



Can tools contribute to integration in MSP? A comparative review of selected tools and approaches



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ABSTRACT

The role of tools and approaches is currently much debated in maritime spatial planning (MSP). Past evaluation has mainly concentrated on decision support tools and the tangible outputs these can provide for MSP, but little attention has so far been given to the soft or indirect benefits tool use can have in MSP. This paper assesses the potential benefits of tool use in the context of four common integration challenges in MSP. Drawing on case study material from the Baltic Sea region, the paper reviews the potential contribution of five selected tools and approaches to multi-level and transboundary, policy and sector, stakeholder and knowledge integration. Specific end points are defined for each integration challenge, including general desired outcomes of integrated MSP processes as a template for assessment. Our review shows that the selected tools play different roles in moving towards the various end points of MSP integration. There is an important difference between the potential of each tool, or its inherent capacity, and how it is applied, e.g. in a participative or non-participative setting. Another lesson is that some integration benefits can be achieved by the tools alone, while others – often secondary benefits - depend on how the outcomes of tool use are taken up by the subsequent MSP process. Although the nature of a tool does restrict its potential contribution to MSP integration challenges, the secondary “soft” benefits that can be achieved through certain styles of application and good links to the MSP process can add important integration benefits up and beyond the tool itself. The results presented here may also be relevant to other types of spatial planning and conservation management.

1. Introduction

Maritime spatial planning (MSP) relies on integration for achieving many of its stated aims and aspirations. Delivery of greater coherence in marine management, achieving a “fair balance of interests”, or reducing fragmentation and uncoordinated decision-making in favour of positive synergistic effects all suggest a pivotal role of some form of integration (Saunders et al., 2016).

From the wide body of academic and grey literature on MSP, integration challenges in MSP can be identified in four interrelated dimensions, along with associated benefits of successful integration. Given that MSP has an international dimension, the first is multi-scale and transboundary integration, defined as collaboration and

coordination between governmental levels across multiple scales and different types of borders, as well as the interrelation of different layers of regulations, norms and practices vertically within a country (Luttmann and Janßen, 2016; Piwowarczyk et al., 2019). The second is policy and sector integration, which is a key prerequisite for MSP as an inherently cross-sectoral approach. It can be defined as the temporal and spatial synchronisation of concerns, objectives and interests across policy fields and sectors (Hassler et al., 2017). The third dimension – closely related to all others – is stakeholder integration, meaning the formal and informal involvement of relevant individuals, groups and organisations in processes that lead to the production and implementation of maritime spatial plans (Morf et al., 2017). Last not least, there is the fourth dimension of knowledge integration, referring

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to how and to what extent diverse types of knowledge are included in MSP processes and reflected in the outputs (Saunders et al., 2017).

Despite its implicit importance, questions remain regarding the levels and scales at which integration can and should take place in MSP and the constraints and benefits of achieving successful integration. A key aspect is the definition of the desired end points for integration, in other words, what planners and other stakeholders are setting out to achieve by pursuing a more integrative approach. Commonly stated end points include e.g. increased implementation efficiency of MSP (assuming that a more integrative approach will be more effective by identifying conflicts early, discussing solutions more broadly and increasing ownership of the plan), or enhanced social sustainability outcomes of the MSP process such as capacity building, greater legitimacy of MSP decisions, inclusiveness or perceived fairness of the MSP process (Pomeroy and Douvère, 2008; Saunders et al., 2016; Ritchie and Ellis, 2010; Flannery et al., 2016; Tafon, 2018). Many such outcomes are interlinked: Well-managed, balanced stakeholder and knowledge integration, for example, may lead to mutual learning and a perception of inclusiveness of the MSP process, which in turn can contribute to greater perceived legitimacy of the MSP process. At the same time, any such end points carry with them difficulties of measurement and attribution, requiring not only near-experimental setups (e.g. involving control groups to measure the effect of greater integration, which is mostly impossible to achieve in MSP practice) and a high degree of self- and process awareness by the participating actors as well as process observers. This is compounded by the fact that integration benefits may not manifest themselves immediately and/or directly, but rather at a later stage and/or more indirectly, e.g. in simply bringing stakeholders together in a broader debate about the future of the sea. A broader question is whether greater integration is really always desirable in terms of the desired outcomes: Processes might be faster to complete, for example, if a less integrative and therefore less complex process is chosen. To stakeholders at least, there may also be the perception that the added costs of greater integration – expressed for example in additional meetings to attend and extra effort required – might outweigh the perceived benefits, especially in the case of inexperienced stakeholders in MSP (Morf et al., 2019). Nevertheless, assuming it is desired, a key question is what can be done to promote integration in MSP in order to reduce transaction costs while also achieving the desired end points.

This paper considers whether selected tools and approaches could make a contribution to promoting integration along the four dimensions outlined above. It is based on the BALTSPACE project (www.baltspace.eu) which reviewed a selection of tools for this purpose. Rather than assessing the final outcome of successful integration – e.g. whether integration really leads to greater process efficiency in MSP – we ask whether the application of a particular tool could support specific dimensions of integration in MSP, and if so, in what way. We emphasise that the paper does not provide a full evaluation of applied MSP tools. Our intention is to review the strengths and weaknesses of a selection of tools in the specific context of four integration challenges in MSP – conscious of the fact that the tools may have many other strengths and weaknesses unrelated to integration questions.

When assessing the contribution of a tool to promoting integration, three aspects need to be considered. Firstly, in order to assess the usefulness of a tool, a more detailed description of potential integration benefits is required. For this, the broad categories of multi-level, policy and sector, stakeholder and knowledge integration need to be broken down into sub-categories. What exactly does policy integration mean, for example, and what might be useful end points against which to assess the application of a particular tool? Secondly, consideration is required of how exactly a tool is linked to integration. Do integration effects manifest themselves during the actual use of the tool, or only (or additionally) at a later stage as a result of feeding the outputs of a tool-related process or product into the MSP process? In other words, are the expected integration benefits intrinsically linked to the capacity of the

tool itself, or are they more related to the context and circumstances of its application? Thirdly, tool efficiency would ideally be measured by relating the observed effect to what would have been the outcome without applying the tool. As this paper is not based on an experimental setup, we can merely infer what would have been the outcomes based on case study interpretation. We therefore also present conceptual and methodological considerations for evaluating tools in MSP more generally.

Specifically thus, the paper aims to:

1. Set out a template for assessing the usefulness of tools and approaches with respect to key integration challenges,
2. Test the analytical template in practice drawing on selected tools and approaches,
3. Draw some general lessons for evaluating the contribution of tools in MSP practice.

