

Assessment tool addresses implementation challenges of ecosystem-based management principles in marine spatial planning processes

Corresponding Author: Dr Ibon Galparsoro

This file contains all editorial decision letters in order by version, followed by all author rebuttals in order by version.

Version 0:

Decision Letter:

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Dear Dr Galparsoro,

Your manuscript titled "Aligning ecosystem-based approach principles with marine spatial planning processes" has now been seen by 2 reviewers, and we include their comments at the end of this message. They find your work of interest, but some important points are raised. We are interested in the possibility of publishing your study in *Communications Earth & Environment*, but would like to consider your responses to these concerns and assess a revised manuscript before we make a final decision on publication.

We hope you will find the reviewers' comments useful as you decide how to proceed. Should additional work allow you to

- address these criticisms (that is, either to incorporate the suggestions or provide a compelling argument why the point made by the reviewer is not valid or relevant to the editorial threshold as outlined below)

AND

- meet our editorial thresholds as outlined below,

then we would be happy to look at a revised manuscript.

In the following, we list our minimum requirements for publication:

********Provide compelling evidence that supports applications of ecosystem-based marine spatial planning assessment tool to national plans in the European Union.

********Clarify data deficiencies, terminology, and details on stakeholders' selection criteria and provide specific examples of the tool application.

*******Expand your discussion to address the gaps in marine spatial plans and the EU targets.

We therefore invite you to revise and resubmit your manuscript, along with a point-by-point response that takes into account the points raised. Please highlight all changes in the manuscript text file.

Please submit your point-by-point responses as a separate file, distinct from your cover letter where you can add responses to the Editors' comments that you do not want to be made available to the reviewers. Word files are preferred.

Important: The response to reviewers must not include any figures, tables or graphs. If you wish to respond to the reviewer reports with additional data in one of these formats, please add them to the main article or Supplementary Information, and refer to them in the rebuttal. Due to current technical limitations, any figures, tables, or graphs embedded in your rebuttal will not be included in the peer review file, if published.

We are committed to providing a fair and constructive peer-review process. Please don't hesitate to contact us if you wish to discuss the revision in more detail.

Please use the following link to submit your revised manuscript, point-by-point response to the referees' comments (which should be in a separate document to any cover letter), a tracked-changes version of the manuscript (as a PDF file) and the completed checklist:

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We hope to receive your revised paper within six weeks; please let us know if you aren't able to submit it within this time so that we can discuss how best to proceed. If we don't hear from you, and the revision process takes significantly longer, we may close your file. In this event, we will still be happy to reconsider your paper at a later date, as long as nothing similar has been accepted for publication at Communications Earth & Environment or published elsewhere in the meantime.

Please do not hesitate to contact us if you have any questions or would like to discuss these revisions further. We look forward to seeing the revised manuscript and thank you for the opportunity to review your work.

Best regards,

Miranda Boettcher, PhD
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Communications Earth & Environment
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Martina Grecequet, PhD
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REVIEWER COMMENTS:

Reviewer #1 (Remarks to the Author):

Dear authors,

Please find my comments below. I provide both general comments, and some additional comments/questions to some of the specific sentences.

All the best,
Ben Boteler

General comments:

The submitted manuscript is very well written and provides a succinct yet detailed introduction into the EB-MSP tool. The tool is a novel effort to merge two dominant approaches within EU marine governance – Ecosystem-Based Management and Marine Spatial Planning. Therefore, it can be a useful contribution to decision makers looking to understand the value of this tool, as well as to other researchers looking to utilize it or apply similar approaches. In particular, the application to transboundary marine areas is highly valuable, and addresses a key governance challenge that decision makers are faced with. The development of the tool through a co-design and validation approach, provides confidence in the application of the tool and the results presented in the paper. However, as the authors point out, some important short comings to the tool do exist – such as how to consider cumulative pressures through planning and management processes, but this is understandable and could be explored in future iterations of the tool.

The description of the application of the tool presented in Chapter 3 is intended to provide an insight into the types of findings one can expect when using the tool. While it is understood that the intention is no to provide an in-depth assessment of the case study areas, the review and the description of findings is at a very high-level, for example referring to the importance of ‘governance instruments and institutional arrangements’ identified by interviewees through the framework. However, this level of information alone does not provide very useful insights into the actual challenges of the case studies, and is therefore sometimes challenging to follow the actual impediments faced by decision makers or the presented differences between the cases. The authors could provide some more specific examples relevant to the cases which might be useful for the understanding of the reader and base the paper more in the context of cases that were studied.

Specific comments:

The title of the manuscript might be improved through a specific mention of the assessment tool and its application – which is the focus of the paper. The current title suggest that the paper would focus more on the two concepts (EB and MSP) and how they might be aligned or merged conceptually.

37: consider alternative wording to ‘traditional’, such as ‘long standing’? maritime traffic is perhaps not a traditional activity in the full sense of the word.

145-146: ‘This deficiency stems from data inadequacies in the social and economic dimensions (..)’ What are the deficiencies or inadequacies?

147-148: “It was also highlighted that current plans do not account for broad restoration goals.” What is meant by ‘broad restoration goals’? Is this referring to the CBD GBF, EU goals, national, or something else?

