of involvement): … …			

4.3.6 Block F: Funding & resources

Effective SPSIs depends on several factors, including funding and availability of infrastructures and human resources. Funding and resources affect multiple dimensions of SPSI, including the two-ways interactions typical of collaborative models, knowledge generation processes, appropriate acquisition and use of information for policy-making, knowledge transfer mechanisms and SPSI platforms (Dale et al., 2019; Oliver et al., 2021). Research funding should be targeted to enabling co-production of policy-relevant knowledge, rather than supporting decision-making and policy processes by solely bringing evidence to the table. Research agendas (and funding agencies) need to take into account public values, thus increasing inclusivity and transdisciplinary research, as important components of SPSI.

The analysis of Building Block F is expected to contribute to responding to all four research questions.

The **key attributes** of Block F are:

- **Type of funding:** different types of funding exist, from national to EU to international, from public to private, which may target different actors. Their assessment is functional in identifying how funding is affecting the structural nature of an SPSI.
- **Drivers for funding:** a mixed set of drivers can be seen as advisable (e.g. demand-driven, supply-driven, or proceeding from competitive funding schemes), in connection with the type of funding. This may affect the relevance, credibility, and/or legitimacy of information and the overall effectiveness of SPSIs. For instance, when funding is only demand-driven, the generation of scientific knowledge may be channelled towards specific requests, leaving room for open gaps and a reduced societal relevance (Pereira et al., 2006). On the other way around, a too strong supply-driven funding can fail in matching some of the key demands of the policy making process.
- **Level and adequacy of funding and resources (including human resources):** the amount, continuity, allocation (e.g., human resources, infrastructures, services, communication) of resources allocated may directly affect the way SPSIs work and how effective they are. The situation here can be very different on different policies, while, similarly, important differences may regard different countries and sea basins. Finally, a specific aspect to consider is if resources are effectively driving the production of knowledge to support policy making, with the expected long-term and anticipatory vision.

Table 6. Building block F - Attributes and guiding questions

Building Block F	Funding & resources		
Key attributes	Guiding questions (examples)	Narrative description	Synthesis
Type of funding	What are main types of funding and their characteristics? (e.g., public, crowd, project, membership, in-kind, private, etc.)	…. ….	Good ☐ Medium ☐ Poor ☐
Drivers for funding	Are available resources mainly demand-driven, supply-driven, or proceeding from competitive funding schemes? Is this affecting relevance, credibility, and/or legitimacy of information? How much are fundings influencing or determining the orientation of research towards public goals and its relevance for practical problems? What are main stages of the policy cycle that are more affected by funding and resources?	…. ….	Good ☐ Medium ☐ Poor ☐
Level and adequacy of funding/resources (including human resources)	Is the level of funding adequate in terms of total amount, continuity, allocation (e.g., human resources, infrastructures, services, communication)? Are resources effectively driving the production of knowledge to support policy making, with the expected long-term and anticipatory vision? Are resources homogeneously distributed to cover policy needs under investigation? Are human resources a limiting factor and in which compartment or sector?	…. ….	Good ☐ Medium ☐ Poor ☐
Specific contribution of the Block to C&CC			
From the analysis of the above attributes and their guiding questions, provide here a description of the specific contribution of this building block to C&CC addressing specifically, where applicable: - Horizontal coherence (within and across Policy Areas) - Vertical coherence - Cross-Compliance			
…… ……			
Sources used to assess Block properties			
List of documents: … … List of stakeholders involved / interviewed (and forms of involvement): … …			

4.4 Step 4 – Synthesis: answering the research questions

The final goal of the SPSI analysis conducted according to this methodology and adapted to the specific policy and geographical scopes of WP2 and WP3 activities is to answer the four main research questions introduced above and repeated here for prompt reference:

1) What type of science, knowledge, and interactions do we need for coherent and cross-compliant formulation and implementation of policies?
2) What type of knowledge is currently provided and used in the different implementation stages?
3) Which role does science play in decision-making, policy-mapping and planning?
4) How is knowledge contributing to horizontal and vertical coherence and cross-compliance of policies?

The activities to define the Science-Policy-Society system in place (step 2) and the findings from the analysis of the Building Blocks (step 3), need to be all integrated in order to answer the research questions.

For this, we need a final step (Step 4) of the methodology, where the evidence collected through the analysis of the 7 Building Blocks is integrated and reported in the form of direct and narrative answers to the 4 research questions, for the specific policy, policy area or policy cluster being analysed. The structure, length and specific contents of the answers composing this synthesis will depend on the context analysed. A maximum length of 3 pages is recommended. Infographics or mental maps may also be added, to help in representing visually the key outcomes.

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