After providing a brief overview of literature on tools in MSP, we give an overview of the tools considered in the BALTSPACE case study and the methodology employed for our assessment. The presentation of results is followed by a general discussion of assessing tools in the context of MSP integration challenges and wider implications for evaluating tools in MSP.

2. Assessing the integration benefits of tools

The number of tools available to marine planners has increased dramatically over recent years, although their use in statutory planning processes remains limited (Pinarbasi et al., 2017; Janßen et al., 2018). In the literature, a common focus is on decision support tools (DST) and spatial decision support systems (SDSS), which are mostly computer-based but not exclusively so (Sullivan, 2002). A number of recent papers have focused Marxan as a DST and its acceptance by stakeholders in MSP (e.g. Janßen et al., 2019; Göke et al., 2018; Peckett, 2015; Stelzenmüller et al., 2013). Another focus is on so-called “serious gaming” as a way of enhancing learning in MSP (e.g. Rodela et al., 2017), specifically the “MSP Challenge” game (Keijser et al., 2017; Jean et al., 2018; Abspoel et al., 2019). It seems obvious that despite some criticisms levelled at DST and SDSS (e.g. Lewis et al., 2003), they can offer advantages in the context of promoting integration in MSP. Technical examples are their capacity to integrate different types of data (e.g., ecological, economic and social) or help weigh management alternatives, e.g. by comparing the impact of different policy decisions (e.g. Portman, 2007; Portman, 2016; Pinabarsi et al., 2017). Integration benefits can also arise from involving stakeholders in the use of a tool (Portman, 2016), as demonstrated by Ripken et al., (2018) for the case of the Living Q methodology, although the mere use of a tool will not automatically lead to inclusive, participative processes. Players of serious games have also been found to learn from each other during that process (Jean et al., 2018; Abspoel et al., 2019), leading to enhanced knowledge integration by means of social interaction (Rodela et al., 2017). Ideally thus, tool use in MSP – whether computer-based or not – leads to both direct outputs (such as a more comprehensive basis for decision-making), as well as less tangible benefits such as enhanced learning (e.g. learning from each other and reflecting on that learning).

Tool use in MSP is instrumental. Common arguments in support of tool use in MSP are that they can save planners time, energy and resources (implying process efficiency as a desired end point), and that their use will contribute to a qualitatively superior MSP process and/or better overall outcomes (implying improved MSP products and maritime governance as desired end points). Disregarding the question of whether greater quality and efficiency can always be achieved at the same time or whether one must come at the expense of the other, it is notable that few studies are concerned with the actual impacts of tool use on MSP. Most of the literature focuses on the potential output of tools and the products they can deliver for marine planning, linked

Table 1
Specific assessment questions for each integration challenge.

Integration challenge	Specific questions
1. Multi-scale and transboundary integration	1.1 Does the tool/approach bring together different geopolitical and/or geographical scales and dimensions in MSP?
2. Policy and sector integration	2.1 Does the tool/approach allow for the integration of asymmetric sectors? 2.2 Does it contribute to increasing (national or transnational) policy coherence?
3. Stakeholder integration	3.1 Does the tool/approach extend the range of stakeholders included and their respective norms and values, e.g. by making marginalised stakeholder groups more influential?
4. Knowledge integration	4.1 Does the tool/approach recognise/address specific knowledge gaps?
5. Contribution to overall process outcomes	5.1 Does the tool/approach improve the efficiency of decision-making? 5.2 Does it enhance the perceived legitimacy of MSP decisions among stakeholder groups? 5.3 Does it contribute to capacity building?

perhaps to a widespread assumption that MSP decisions are evidence-driven, and that data can be readily transformed into evidence in order to be further interpreted by planners and possibly stakeholders.

An important gap is that there is little mention of the role of process in MSP in achieving desirable MSP outcomes and the use of tools to facilitate such processes - such as learning by doing, discussion of planning options, or the role of different forms of knowledge in MSP decision-making in addition to technical information gathering. Process may be as important as outcomes in MSP, in that even less popular outcomes may be accepted if the process that led to a decision is respected by those involved. Little attention is also given to the conditions needed for the useful application of tools such as time, computer literacy etc., although some restrictions are mentioned by Pinarbasi et al., (2017).

Lastly, there is little consideration of how a tool is being applied. This comes back to the fact that even very technical computer-based tools require an application process, and that this process has to be designed and managed with specific objectives in mind. As stated above, applying tools will also have indirect effects, either during the application as such or as a follow-on. For example, using tools always leads to some form of learning, whether it is the integration of data (e.g. obtaining data from various sources) or the application of a complex computer-based instrument (e.g. Marxan). This, too, has implications for tool evaluation.

This last aspect – the indirect effects of using tools – already points some way towards the potential roles of tools in supporting integration. An obvious example is the case of a mapping tool, where the design of the map can lead to better knowledge integration, whilst the use of that map in the subsequent MSP process can then lead to a more integrative discussion of planning options and a more transparent process as follow-on benefits. Conceptually, we thus suggest that tools can contribute to improving integration in the following ways:

- (1) through the inherent capacity of a tool to address a particular integration challenge – e.g. its capacity to integrate different forms of knowledge;
- (2) through the application of the tool – e.g. whether it is applied in a participative setting or not, leading to indirect/added integration benefits; and
- (3) through the way in which it relates to the MSP process, i.e. whether the tool leads to a product that can be fed into the MSP process or provides more comprehensive support to the MSP process in the sense of a structuring framework.

To clarify some basic terminology, we use the term “tool” to mean applications or techniques that help complete a particular task in MSP. In our definition tools often lead to a specific product which can be fed into the MSP process (such as a map or scenario); at the same time, all tools also have a process element in that their output needs to be

developed in some way. This process may be more or less technical, reliant on expert input, or participatory.

An “approach” is broader and more likely to be process-oriented. It represents a structuring framework that provides overarching guidance for planning and decision support. It may also make use of a variety of more specific tools with which to accomplish specific objectives (Schwartz et al., 2017). The difference between tools and approaches is arbitrary and not always clear cut.

Product-oriented tools such as mapping tools will deliver integration benefits as part of developing that product (such as a map), although there may also be options for expanding the expected integration benefits through appropriate process design (e.g. by choosing a participatory process). Process-oriented approaches deliver integration benefits on account of that process alone, making the quality of that process essential in the delivery of the expected integration benefits.

Overall, the benefits from using the tool (in our case, integration benefits) must be larger than the costs incurred for using them (e.g. learning how to use the tools, pay for software etc.).