175-176: “The assessment of human pressures and impacts (inventory and mapping, substage 2.2), was not properly addressed”. What would ‘properly assessed’ entail?

178-180: Same comment as above

181-184: “Spatial use conflicts and compatibilities and the subsequent environmental, social and economic implications

(substage 2.3) were properly addressed in both plans, but high discrepancies were found in the identification of different options for sharing the marine space (substage 2.4).” Ok, but the statements following this start with how the plans are similar – not different.

187: ‘area based management regulations’ – assume this should be area based managed tools?

262-264: Suggest reconsidering the use of “guarantees” in this sentence – it comes across as a bit of an overstatement. Or maybe add ‘helps to’ i.e. helps to guarantee – as much is beyond the capacity of the tool.

281-285: It would be useful to mention the number of interviews conducted, and what method of interviewing was used.

Reviewer #2 (Remarks to the Author):

Dear authors, I hope you find my comments helpful and choose to implement (some of) them. I would like to acknowledge your achievement and commitment in producing this exciting research. Best regards, Gregory Fuchs.

The paper is well written and clearly signposted, with a logical intent, approach, methods, and highly relevant results for marine policy, particularly in the context of MSP and its alignment with an ecosystem-based approach (EBA).

The paper offers a mostly clear and effective presentation of the novel framework, explaining its conception and underlying principles, and based on that the novel self-assessment tool, explaining its function and use. The tool indeed appears user-friendly and applicable, which is a significant strength. I have two remarks on the tool:

- o The paper is arguably aimed in particular at decision-makers in the field to encourage them to undertake the assessment in regions beyond the two countries where it has already been performed. Line 274 states “the assessment can be repeated at any time” - it would be beneficial to demonstrate how (easy it is) to use the tool without guidance, including summarising results and spotting patterns, and to outline more clearly its application in other countries and contexts.

- o While the tool introduced is publicly available, it requires a registration process that includes creating a user account while agreeing to terms of use, which should be clarified also in the intended peer-review publication. In line 255, it states that the tool “has proven useful to marine planners and the scientific community in supporting spatial planning efforts.” However, it is not clear how it has done so for the scientific community, given that it is only now being peer-reviewed. If the tool has already been used in other publications, this should be more explicitly stated.

The paper could more strongly emphasize the need for an ecosystem approach. Specifically, in my opinion, it should outline more strongly why this approach is so essential for sustainable management and conservation of the marine environment. By doing so, the paper would achieve a better balance between natural and social sciences, addressing ecological aspects as well as equity, human well-being, and other socio-economic factors. For instance:

- o The lack of consideration for nature restoration and ecosystem processes and functioning is identified as a clear gap in both MSP plans (line 175). However, this critical aspect is not further discussed in the paper. Given that the challenges of balancing biodiversity conservation and economic growth targets are mentioned in the introduction (line 40), it is somewhat surprising that this important element is not explored in more detail. Addressing these shortfalls could highlight significant opportunities for improving marine spatial plans.

- o It could be beneficial to mention relevant EU policy targets (i.e. Biodiversity Strategy), especially since the tool was tested in two EU member states. While the EU Nature Restoration Law may not have been adopted by Parliament at the time of submission, referencing this legislative process could be valuable. This is due to its mandatory restoration goals, which will ultimately need to be reflected in MSP processes of all EU member states.

- o The introduction states that “EBM is recognized as the best practice for managing multiple ocean-use sectors, explicitly assessing trade-offs among them” (line 61). However, it is also mentioned that “the MSP process of both countries did not take into account the trade-offs” (line 301). This crucial aspect is not further discussed. Given that “the adoption of the precautionary approach and the assessment of the uncertainty at all stages of the planning processes were not adequately addressed” (line 316), this issue should be further explored. These points highlight where the paper describes assessment outcomes without delving further into their significance. Elaborating on the importance of addressing these trade-offs and the potential benefits of correcting this flaw in the MSP process would enhance understanding of the critical gaps and opportunities for improvement in MSP.

- o Moreover, as stated in line 238, “the success or failure of the plan depends, to a large extent, on the plan development process.” While it is indeed key to assess if a plan “will fulfill EBA criteria” (line 346) and to “determine the degree of implementation of EBA in the MSP processes” (line 351), it is also important to recognize that even with sound planning, the true conservation value of an MSP plan could be low. For instance, having restoration goals, ecological indicators, and accounting for land-sea interactions (Table S1) are crucial. However, a holistic self-assessment should not only take stock of whether all important aspects are considered but also evaluate how well these aspects align with conservation goals and help to assess their effectiveness in achieving those goals. Given that “decision support system” and “decision support tool” are among the Keywords of the paper, this further emphasizes the need to provide a basis for making the right decisions, not just designing a perfect plan. Since the paper also serves to “identify the key topics that would benefit from further development and cooperation” (line 355), it would be beneficial to at least discuss these topics in more depth to provide a more comprehensive understanding of a plan's true impact on conservation and sustainability and what would be needed to achieve that.