3. Methods

3.1. Designing an analytical template: defining end points for integration

As stated above, one of the key requirements for assessing tools and approaches in the context of MSP integration challenges is to break down the general categories of multi-scale, policy and sector, stakeholder and knowledge integration into smaller sub-sets that can serve as potential end points for assessment. Many different end points are conceivable in theory; there is also overlap between the categories (e.g. a close relationship between stakeholder and knowledge integration). In drawing up our template for analysis, we rely on recently published assessments and key lessons emerging from thematic case studies (Saunders et al. 2016, 2017; Hassler et al., 2017; Morf et al., 2016; Luttmann and Janßen, 2016). Below we set out our rationale for defining the respective questions for assessment; Table 1 summarises the final set of questions derived.

3.1.1. Multi-scale and transboundary integration

Multi-scale and transboundary integration refer to integration across different spatial and administrative levels, which may be international, but also national and sub-national. The commonly stated aim of transboundary integration (such as supported by the EU MSP Directive) is to achieve coherence in planning across the borders of several states or smaller administrative entities such as the German Länder (Janßen et al., 2018). Successful integration in this context depends on a solid understanding of the distinct roles and functions of the various MSP levels, as well as effective formal and informal communication between these levels (Janßen et al., 2018; Zaucha and Gilek, 2016). Communication is a general process question for MSP

rather than specific to multi-scale and transboundary integration, and most tools are likely to contribute to communication in some way. But tools could conceivably also contribute to understanding and aligning the various regulations, norms and practices that exist across scales and borders.

3.1.2. Policy and sector integration

Policy integration becomes necessary when there are gaps in focus or responsibilities, or when there is incompatibility or competition between policy packages (Saunders et al., 2019). An example for this is the integration of the Ecosystem Approach (EA) and MSP. Although the EA and MSP have arguably originated from the same source (Kidd et al., 2012), and although the EA is widely understood as an overarching principle of MSP (Jay et al., 2016), the concept is variously understood and does not always translate easily into MSP. In Europe, the emergence of two separate European Directives¹ has led to them being treated as distinct policy areas, reflected e.g. in current MSP practice in Europe where the relative weight given to environmental protection and maritime development varies between countries. Hassler et al. (2017) found that in some cases, separation of the two policy areas can be more fruitful, yet some form of integration between the two policies is necessary to establish clear relations between them and to be able to use both to achieve sustainable marine use.

Sectoral power differences and the inclusion of asymmetric sectors are another dimension. If managed well, and in line with political objectives, sector integration can be more effective and there may be a greater chance of achieving long-term process legitimacy. If not managed well, sectors with weak stakeholders are in danger of being marginalised in MSP processes. Another aspect is to facilitate long-term policy coherence, or the alignment of (transnational) policy trajectories, in other words, a situation where policies may gradually converge. Last not least, policy and sector integration also relate to overcoming institutional incompatibilities, e.g. by ensuring that policy spaces provided at higher levels are utilised by the lower levels to maximise the potential for (bilateral) coordination.

3.1.3. Stakeholder integration

Stakeholder and knowledge integration in MSP are relatively well studied in the academic literature, so the range of issues that need to be contended with is well described. These range from tokenistic stakeholder involvement (e.g. Gopnik et al., 2012; Flannery et al., 2018), the diverse interests, capacities and knowledge of stakeholders (e.g. Morf et al., 2019), varying belief systems and interests, differing levels of trust in the MSP process (Ciolek et al., 2018), the breadth and quality of the engagement process (e.g. the capacity to influence decisions), and whether involvement is early and continuous (Saunders et al., 2019).

Stakeholder integration has been highlighted as a future development need in past MSP tools research (Pinarbasi et al., 2017). The central question in the context of integration challenges is how marine stakeholders can meaningfully contribute to addressing MSP issues, and how MSP processes can be designed to include them in an efficient but also equal, legitimate, and transparent way (Morf et al., 2017). Aspects such as mobilising and educating stakeholders, building trust, sharing

¹ The Marine Strategy Framework Directive was adopted in 2008. It “enshrines in a legislative framework the ecosystem approach to the management of human activities having an impact on the marine environment, integrating the concepts of environmental protection and sustainable use.” (http://ec.europa.eu/environment/marine/eu-coast-and-marine-policy/marine-strategy-framework-directive/index_en.htm, accessed 20 April 2019). The MSP Directive was adopted in 2014, seeking to ensure “human activities at sea take place in an efficient, safe and sustainable way.” Although environmental protection also plays a role, policy objectives include reduction of sectoral conflicts, encouraging investment and increasing cross-border cooperation. (https://ec.europa.eu/maritimeaffairs/policy/maritime_spatial_planning_en, accessed 20 April 2019).

knowledge, and the ability to learn point to close connections with knowledge integration. There are varying degrees of participation in planning, ranging from the provision of information to more collaborative forms of decision-making (Morf et al., 2017), each of which may be linked to varying degrees of empowerment and different roles in decision-making (Morf et al., 2019). MSP has been criticised for perpetuating (unequal) power relations (Ritchie and Ellis, 2010; Flannery et al., 2016; Tafon, 2018), meaning tools could contribute to including marginalised stakeholders in MSP. These may be the general public, but also stakeholders that still view the MSP process with some suspicion (in many countries, fishers, e.g. Ciolek, 2018). Tools could thus conceivably contribute to broadening the type of stakeholders included, the mobilisation of marginalised groups, and different types of participation, starting with simple information provision all the way to collaborative decision-making.

3.1.4. Knowledge integration

Knowledge integration is closely related to stakeholder integration, but carries the added dimensions of acknowledging and accepting the relevance of different types and forms of knowledge and finding ways of bridging knowledge gaps. MSP can be understood as either a technical, performance-oriented exercise (with a corresponding focus on scientific data and information), or a process that is used to actively include an array of different stakeholders, including scientific and more qualitative forms of knowledge (Saunders et al., 2017). Including qualitative knowledge often requires a participatory setting and broad stakeholder engagement to embed the knowledge of different epistemic communities in the MSP process. In addition, knowledge integration as a concept also relates to the interpretation of “raw” data to achieve shared understanding, as well as integrating differences in the interpretation of knowledge. Identifying knowledge gaps can be understood as a precondition for knowledge integration. The actual act of knowledge integration can take many forms, from simply gathering additional data to bringing in local or contextual knowledge to the co-production of knowledge and its use in deliberative processes.

Tools can thus play very different roles in the context of knowledge integration. Some may have been designed to elicit particular knowledge, for example spatial knowledge versus non-spatial knowledge. They may be particularly suited to bringing together different types of knowledge (such as scientific, local or socio-cultural knowledge, quantitative and qualitative knowledge, sector-specific knowledge), or able to address specific data or knowledge gaps. But apart from these more tangible, output-oriented aspects, there is also a process-oriented role of tools, such as contributing to building shared norms, or offering a platform for debate and the co-production of knowledge.

3.1.5. Overall outcomes of employing the tool related to integration challenges

In line with differentiating between the inherent capacity of a tool to address a particular integration challenge, the application case of the particular tool and the relationship of its application to the wider MSP process, it is useful to establish whether tools and approaches can also contribute to wider commonly desired outcomes of the MSP process. This particularly refers to the social benefits of successful integration, which can be expressed as social sustainability and general process indicators. Here, it is less the capacity of the tool that comes into play but more the more long-term and indirect outcomes of tool use. These are likely to depend on factors such as good process design and ensuring the results of applying the tool are fed into the ongoing MSP process in an appropriate way.

Based on the above, we draw up a list of questions relating to the four integration challenges and more general MSP outcomes against which the capacity of each tool can be assessed (Table 1). This is not an exhaustive list, and many other and more specific questions are conceivable (a longer list was developed in Gee et al., 2018). Here we choose to focus on a relatively simple sub-set of questions to illustrate

the principle of tool assessment in MSP integration. We have selected questions that (1) reflect common problems discussed and encountered in MSP, (2) are generic enough to apply to a wide range of MSP processes,² (3) can be answered by different types of tools, and (4) could easily be assessed as part of the BALTSPACE case studies (Table 2).

3.2. Tool selection

When looking at current MSP practice, it is apparent that a range of instruments are already being used to promote and implement integration in MSP. Formalised institutional arrangements, voluntary approaches and partnerships or mechanisms specific to particular sectors or contexts can all be classified as instruments designed to support or actively facilitate integration. Clearly, it is not possible to test the entire range of tools that is conceivably available to support MSP. Our intention is here is to review different types of tools, moving away from considering DSTs as a specific case. We therefore include tools that have been developed for MSP, but also tools that were originally conservation tools and one originating from business management. Our selection comprises the following:

- Culturally Significant Areas (CSAs)
- Integrated Indicator System for monitoring the spatial, economic and environmental effects of MSP solutions (IIS)
- The tools Marxan and Marxan with Zones (MAR)
- Open Standards for the Practice of Conservation (OS)
- Spatial Economic Benefit Analysis (SEBA)

This choice reflects both the variety of available methods and the diverse range of tasks that commonly need to be completed in MSP (Cormier et al., 2013; Gilbert, 2008; ICES, 2013; Morf et al., 2017; Olsen et al., 2009; Schwartz et al., 2012; Watts et al., 2009). All tools and approaches chosen are analytical; they furthermore comprise product- and process-oriented as well as data and spatially focused tools and approaches. Tables 2 and 3 provide brief overviews of the tools (see Gee et al., 2018 for more detailed tool descriptions).

The assessment of the tools is based on a single application case for each tool carried out in the Baltic Sea Region in 2016/17. Table 3 gives a short description of each tool, the expected outcome of the case, and the setting in which the application took place.

3.3. Constraints of the application cases

The tool assessment carried out for the purpose of this paper was not a comparative exercise in the sense of applying each tool in different settings and then comparing the outcomes. Each tool was applied only once, and each was applied in a different case study context. The tools were applied by researchers familiar with them; the same researchers also carried out the evaluation based on a common template of evaluation questions. In order to broaden our evidence base, the analysis presented here also draws on previous experiences with the tools to identify their full potential rather than basing our analysis on a single application case.

It should also be pointed out that when assessing the outcomes of the tools and approaches, our evaluation did not define counterfactuals, i.e. measure the effect of a tool by considering what would have been the likely outcome (of a process or step in MSP) without employing the tool, assuming all other conditions are the same. Where possible, the tools were applied in ongoing MSP processes; however, due to the lengthy nature of these processes, full before- and after evaluation (and

² In the Baltic Sea region, countries are still at very different stages of the MSP process, ranging from early stage stocktakes to completion of second-generation plans. For the tools assessment the BALTSPACE project drew on Germany, Poland, Lithuania, Sweden, and Denmark (see also Table 2).

Table 2
A comparative overview of the tools and approaches.

Tool/approach	Spatial focus?	Data focus?	Problem or process focus?	Computerised?	Descriptive or analytical?
Culturally Significant Areas (CSA)	Yes	Yes	Problem and process focus	Some (mapping)	Analytical
Integrated Indicator System for monitoring the spatial, economic and environmental effects of MSP solutions (IIS)	Yes	Yes	Problem focus	No	Analytical
Marxan and Marxan with Zones (MAR)	Yes	Yes	Problem focus	Yes	Analytical
Open Standards for the Practice of Conservation (OS)	(Yes) ³	No	Process and problem focus	Yes	Analytical
Spatial Economic Benefit Analysis (SEBA)	Yes	No	Problem focus	Some (mapping)	Analytical

³ A GIS based spatial tool has become available during 2017, but has not been used in the Swedish cases analysed. The tool is (so far) not coupled with the logical conceptual model for planning and management that is developed case-specifically when using the OS-approach.

Table 3
Short description of the tools and approaches, their outcomes, and the case studies.

Tool	Short description	Outcomes	Case study
Culturally Significant Areas	A participatory approach to identify and take account of immaterial cultural values in communities. Five criteria are used for determining cultural significance based on community input.	A deeper understanding of why communities value different places. Baselines of immaterial values, maps and risk assessments.	Application case in Sweden at the municipal level.
Integrated Indicator System for monitoring the spatial, economic and environmental effects of MSP solutions	Evaluates the impact of MSP against an initial baseline and is thus capable of evaluating MSP ex-post. Can be applied in a participatory or non-participatory setting.	Monitoring and evaluation of environmental and socio-economic change before and after the introduction of MSP.	Application case in Lithuania and exploring the potential for application in Poland.
Marxan and Marxan with Zones	Software-based site selection software that helps to systematically identify possible locations for specific uses or nature conservation based on an iterative, cost optimizing model and geographic data. Expert guidance is required for using the software; data quality is a constraint. Can be used in a participative context.	Maps and data visualizing the spatial management options for the modelled scenarios.	Application case in Denmark.
Open Standards for (the practice of) Conservation	Process standards including a comprehensive, 5-step adaptive management approach, an ecosystem-based conceptual framework and a digital and practical toolbox. All is owned and supported by a community of practice and learning (Conservation Measures Partnership). Designed to be used in participative settings.	Systematically structured planning, based on a situation specific conceptual model, enabling evaluation and learning and process-based multidimensional integration.	Conceptual study of how OS has been applied so far and how it could be effectively linked to coastal and marine spatial planning (local, regional, national, cross border Sweden-Norway).
Spatial Economic Benefit Analysis	Identifies and maps the spatial distribution of beneficiaries (jobs, companies) associated with a given set of maritime uses. Requires appropriate data and expert interpretation; can be used in participative settings.	Maps showing the geographical distribution of beneficiaries at different scales.	Application case in Germany with focus on the German Baltic Sea coast and selected economic activities.

thus longer-term impact evaluation) for the tools could not be carried out. Benefits from using the tools were therefore identified qualitatively. In two cases (IIS and OS), evaluation draws entirely on previous application cases due to the sensitivity of ongoing MSP processes. Other constraints were data and information-related, e.g. in the case of the SEBA approach, which meant the application of the tool was limited to those sectors were sufficient information could be obtained.