Several more things can be pointed out:

1. The impediments to operationalization are presented as a key highlight and outcome of the paper (e.g., lines 22, 67, 366). However, the specific contexts or levels at which these impediments emerge are not clearly shown, leaving the reader expecting a more detailed elaboration to enhance understanding of these challenges. It appears that the impediments might

be part of another published research, specifically Haugen et al. 2024. While there may be links to that paper, such as co-authorship or shared funding, in my opinion, these impediments should not be labelled as a highlight of this paper under review.

2. In Line 90, using the heading "Results" would be beneficial for clarity, helping the reader immediately recognize that this section presents the outcomes of the study. It could also be combined with the current more descriptive heading using a colon, such as "Results: A Novel EB-MSP Assessment Tool," especially since this heading contains abbreviations.

3. The EB-MSP (cross-cutting) topics are highlighted as those "that should be addressed during the planning process" (line 106) and are recognized as highly relevant (line 181, where it could also be good to add by whom). Therefore, it may be beneficial to detail some of the specific actions to be undertaken in this regard. While it may not be feasible to present all 130 identified tasks and actions in one publication, it could be useful to provide detailed examples of an exemplary stage, substage(s), and corresponding topic. This would illustrate which tasks fall under each and offer more practical application insights into the assessment.

4. There is some lack of clarity about what is included in the additional/complementary fields of information. Six fields are listed in line 128, but Figure 3 at the bottom only shows four fields as also described in the discussion (line 257), while in the methods section (line 428) this difference is explained stating that "a semi-quantitative scoring was given to the first four dimensions to provide a standardized approach for examining the progress of each action/task." For clarity, it would be beneficial to explain this earlier in the paper and more clearly explain this in Figure 3. Use of consistent terminology, such as introducing the term "dimension" when these fields are first mentioned, can prevent readers from having to piece together information from different parts of the paper, which is time-consuming.

5. Given that "the issues raised by the stakeholders were considered for refining the assessment tool" (line 444), it is crucial to provide details on how the stakeholders were selected. Clear information on the selection criteria and process is essential for understanding the robustness and representativeness of the stakeholder input. In line 228, it is stated that the responses reflect the information present in MSP-related official documents. I suggest inserting "ought to" as, despite high confidence levels and participants having been involved in the plans, there is always a potential for bias.

6. Figure 3 I find somewhat overburdening at first glance for the following reasons:

- o Each description of the substages is duplicated per country, adding to a visual overload. It's also rather difficult to match each description to the corresponding coloured segments of the circular diagram, as there are no connecting lines; the very small colour segments make it hard to distinguish exact differences between the plans. Additionally, if the "implementation degree" (the first assessed dimension in Figure 3 with blue colour) is the most important (which it seems to be given it's the only dimension which find itself mentioned in the conclusion in line 351) and the other dimensions (confidence of respondent, knowledge base, and relevance of statement) are secondary, then the results regarding the "implementation degree" should be more prominently displayed (in Figure S1 it's comparatively better to see). Currently, it is placed in the middle and is the least distinguishable. A potential solution could be to move it to the outside of the circular diagram or even present it all as bar charts for better visibility and comparison. The term "dimension(s)" should be reserved solely for the assessed dimensions in Figure 3. Therefore, using the term for "social and economic dimensions" in line 148 could cause confusion.

- o The number of actions and tasks carried out in each assessed country per substage is not shown. Instead, "the use of common criteria facilitates the comparison between different plans" (line 266) using a scale of 1-5, referred to elsewhere as benchmarking criteria (line 420) and dimensions (line 427). Again, consistent use of terminology would be beneficial. Also, while the term "benchmark" usually implies comparison with established standards or datasets, since this tool sets a new standard for assessment, "benchmark" might indeed be appropriate for this adherence scale. However, it would be helpful to clarify this context better.

- o While the evaluation aims to identify "commonalities and differences" as well as "equivalence" between individual plans, the assessment of "coherence" (lines 126-127) is arguably not clearly addressed. A coherence assessment of a plan could be interpreted as an analysis of the logical consistency, alignment with overarching goals, and integration of various components within the plan. This aspect is not clearly articulated or evaluated in the current results, and providing a more explicit analysis of coherence would strengthen the findings.

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Dear Dr Galparsoro,

Your manuscript titled "A novel ecosystem-based marine spatial planning assessment tool and its application" has now been seen by our reviewers, whose comments appear below. In light of their advice we are delighted to say that we are happy, in principle, to publish a suitably revised version in Communications Earth & Environment.

We therefore invite you to edit your manuscript to comply with our format requirements and to maximise the accessibility and therefore the impact of your work.

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We hope to hear from you within two weeks; please let us know if you need more time.

Best regards,

Miranda Böttcher, PhD
Editorial Board Member
Communications Earth & Environment

Martina Grecequet, PhD
Senior Editor,
Communications Earth & Environment
@CommsEarth

REVIEWERS' COMMENTS:

Reviewer #1 (Remarks to the Author):

Dear authors,

Thank you for taking the time and making the effort to consider the comments and feedback carefully. Your improvements are most welcome and the paper is highly satisfactory for publication.