Both tool application and their subsequent assessment involved input by practitioners and/or stakeholders. In some application cases, stakeholder input was more intensive than in others. Most of our evaluation data is qualitative and derived from interviews and workshops, as well as more informal conversations and information gathering during meetings. In the case of SEBA, researchers developed the tool in-house and then presented it to practitioners for input and reflection.

4. Results

The following section presents the results of assessing the seven tools and approaches against the specific integration challenges listed in Table 1. Each sub-section contains a summary of the most important aspects and differences between the tool.

4.1. Multi-level and transboundary integration: does the tool/approach bring together different geopolitical and/or geographical scales and dimensions in MSP?

All of the tools analysed are capable of integrating different scales of assessment. Analytical tools such as SEBA and MAR are useful for highlighting interlinkages between scales, e.g. by producing maps. In the case of the OS the choice of geographical scale is very important in

terms of the original problem definition and choosing which stakeholders to involve. The tool itself is capable of integrating different scales, although problems and issues to be tackled by the tool need to be matched with appropriate boundaries and mandates.

Land-sea integration was found to be a key benefit of applying some of the tools. Some bridge the gap between terrestrial and maritime data, as is most apparent for the IIS which integrates statistics as well as the spatial implications of both terrestrial and marine activities. Connections can therefore be established between activities in the sea, the spatial footprint of these activities (and changes over time) and the impacts of these activities on land, e.g. on coastal infrastructure and other socio-economic indicators (although the problem of attribution is a particular issue here). SEBA was specifically developed to show the economic impacts of marine uses on land, revealing land and sea to have close connections and showing the consequences of MSP decisions for the economic well-being of regions, which is highly relevant information for terrestrial planning. CSAs also facilitate land-sea integration, but it does so in a less data-oriented and more qualitative way. CSAs facilitate combined value assessments of coastal and marine values as perceived by communities. A scenic view, for example, readily transcends the land-sea boundary as it is dependent on particular qualities of the terrestrial and marine environment. MAR, as a tool supporting the spatial planning, can handle the direct neighbourhoods of uses and ecosystem components on land and at sea and suggest zones stretching over land and sea.

4.2. Policy and sector integration: does the tool/approach allow for the integration of asymmetric sectors and contribute to increasing (institutional) policy coherence?

In terms of inherent capacity, three tools were found to specifically assist the integration of asymmetric sectors. Here we refer to situations where less powerful sectors (with legitimate claims) are unable to make their voices heard against more powerful sectors and where some active balancing may be necessary. The CSA tool can contribute to such re-balancing if one considers local communities and/or socio-cultural stakeholders a sector. Often, these stakeholders and their values are overlooked in the MSP process, so the CSA tool is designed to help make their concerns heard. In MAR, it is also possible to give greater weight to weak sectors or set higher targets for these sectors. At the same time, CSA and MAR only illustrate different options, or in the case of MAR the consequences of decisions. Responsibility for then taking these decisions (e.g. including the voices of the less powerful sectors in such decision-making) still then lies with the respective planning authorities. SEBA is an interesting case as it can be combined with an assessment of relative sector strength. A SEBA may reveal, for example, that weaker sectors in fact have a stronger positive effect on the (coastal) economy than sectors with more powerful stakeholders, which may help such sectors gain more attention.

None of the tools were found capable of directly achieving greater policy coherence, although three tools were found to be useful in identifying policy gaps or lack of coherence. The first is CSA which can point to the wider policy landscape related to landscapes, archaeology or the management of historic sites, either at the national or transnational level, and encourage MSP to take note of these policies. The second is OS which can help to increase the coherence of objectives, action and evaluation at the national and transnational level. This, however, depends on the geographic, thematic and procedural scope of its application and how broadly the process of interaction is organised. In prior application cases in Sweden, the material produced by OS has fed into other policy areas, e.g. green infrastructure planning, fisheries management and coastal spatial planning. The third is SEBA whose outcome could also lead to increased policy coherence, in this case the coherence of MSP and economic policy. Knowledge of economic relationships and the spatial distribution of beneficiaries could be a starting point for aligning transnational policy trajectories in MSP, coastal spatial planning or regional economic development. The connectivity shown in the output maps represent a strong argument in favour of aligning policy.

None of the tools go as far as resolving institutional incompatibilities; at most they can contribute to highlighting these or working together despite such incompatibilities. OS, for example, can be extended to cover bilateral perspectives with dissimilar institutional structures, and there is one application case covering trilateral fisheries and conservation management in Denmark, Norway and Sweden. Assessing the impact of tools on resolving institutional incompatibilities is difficult on account of the attribution problem and would in all likelihood require a more long-term and intensive social science assessment than was carried out here.

4.3. Stakeholder integration: does the tool/approach extend the range of stakeholders included and their respective norms and values, e.g. by making marginalised stakeholder groups more influential?

In the case of stakeholder integration, the difference between the fundamental capacity of the tools and specific application cases probably becomes most obvious as everything depends on the intention with which a tool is used. Our analysis takes account of this fact by differentiating between three types of tools. The first type require stakeholder involvement to generate results at all; we would class these as original stakeholder integration tools. The second type produce better results if stakeholders verify certain stages or interim results; these

would also be considered stakeholder integration tools, especially if this involves stakeholders that are not otherwise included in the MSP process. The third type do not need stakeholders to generate an output (and could be run by experts or planners alone); however, they could also be applied in a participatory setting and contribute to stakeholder integration in that way.

For the second and third type, the main difference is whether the tool is merely used for information gathering (which may only need sporadic stakeholder input) or whether its application is intended to be collaborative exercise. Much will also depend on factors such as the availability of stakeholders and the skill of the person(s) applying the tool, as stakeholder integration benefits are not a foregone conclusion even in the case of collaborative tools.

CSA and OS are examples of broadly participative tools in that they rely on the input of stakeholders to generate primary outputs. CSAs facilitate the participation of communities and stakeholders not normally included in MSP processes, thus broadening the range of stakeholders involved in MSP.