Kind regards,
Ben Boteler

Reviewer #2 (Remarks to the Author):

I would like to thank the authors for the extensive and thoughtful revisions made to the manuscript. The comments by myself and the other reviewer have been addressed thoroughly, resulting in improvements to clarity and further enhancing already high quality of the work. The authors provided clear and detailed explanations that helped me better understand their approach.

Overall, I am very pleased with the revisions and have no further comments. I believe the manuscript is now in an excellent state and recommend its acceptance.

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REVIEWER COMMENTS:

Reviewer #1 (Remarks to the Author):

General comments:

The submitted manuscript is very well written and provides a succinct yet detailed introduction into the EB-MSP tool. The tool is a novel effort to merge two dominant approaches within EU marine governance – Ecosystem-Based Management and Marine Spatial Planning. Therefore, it can be a useful contribution to decision makers looking to understand the value of this tool, as well as to other researchers looking to utilize it or apply similar approaches. In particular, the application to transboundary marine areas is highly valuable, and addresses a key governance challenge that decision makers are faced with. The development of the tool through a co-design and validation approach, provides confidence in the application of the tool and the results presented in the paper. However, as the authors point out, some important short comings to the tool do exist – such as how to consider cumulative pressures through planning and management processes, but this is understandable and could be explored in future iterations of the tool.

Thank you very much for your positive comments.

The description of the application of the tool presented in Chapter 3 is intended to provide an insight into the types of findings one can expect when using the tool. While it is understood that the intention is no to provide an in-depth assessment of the case study areas, the review and the description of findings is at a very high-level, for example referring to the importance of ‘governance instruments and institutional arrangements’ identified by interviewees through the framework. However, this level of information alone does not provide very useful insights into the actual challenges of the case studies, and is therefore sometimes challenging to follow the actual impediments faced by decision makers or the presented differences between the cases. The authors could provide some more specific examples relevant to the cases which might be useful for the understanding of the reader and base the paper more in the context of cases that were studied.

As correctly interpreted by the reviewer, the scope of the paper is to present and describe a new assessment tool, the development process and its practical implementation, and to showcase its utility in a transboundary region. The EB-MSP framework and tool consists of 130 actions/tasks, organized in substages and stages, and it is difficult to include in the manuscript all the information given by the practitioners in each of them. Therefore, we put more emphasis on those substages that had a degree of implementation of three (partially addressed) or lower, as these are the ones on which improvement efforts should be especially concentrated in the next revisions of the plans. However, as recommended

by the reviewer, we have enriched the information of some of the sub-stages to provide insights into the actions carried out in the Spanish and French MSPs: 2.5. Governance instruments and institutional arrangements: “Spanish practitioners reported that, for some topics, expert groups had been designated for integration of the most recent knowledge, while French indicated that the initial assessment was based on scientific reports from expert groups, notably linked to the Marine Strategy Framework Directive (MSFD) and its Good Environmental Status (GES) descriptors”. Regarding the presence of a governance structure that allows the capture of local knowledge, “in Spain the level of resolution was at the level of the autonomous communities, while in France a bottom-up approach was established, where local knowledge was incorporated during the development of the plan.” (L223-231).

2.6. Stakeholder participation: “In France, a public debate with stakeholders was organized and a report on the participation process was published. This was not the case in Spain during the first plan elaboration, but an assessment of the success of the stakeholder participation process is planned in the forthcoming revision process.” (L234).

3.3. Stakeholder participation: “The stakeholder participation was only partially addressed in both plans, as only the feedback of some sectoral stakeholders was considered when selecting the optimal planning option. In this sense, practitioners reported that in the coming revision of the plans, specific workshops with a wide range of sectors, to discuss trade-offs of the different planning options, are planned.” (L247).

3.5. Public consultation: “Regarding public participation, this is a mandatory process in both countries, consisting of an institutional and authority consultation round, followed by a public consultation period. Some areas for improvement were identified by the practitioners, such as the use of additional dissemination mechanisms to ensure that the information reaches the whole population and the reduction of the complexity of the results to ease their understanding. It was also noted that the number of allegations received were published, but that sometimes the specifics of how the issues raised by the public had been addressed were not indicated.” (L353).

4.1. Implementation of the plan: The plan implementation processes (Stage 4) were conducted properly by both countries, being compliant with legal regulations and obligations, developing synergies with other processes (e.g., Water Framework Directive (WFD), MSFD) and informing stakeholders of the implementation of the plan.” (L262).

Additionally, the relevance of the outputs obtained after the assessment of the Spanish and French MSPs with the EB-MSP tool and the main challenges faced by practitioners in the development and implementation of MSPs in Europe have been comprehensively discussed in the section “3.2. EB-MSP assessment outputs” (L358-448).

Specific comments:

The title of the manuscript might be improved through a specific mention of the assessment tool and its application – which is the focus of the paper. The current title suggest that the paper would focus more on the two concepts (EB and MSP) and how they might be aligned or merged conceptually.

We have modified the title, and now reads “A novel ecosystem-based marine spatial planning assessment tool and its application”.

37: consider alternative wording to ‘traditional’, such as ‘long standing’? maritime traffic is perhaps not a traditional activity in the full sense of the word.

Agree. We have changed the term “traditional” with “long-term existing” activities.

Now the sentence reads: “Rapidly expanding marine sectors, such as offshore renewable energy, aquaculture, and tourism, together with nascent activities, like deep-sea mining, need to coexist with long-term established activities, such as fishing and maritime traffic”.

145-146: ‘This deficiency stems from data inadequacies in the social and economic dimensions (..)’ What are the deficiencies or inadequacies?

We have rephrased the sentence. Now it reads: “This is mainly explained by the lack of SMART (specific, measurable, achievable, relevant, and time-bounded) social and economic objectives and associated indicators and targets/thresholds due to the substantial lack of data, and because the long-term strategic goals (>6 years) were only defined for specific sectors (e.g., aquaculture, renewable energies).” (L173)

147-148: “It was also highlighted that current plans do not account for broad restoration goals.” What is meant by ‘broad restoration goals’? Is this referring to the CBD GBF, EU goals, national, or something else?

We have now removed the term “broad” and have added a reference to the EU Nature Restoration Law that was approved after the writing of the first version of the manuscript. Now the text reads “The assessment results also showed that current plans do not account for the targets included in the new Nature Restoration Law (EU, 2024), which entered into force after both spatial plans were approved.”

175-176: “The assessment of human pressures and impacts (inventory and mapping, substage 2.2), was not properly addressed”. What would ‘properly assessed’ entail?

It means that Spanish and French practitioners considered that the assessment of the pressures and impacts produced by human activities were not addressed in full detail during the development of the spatial plans and that it would require further strengthening in the next revision of the plans. This also applies to the remaining tasks/actions evaluated by the EB-MSP assessment tool. The text has been slightly modified for ease of understanding: “Similarly, the assessment of human pressures and impacts (inventory and mapping, substage 2.2), was not sufficiently addressed during the planning process, mainly explained by the difficulties faced in dealing with existing complex and resource-intensive methods for monitoring and assessing cumulative pressures and their effects. These substages were recognised by practitioners as highly relevant, requiring further elaboration in the subsequent revision of the plans.” (L196).

178-180: Same comment as above

The answer to this point raised by the reviewer can be found in the comment above.

181-184: “Spatial use conflicts and compatibilities and the subsequent environmental, social and economic implications (substage 2.3) were properly addressed in both plans, but high discrepancies were found in the identification of different options for sharing the marine space (substage 2.4).” Ok, but the statements following this start with how the plans are similar – not different.

We understand the point made by the reviewer and have amended the text accordingly: “Spatial use conflicts and compatibilities and the subsequent environmental, social and economic implications (substage 2.3) were mostly addressed in both plans, but high discrepancies were found in the identification of different options for sharing the marine space (substage 2.4). While Spain forecasted future scenarios, in terms of the spatial and temporal needs of human uses and considered other area-based management regulations and priority areas for conservation when identifying the sharing options, that was not the case for France. Besides, none of the plans envisaged co-use and co-location options for activities, nor did they define possible alternative scenarios in the context of climate change.” (L212-220).

187: ‘area based management regulations’ – assume this should be area based managed tools?

We rather prefer to keep the term “regulations”. We have tried to keep separate the idea of a physical tool for achieving an aim, from the approaches and instruments required to underpin that aim.

262-264: Suggest reconsidering the use of “guarantees” in this sentence – it comes across as a bit of an overstatement. Or maybe add ‘helps to’ i.e. helps to guarantee – as much is beyond the capacity of the tool.

Agree. It has been changed as follows: “In summary, the tool helps to assess whether environmental, social, economic, governance aspects and stakeholder and public participatory processes are adequately considered during the plan development (Dickey-Collas *et al.*, 2022).” (L327)

281-285: It would be useful to mention the number of interviews conducted, and what method of interviewing was used.

Such information is provided in the Methods section, but we have added a statement to clarify it: “Each plan was independently evaluated by completing the EB-MSP assessment framework in three virtual workshops with five representatives of the MSP competent authorities” (L161).

“The workshops were moderated by three members of the authorship team, who addressed inquiries and provided clarifications to the questions raised by the national representatives during the completion of the template” (L600)

Reviewer #2 (Remarks to the Author):

Dear authors, I hope you find my comments helpful and choose to implement (some of) them. I would like to acknowledge your achievement and commitment in producing this exciting research.

Thank you very much for acknowledging the utility of the work presented.

We have duly considered all your valuable comments and suggestions.

Please, find below our responses to each point.

The paper is well written and clearly signposted, with a logical intent, approach, methods, and highly relevant results for marine policy, particularly in the context of MSP and its alignment with an ecosystem-based approach (EBA).

The paper offers a mostly clear and effective presentation of the novel framework, explaining its conception and underlying principles, and based on that the novel self-assessment tool, explaining its function and use. The tool indeed appears user-friendly and applicable, which is a significant strength. I have two remarks on the tool:

- o The paper is arguably aimed in particular at decision-makers in the field to encourage them to undertake the assessment in regions beyond the two countries where it has already been performed. Line 274 states “the assessment can be repeated at any time” - it would be beneficial to demonstrate how (easy it is) to use the tool without guidance, including summarising results and spotting patterns, and to outline more clearly its application in other countries and contexts.