OS also have the potential to be highly participatory, although the OS tools can also be used without a participatory process. Broad involvement is particularly important for the initial development of a vision, problem analysis and measures, but the degree of participation ultimately depends on the scope that is chosen for the process and how the subsequent process is organised (e.g. relying on workshops or not). Given careful facilitation, OS are able to integrate a broad range of stakeholder views and values, although the terms used in the conceptual framework need to be defined in a way that is easily understood by everyone to avoid deepening schisms (e.g. defining fisheries as a threat).

Desktop tools such as MAR and SEBA can either be run as purely expert-led approaches or as participative exercises, although the number of stakeholders that can realistically be involved at any one time is probably small. All of these tools benefit from stakeholder feedback and sometimes actively require it: The common understanding of good practice for applying of MAR, for example, is to bring together different stakeholders for both generating and subsequently assessing different management scenarios. Some of the more analytical tools are more accessible and useful to expert stakeholders (such as policy makers and planners) than to the general public, although involving non-expert stakeholders may simply require more facilitation and explanation. The outputs of these tools can certainly be used for broad-scale communication, feeding into other processes of stakeholder or knowledge integration. SEBA is particularly useful for the integration of the private sector, although the outcome of a SEBA analysis may not please everyone. A discussion base for different economic sectors and the role of MSP in facilitating economic development is certainly provided.

The stage of the MSP cycle at which a tool is employed also affects the role it can play in stakeholder integration. Tools that are used retrospectively, e.g. to analyse the outcome of an MSP process, are likely to involve stakeholders differently, less in a co-design capacity than for the purpose of giving feedback on results. IIS and SEBA are examples of more retrospective assessment tools where integration of stakeholders is potentially less strong than in the case of process-oriented tools such as OS.

One way for tools to encourage broader stakeholder involvement in MSP, especially also drawing in marginal groups, is to act as door-openers. Door-openers are tools that make the connection between stakeholders and MSP more tangible, rendering MSP less remote and abstract and offering an easy "way in". Useful door-openers will reduce misconceptions about MSP; they may also establish emotional connections to places or practices to encourage stakeholders to become involved (such as CSA). At the same time, these tools must also show ways for these important values to be included in the subsequent MSP process if stakeholders are not to experience frustration and turn away from MSP.

Another route for encouraging marginal stakeholders to become involved is to provide information that can help stakeholders make their case. SEBA is such a tool in that it expresses the economic benefits of maritime sectors and the geographical distribution of these benefits. This can make stakeholders more aware of the role of MSP (and terrestrial planning). A factual information base may also help private sector stakeholders and planners to engage in a constructive discussion on where investment may need to be encouraged and what the consequences of certain spatial planning decisions might be.

Generally speaking, stakeholders need continued motivation in order to remain involved. A balance needs to be struck in terms of transaction costs, especially in the case of long-term processes and associated tools such as OS, which means stakeholders must perceive a clear benefit in order to remain involved. Stakeholder mobilisation may be easier if they perceive immediate benefits from their involvement, such as seeing their input reflected in products (e.g. in creating MAR scenarios).

All tools are inherently capable of producing information that can then be used in consultation. None of the tools, however, directly takes the last step towards collaborative decision-making, although most at least are capable of creating a basis for such decisions.

4.4. Knowledge integration: does the tool/approach recognise/address specific knowledge gaps?

Stakeholder integration is closely connected to knowledge integration, although knowledge integration is also possible without direct stakeholder integration (e.g. by drawing on existing data). Direct stakeholder involvement can lead to more and different knowledge being made available, filling existing knowledge gaps (e.g. process-related or tacit knowledge), although the issue of data impartiality can be tricky to resolve.

In the case of CSAs, there is explicit focus on socio-cultural knowledge and making this (often neglected) knowledge visible. Two different ways of knowing places are brought together: the more scientific quantitative knowledge of e.g. visitor distribution and site visits, and the more tacit, qualitative and value-based knowledge held by stakeholders or communities on particular places. Place-based knowledge held by local communities and people can be driven by entirely different knowledge systems and experiences of the world, as is the case in First Nations communities around the world. The CSA tool therefore also points to some limits of knowledge integration, in that some of the qualitative knowledge held by people (e.g. certain values) is difficult to translate into spatially explicit products such as maps.

Several of the tools play an important role in identifying knowledge gaps. The IIS reveals knowledge gaps through the process of compiling statistics and graphs; more often than not gaps are apparent in the socio-economic rather than the ecological sphere. The SEBA tool can reveal a lack of data for maritime sectors; some interesting questions on who benefits from the use of maritime space cannot be answered at present (or not in the required depth) because of the lack of statistical data. The OS can help to identify all types of knowledge needs and gaps by providing an overall logical framework that reveals what is already known and what isn't, e.g. with respect to ecological or human well-being.

Another knowledge gap is related to the consequences of planned action in MSP. With the exception of MAR, none of the tools are designed to be scenario tools. Evidently, there are many tools not showcased in this analysis that do fulfil this role (see [Pinarbasi, 2017](#) for a selection). Bearing in mind some caveats, most of the tools presented here could be used in such a way with minor adaptations. CSAs for example could be combined with a risk assessment to depict the consequences of planning decisions (or lack of planning decisions) for socio-cultural values. The IIS could be applied as a predictive tool if combined with a scenario-based approach: It could highlight the spatial changes, economic effects and social implications that would result

from different development paths. SEBA could become a forecasting tool in the same way: Used in the context of development scenarios where different uses are given priority in marine space (e.g. different zoning priorities), it could be used to identify which areas might benefit or suffer disadvantages as a result. None of these forecasting applications, however, have been tested so far. Within OS, evaluating the consequences of action is an essential element of the adaptive management approach and facilitated by the logic of the method. At the same time, this may be difficult if the OS are only used as part of an MSP process and do not accompany the entire planning cycle. It is also difficult to evaluate certain consequences of action in planning due to the attribution problem.

One of the least visible, but often crucial knowledge gaps is related to knowledge generated from deliberative settings and more advanced forms of learning such as double and triple loop learning ([Hurlbert and Gupta, 2015](#)) where knowledge is developed by the participating stakeholders through processes of (self) reflection and self-evaluation. Whether such knowledge gaps can be filled comes back to the difference between the tool itself (and what it is capable of delivering in terms of knowledge integration) and how it is being applied. Opportunities for enhancing the knowledge base are much greater if the process of using the tool is considered a value in its own right, delivering "soft" benefits (such as stakeholder interaction, stakeholder learning) on top of the "hard" outcomes in terms of tool products (e.g. maps).