We have extended the description of the functionalities of the tool: “Upon first access to the EB-MSP assessment tool, the user must register in the web app (<https://aztidata.es/EB-MSP>). The evaluation can be conducted by documenting the actions and tasks implemented during the assessed planning process or by examining how EB-MSP cross-cutting topics have been incorporated into the plan. Users can conduct multiple assessments in a single session or in different sessions and can retrieve the information from previous sessions. Once the assessment is performed, the results are displayed in stacked bars or disaggregated through radar plots. All the responses are also stored in a table, which can be downloaded as an Excel spreadsheet” (L149-157).

“The applicability of this EB-MSP assessment tool is exemplified and illustrated by its use in the transboundary context of the Bay of Biscay (France and Spain), but it is designed to be applicable in any geographic context” (L92).

“The EB-MSP assessment tool is designed to apply to any spatial plan, regardless of its stage of development” (L123).

“Needs and recommendations from MSP practitioners and managers of 10 European countries, representing diverse socioeconomic and ecological contexts and at various MSP development stages, were considered during the development of the tool.” (L303)

“The EB-MSP assessment structure was agreed upon by the whole authorship team, composed of renowned interdisciplinary MSP experts from ten European countries (Belgium, Denmark, Germany, Greece, Ireland, Italy, Portugal, Spain, the Netherlands and the United Kingdom)” (L534).

- o While the tool introduced is publicly available, it requires a registration process that includes creating a user account while agreeing to terms of use, which should be clarified also in the intended peer-review publication. In line 255, it states that the tool “has proven useful to marine planners and the scientific community in supporting spatial planning efforts.” However, it is not clear how it has done so for the scientific community, given

that it is only now being peer-reviewed. If the tool has already been used in other publications, this should be more explicitly stated.

As commented above, we have extended the description of the registration process in the web app and how to retrieve and modify the already performed assessments.

The tool has not been used in other publications yet and this paper describes the EB-MSP assessment tool development process and its practical implementation. This content has not been published elsewhere. “The EB-MSP assessment structure was agreed by the whole authorship team, composed of renowned interdisciplinary MSP experts from ten European countries (Belgium, Denmark, Germany, Greece, Ireland, Italy, Portugal, Spain, the Netherlands and the United Kingdom)” (L534). The idea of developing the tool was largely supported by the authorship team's previous collaborations with the scientific community specialised in MSP and with their respective national MSP practitioners and experts. Thus, the process of developing the EB-MSP framework and tool was based on responding to existing stakeholder needs.

However, we understand the point raised by the reviewer and we have modified the text: “The EB-MSP tool, designed in conjunction with marine environmental managers and subjected to multiple iterations by interdisciplinary experts and MSP practitioners, is expected to be instrumental for marine planners and the scientific community in supporting spatial planning efforts” (L312).

The paper could more strongly emphasize the need for an ecosystem approach. Specifically, in my opinion, it should outline more strongly why this approach is so essential for sustainable management and conservation of the marine environment. By doing so, the paper would achieve a better balance between natural and social sciences, addressing ecological aspects as well as equity, human well-being, and other socio-economic factors. For instance:

- o The lack of consideration for nature restoration and ecosystem processes and functioning is identified as a clear gap in both MSP plans (line 175). However, this critical aspect is not further discussed in the paper. Given that the challenges of balancing biodiversity conservation and economic growth targets are mentioned in the introduction (line 40), it is somewhat surprising that this important element is not explored in more detail. Addressing these shortfalls could highlight significant opportunities for improving marine spatial plans.

Agree. We have strengthened this idea in different sections of the manuscript “...as a result, 2021–2030 was proclaimed, by the United Nations, as the Decade on Ecosystem Restoration (UNGA, 2019), with many countries adopting nature restoration into their legal framework (EU, 2024).” (L51)

“The assessment results also showed that current plans do not account for the targets included in the new Nature Restoration Law (EU, 2024), which entered into force after both spatial plans were approved” (L177).

“Current plans lack proper consideration of ecosystem processes and functioning (e.g., ecological connectivity, ecological carrying capacity, social-ecological systems and valuation of ecosystem services) and the need to adopt nature restoration measures.” (L193).

“Existing marine spatial plans are already progressing towards meeting the EU targets, and will surely have a more relevant influence in the forthcoming years, especially in securing efficient governance structures, effective stakeholder engagement, consideration of social aspects, economic development, conservation and restoration, and adaptation to climate change (Zuercher et al., 2022b). However, marine spatial planning has to be seen as a continuous adaptive process and approved marine spatial plans may require modifications to meet new targets established by the EU (e.g., ensuring the success of the nature restoration law; Hering et al. (2023)).” (L368-376)

Regarding the challenges of balancing biodiversity conservation and economic growth targets and the suggestions for improving MSPs, following the reviewer’s suggestion, this has been further discussed in the section “3.2. EB-MSP assessment outputs”, as follows:

“Failing to estimate the ocean space requirements of present and future activities can result in conflicts between different sectors... Failure to consider trade-offs could lead to significant negative consequences, including ecological degradation, economic losses, and social conflicts (Püts *et al.*, 2023; Hopkins *et al.*, 2024). Accordingly, practitioners acknowledged that this topic was highly relevant, and it was expected to be addressed in a subsequent revision, when the demand for marine space would be less uncertain and more data for trade-off analysis of management options would be available” (L377-389).

“Finally, a limited understanding of ecosystem processes and the impact of human activities on the goods and services they provide can hinder effective planning. Amongst the most critical actions not addressed during the French and Spanish planning processes, was the assessment of the effects of cumulative pressures (or cumulative impact assessment). This is a particularly relevant topic for improving the integration of environmental considerations into strategic decision-making, which could be strengthened by improving data collection methods and rendering this rather complex data into a readily understandable format that informs on the likelihood of the environmental consequences of different management options (Hammar et al., 2020). Similarly, ecosystem processes and functioning (e.g., difficulties in establishing the boundaries of ecosystems, varying temporal scales and the delay (lag) in the onset of effects), were not adequately addressed in current plans, mainly due to the lack of data and scientific knowledge, but it should be pursued in future revisions of the plans.” (L430-442).

o It could be beneficial to mention relevant EU policy targets (i.e. Biodiversity Strategy), especially since the tool was tested in two EU member states. While the EU Nature Restoration Law may not have been adopted by Parliament at the time of submission, referencing this legislative process could be valuable. This is due to its mandatory restoration goals, which will ultimately need to be reflected in MSP processes of all EU member states.

Totally agree. We have added the following paragraph: “MSP is a crucial instrument for sustainable ocean management and the achievement of environmental and socio-economic targets (i.e., the EU’s Biodiversity Strategy for 2030 (EC, 2011); the Green Deal (EC, 2019); the new approach for a sustainable blue economy (EC, 2021); the REPowerEU Plan (EC, 2022); Renewable Energy Directive (EC, 2018); and the newly-adopted EU Restoration (EU, 2024)). Furthermore, MSP is being regarded as a necessary part of the Programme of Measures required to achieve Good Environmental Status (GES) under the EU Marine Strategy Framework Directive (Directive 2008/56/EC). Existing marine spatial plans are already progressing towards meeting the EU targets and will surely have a more relevant influence in the forthcoming years, especially in securing efficient governance structures, effective stakeholder engagement, consideration of social aspects, economic development, conservation and restoration, and adaptation to climate change (Zuercher et al., 2022b). However, marine spatial planning has to be seen as a continuous adaptive process, and approved marine spatial plans may require modifications to meet new targets established by the EU (e.g., ensuring the success of the nature restoration law; Hering et al. (2023)).” (L361-376).

Additionally, the information of the newly adopted Restoration Law has been enriched all along the document, as can be seen in the previous comment.

o The introduction states that “EBM is recognized as the best practice for managing multiple ocean-use sectors, explicitly assessing trade-offs among them” (line 61). However, it is also mentioned that “the MSP process of both countries did not take into account the trade-offs” (line 301). This crucial aspect is not further discussed. Given that “the adoption of the precautionary approach and the assessment of the uncertainty at all stages of the planning processes were not adequately addressed” (line 316), this issue should be further explored. These points highlight where the paper describes assessment outcomes without delving further into their significance. Elaborating on the importance of addressing these trade-offs and the potential benefits of correcting this flaw in the MSP process would enhance understanding of the critical gaps and opportunities for improvement in MSP.

Totally agree. We have expanded these ideas as follows:

“Failing to estimate the ocean space requirements of present and future activities can result in conflicts between different sectors. The MSP process of Spain and France did

not consider the trade-offs of the different space designations for activities. In turn, this point is also related to the forecast of future needs and requirements of maritime sectors, an action that was not properly addressed in the current plans, in particular with regard to trade-offs such as the balance between energy extraction and preservation of fishing grounds or the assessment of the socio-economic impacts of the designation of new marine protected areas. Failure to consider trade-offs could lead to significant negative consequences, including ecological degradation, economic losses, and social conflicts (Püts et al., 2023; Hopkins et al., 2024). Accordingly, practitioners acknowledged that this topic was highly relevant, and it was expected to be addressed in a subsequent revision when the demand for marine space would be less uncertain and more data for trade-off analysis of management options would be available” (L377-389).

“Also, the adoption of the precautionary approach and the assessment of the uncertainty, at all stages of the planning processes, were not adequately addressed. On the one hand, the precautionary principle in MSP can help prevent the overlapping or the over-concentration of marine activities and spatial conflicts in sensitive areas. On the other, embracing the uncertainty of background information, climate effects and socio-economic contexts can facilitate the adoption of appropriate management strategies.” (L442-448)

o Moreover, as stated in line 238, “the success or failure of the plan depends, to a large extent, on the plan development process.” While it is indeed key to assess if a plan “will fulfill EBA criteria” (line 346) and to “determine the degree of implementation of EBA in the MSP processes” (line 351), it is also important to recognize that even with sound planning, the true conservation value of an MSP plan could be low. For instance, having restoration goals, ecological indicators, and accounting for land-sea interactions (Table S1) are crucial. However, a holistic self-assessment should not only take stock of whether all important aspects are considered but also evaluate how well these aspects align with conservation goals and help to assess their effectiveness in achieving those goals. Given that “decision support system” and “decision support tool” are among the Keywords of the paper, this further emphasizes the need to provide a basis for making the right decisions, not just designing a perfect plan. Since the paper also serves to “identify the key topics that would benefit from further development and cooperation” (line 355), it would be beneficial to at least discuss these topics in more depth to provide a more comprehensive understanding of a plan's true impact on conservation and sustainability and what would be needed to achieve that.