4.5. Contribution to overall process outcomes: efficiency, inclusiveness, capacity building

Efficiency of decision-making is a difficult outcome to evaluate as clarity is first needed on what efficiency means. For example, efficiency could refer to a faster planning process, a less costly process, or a less contentious one in the sense of dealing with fewer conflicts. A faster and less costly approach may not always be an advantage as lean processes may also reduce opportunities for deliberation and participation, although efficiency gains have obvious advantages if the same outcomes can be achieved.

In terms of the tools, most appear a two-edged sword with respect to efficiency. In many ways, tools add more complexity to a process that is already complex, potentially adding more time to what is already time-consuming. It is not a given that the outputs of tools simplify or streamline decision-making; they might even have the opposite effect when results are contentious or trigger additional debate. Tools that allow a degree of forecasting may provide a more factual baseline for discussion or deliver indications of possible changes, but this strongly depends on data availability and the skill of the tool operator. Information provided by tools can only provide input to the debate; any value judgements on what might be a desirable course of action are then in the hands of planners - and stakeholders if MSP is a participative process. Comprehensive process-oriented tools such as OS can make decision-making more structured and systematic and increase awareness of knowledge gaps, but the initial investment costs are high and only worthwhile if the problems and landscape of actors is complex and requires careful analysis and synthesis of different kinds of knowledge. Some of the initial investment costs may be recouped at a later stage if the outcomes of tools (or their debate) reduces the potential for conflict further down the line and therefore enables a smoother process.

Tools only contribute to greater legitimacy of MSP decisions if they allow for broader stakeholder involvement and participative decision-making. In most cases, this is not a question of the tool but of the subsequent process, i.e. how the information the tool has provided is used and interpreted - and by whom. At most, thus, tools can be said to create a basis for more legitimate decisions in that they broaden the knowledge or evidence base available for decision-making and - if done as a participative exercise - facilitate a more inclusive process.

Some but not all of the tools analysed here actively facilitate greater

overall inclusiveness of the MSP process. The CSA tool invites stakeholders to the table that may not otherwise be included; the SEBA tool enhances the inclusion of economic stakeholders. For the IIS, greater representativeness of the MSP process (understood here as a process based on ecological, economic and social values) is in fact the main purpose of the tool. For most of the tools, however, everything depends on whether they are applied in a participatory setting or not. Inclusiveness, representativeness and also fairness are thus less a function of the tool than its context and mode of application. (Perceived) fairness in particular is often due to the perception that different voices are being heard and that no group is given undue preference over others.

Capacity building is probably one of the most important side-effects of tool use. Depending on the setting, individual learning takes place as well as group and organisational learning, encompassing technical learning (e.g. how to use a tool, how to interpret its results) as well as other learning (e.g. encountering other ways of thinking, other world views, other sectors, other approaches to science). At the same time, additional input may be needed to facilitate specific types of capacity building, such as training in technical matters and soft skills.

5. Discussion

There are plenty of other MSP tools not covered in this study that might address the integration challenges in a better way. Nevertheless, our assessment can offer some general pointers for tool use in this specific context.

Bearing in mind the limitations of our empirical basis, we find that the most obvious shortfalls exist in the category of policy integration. Arguably, it is not the task of tools to actually achieve greater policy integration or policy coherence in and by themselves. They can only assist policy makers in reflecting on the current status of policy integration at various levels. Tools, however, may play an important role in highlighting existing gaps in policy integration. This is a field where more analytical tools could come to the fore. An example for a tool not presented here is the bowtie approach that was successfully employed to analyse marine legislation within a multi-jurisdictional context from a cumulative-effects assessment perspective (Cormier et al., 2018). The OS analytical framework also allows identification of institutional and regulatory challenges and strategies. Still, policy integration in the sense of achieving greater policy coherence or addressing institutional incompatibilities seems a very distant potential outcome of the tools presented here. The exception could be OS if it runs alongside repeated MSP cycles, as this offers space not only for integrated analysis but also for reflection, deliberation and collaborative decision-making.

Stakeholder and knowledge integration seem the easiest integration challenges for tools to address. One of the reasons for this are the multiple entry points offered to tools in these contexts. Another is that tool application in MSP is usually a social process, Especially process-oriented tools, by their very nature, are inherently dependent on stakeholder involvement, although some tools such as SEBA and MAR could also be used by individuals as mere desktop exercises. In terms of knowledge, any tool use is likely to have some benefit in terms of new knowledge produced, although the depth and complexity of that learning then obviously depends on the design and scope of the tool and how and when in the MSP process it is used.

How a tool is used can make a considerable difference to the number of integration benefits that can be obtained from using it. While good technical understanding is essential to obtain reasonable outputs (e.g. a MAR scenario that makes sense), focusing on tool outputs alone will not do justice to the tools in terms of the integration benefits they could be achieving. This particularly concerns the “soft” or secondary outputs of tool use. Consider the example of stakeholder integration: All tools, whether process or product-oriented, can contribute to stakeholder integration, but in the case of product-oriented tools, this requires them to be used in a participatory setting. The implication is that

some of the integration benefits achieved by tools and approaches are down to the tools themselves, but additional – and possibly more important benefits – can be achieved if designing the application case with indirect or secondary integration benefits in mind.

One caveat is that tools may well be able to facilitate stakeholder involvement in MSP, e.g. when acting as “door openers” to MSP, but this does not necessarily equate to full-scale stakeholder integration in the sense of meaningful, fair inclusion throughout the entire MSP process. A similar point can be made with respect to other recent studies that focus on serious games as a boundary objects and means of involving stakeholders with limited decision-making power (Jean et al., 2018a). Studies of the MSP Challenge game (Keijser et al., 2018; Jean et al., 2018b; Abspoel et al., 2019) found that it has significant added value for individuals and groups through the promotion of knowledge co-creation (Jean et al., 2018b). It was also found to be an efficient and effective way of familiarising stakeholders with MSP, and creating meaningful interaction and learning among stakeholders. All these benefits, however, do not automatically imply meaningful integration of stakeholders in the subsequent MSP process.

One of the objectives of this paper was to assess the contribution of tool use to overall MSP process outcomes. This is a difficult challenge, not least because of problems of attribution. In terms of overall efficiency of the MSP process, tools may make MSP processes more efficient in the long term, e.g. by providing a framework for addressing a difficult issue or clarifying a specific point with stakeholders. Yet the mere fact that a tool is being applied also adds more complexity, requiring good management of time, timing and resources.

In terms of overall process outcomes, it is worth considering legitimacy as the (perceived) legitimacy of the MSP process may be influenced by the (perceived) legitimacy of tool use. To assess the legitimacy of the tool process, it may be useful to borrow from political science and differentiate between input, process and output legitimacy. Input legitimacy is concerned with decisions being made in a way that involves those being governed (Scharpf, 2003); it is increased if more people are able to take part in the decision-making process. Examples for input legitimacy would be the kind of data used or perhaps the range of stakeholders included. Process legitimacy focuses on the how of decision-making; it would be related to transparency and inclusiveness of the tool process. Output legitimacy, also termed legitimacy through performance, is increased if the needs of more stakeholders or individuals are met; in MSP it would refer to the end result or products for different stakeholders which could be material or immaterial. Tool use can deliver different combinations of legitimacy, so even if the end result is not ideal (e.g. there is insufficient data to achieve the desired output) a tool could still achieve process legitimacy. Whether the tool contributes to greater legitimacy of the MSP process would then depend on how its use is linked to the MSP process, and whether the results are fed in, discussed and acted upon in a way that all participants agree is legitimate (e.g. transparent).

Ultimately, whether a tool can successfully contribute to improving the overall outcomes of the MSP process at least partially depends on how it is linked to the MSP process. Fig. 1 shows two options for doing so. The first option on the left is at one end of the scale, showing the MSP process as a yellow circle surrounded by the independent use of MSP tools. In this case, tools are used as stand-alone processes, either on their own or in combination, producing independent results that can then be fed into the MSP process at particular points in time. This scenario could be likened to the use of expert opinions: Both give input, but are not an integral part of the discussion. This scenario is likely to apply to many product-oriented or analytical tools that are designed to resolve a particular issue, and can apply irrespective of whether the tool is used in a participatory way or not.

The second option represents the other end of the scale, in the sense that the tool (most likely a complex process-oriented tool such as OS) accompanies the entire MSP process – often to the point that it becomes difficult to separate the tool process from the MSP process. Here, the

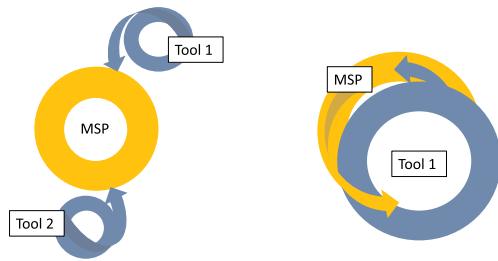


Fig. 1. Different roles of tools in the MSP process. Left hand side: Tools as independent processes that can feed into the MSP process at different times. Right hand side: Tool and MSP process are closely interconnected and even one and the same.

options for influencing the MSP process and its results are much more direct and long-term (e.g. in achieving stakeholder integration at a level of collaborative decision-making), but also more dependent on the skill of the process manager. Other options are conceivable, e.g. where tool use triggers the MSP process or vice versa. Both types of tools could still be judged based on input, process and output legitimacy, although their scope for influencing the overall MSP process is different. Having said this, even a “small” tool can make an important contribution to an integration challenge if this comes at the right time, with the possibility for setting or changing the course of the subsequent MSP process (e.g. the inclusion of community-based knowledge from the beginning as a way of generating trust).

It is the wider MSP context which ultimately influences whether tools can successfully address integration challenges or not. “Context” refers both to the application of the tool, e.g. whether a participatory approach is chosen, as well as the ability of the wider MSP process to make use of the results the tool has produced. This may require a general openness to reflection and debate, the ability to honestly discuss the constraints of tools and results, and a willingness and ability to act on the outcomes provided by the tools.

6. Conclusions

Whichever integration benefits tool use is designed to deliver, good prior knowledge of tools and their requirements, potentials and limitations is needed for applying them. Clarity of purpose is essential to ensure the right tool is chosen for the right task in the right context: This must include understanding of the capacity of the tool (what it is designed to do), application requirements (what resources are needed to apply it) and the limitations of the tool (what outcomes can be realistically expected). It must also include understanding of which tool is useful at which stage of the planning or management process.

In terms of integration benefits, we find it helpful to differentiate between process- and problem-focused tools, in other words those that deliver a particular output (e.g. maps, scenarios) and those that are more about processes. This can point to the type of integration the tool is more ready to support. Having said this, there are significant differences within each of the four integration challenges in terms of what exactly the challenge consists of. In the case of knowledge integration, for example: Is the challenge to gather different scientific data to produce a map? In that case, a technical tool may be ideally suited to the task. If it is about bringing together scientific information with more contextual, locally held stakeholder knowledge, a process-oriented tool may be the better choice.

There are many other ways of evaluating the benefits of tools and approaches in MSP that are not related to integration challenges. A key message of our assessment is that process-related aspects of tool use may deliver additional integration benefits and in some cases considerably extend the inherent potential of the tools. These hidden capacities depend less on the tools themselves than the circumstances and skill of their application. In some cases – e.g. a contentious MSP process

– these secondary benefits (e.g. enhanced stakeholder collaboration) may be more important than the primary outcome of using the tool (e.g. a map).

We also want to point to some constraints with respect to tools and their role in addressing integration challenges.

Firstly, even if the right tool is chosen for the task at hand, merely applying it does not automatically lead to greater integration. Tools can be applied without the intention of achieving integration effects, or merely applied badly. Although some tools may seem self-explanatory, a dedicated facilitator with specialist skills is thus an advantage.

Furthermore, data constraints limit the applicability of data driven or statistical tools. Especially economic data is often missing at the right scale, and social and spatial data can also be difficult to obtain. In some cases, the real constraint is not with the tool itself but with feeding its outputs into the MSP process. Some tools point out limits of knowledge integration - for example when non-spatial values cannot be translated into spatially explicit maps.

Whether a tool contributes to addressing integration challenges is down to many other variables that can only be partially controlled by the tool users. Tools can contribute to, but rarely fully “resolve” an integration challenge. The definition of success depends on how the aims or end points of integration are defined. If stakeholder integration is simply about broad stakeholder participation, then the task is easily resolved. If it is about optimal stakeholder integration, definitions may be more difficult. Other integration challenges are more complex. Efficiency is a case in point, as this is commonly defined by comparing costs (such as time spent, training needs, financial investments) to the benefits that can be achieved. Suitable – and integrative - ways need to be found to define and measure “softer” benefits of tool use, including those related to the social dimensions of MSP.

Ultimately, a successful tool in the context of MSP integration challenges is one that is applied in the right context at the right time for the right purpose with the right degree of support and facilitation. For tool use to contribute to overall MSP process outcomes – such as legitimacy - planners or anyone else applying the tool will require a high degree of awareness of process- and power-related aspects up and beyond good technical knowledge of the tool. If designed well, and if suitable transfer is ensured, tool use can substantially enhance the integrative capacity of the MSP process.

The results described in this paper are necessarily tentative; more validation by additional case studies would certainly be desirable. It would also be useful to evaluate the medium and long-term impact of tool use in the context of integration challenges in a before- and after comparison using a standardised baseline against which to measure change.

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