Interesting comment.

The EB-MSP assessment framework and tool is not intended to assess the effectiveness of the management plan, but to guarantee that all the criteria for a comprehensive assessment are adopted. Although the tool is based on a holistic self-assessment, that considers the degree of implementation of each of the task/actions at the different stages

of the development of a plan (defining, developing, assessing, implementing and following up), the task/actions included in the “Stage 5. Following-up” (5.2 Evaluation phase) also provide some insights into the effectiveness of the plan in achieving the goals set in the defining stage (see Table S1; e.g., “5.2.03 The appropriate balance between the environmental status, conservation, protection and restoration and human activities has been demonstrated”; “5.2.04 Positive and negative effects of the plan have been accounted for, including unintended effects; “5.2.05 The appropriateness of the defined indicators (i.e., ecological, economic and social), to assess the achievement of predefined objectives, has been assessed”; “5.2.08 The evaluation reports state if previously identified knowledge gaps have been effectively addressed”).

Additionally, the sentence mentioned by the reviewer in line 238, “the success or failure of the plan depends, to a large extent, on the plan development process”, has been clarified as follows: “The success or failure of a plan depends, to a large extent, on the plan development process (see Zuercher et al. 2022a), and this tool could facilitate the communication of results, guiding the development of novel MSPs, as well ensuring additional transparency during the evaluation phase of already implemented MSPs, in support of adaptive management” (L321-326).

Regarding “the key topics that would benefit from further development and collaboration”, following the reviewer's recommendation, the relevance of the outputs obtained after the assessment of the Spanish and French MSPs with the EB-MSP tool and the main challenges faced by practitioners in the development and implementation of MSPs in Europe (i.e., deficient cross-sectoral coordination, inadequate governance and stakeholder participatory processes, unawareness of the impact of climate change and insufficient data and knowledge) have been comprehensively discussed in the section “3.2. EB-MSP assessment outputs”.

Several more things can be pointed out:

1. The impediments to operationalization are presented as a key highlight and outcome of the paper (e.g., lines 22, 67, 366). However, the specific contexts or levels at which these impediments emerge are not clearly shown, leaving the reader expecting a more detailed elaboration to enhance understanding of these challenges. It appears that the impediments might be part of another published research, specifically Haugen et al. 2024. While there may be links to that paper, such as co-authorship or shared funding, in my opinion, these impediments should not be labelled as a highlight of this paper under review.

The paper from Haugen et al. (2024) is independent from the one presented here. Haugen et al. (2024), based on a questionnaire consisting of 23 questions, answered by 150 international EBM experts (especially scientists, corresponding to 71% of the consulted experts), identified progress, challenges, and solutions in EBM implementation worldwide. On the other hand, the approach presented here is focused on the implementation of EBM into national marine spatial plans.

The EB-MSP assessment framework and tool presented here is the result of a co-development process, developed under the Horizon Europe project MarinePlan, involving a research team composed of 23 renowned interdisciplinary MSP experts from ten European countries (Belgium, Denmark, Germany, Greece, Ireland, Italy, Portugal, Spain, the Netherlands and the United Kingdom). Additionally, the developed tool was shaped to fulfil the requirements of MSP practitioners and managers through a workshop, attended by 36 high-level stakeholders, where they indicated their needs and proposed improvements to the tool.

In this paper, when we refer to the impediments to the implementation of EBM in MSPs, we refer to the challenges encountered in the Spanish and French MSPs, as reported by the consulted practitioners (i.e., each national plan was independently evaluated by completing the EB-MSP assessment framework in three virtual workshops with five representatives of the MSP competent authorities), after being assessed with the novel EB-MSP assessment tool. These impediments can be classified into four main groups: deficient cross-sectoral coordination, inadequate governance and stakeholder participatory processes, unawareness of the impact of climate change and insufficient data and knowledge. Following the recommendation of the reviewer, these impediments have been further elaborated in the “3.2. EB-MSP assessment outputs” section.

2. In Line 90, using the heading "Results" would be beneficial for clarity, helping the reader immediately recognize that this section presents the outcomes of the study. It could also be combined with the current more descriptive heading using a colon, such as "Results: A Novel EB-MSP Assessment Tool," especially since this heading contains abbreviations.

We have changed the title of the heading as recommended.

3. The EB-MSP (cross-cutting) topics are highlighted as those “that should be addressed during the planning process” (line 106) and are recognized as highly relevant (line 181, where it could also be good to add by whom). Therefore, it may be beneficial to detail some of the specific actions to be undertaken in this regard. While it may not be feasible to present all 130 identified tasks and actions in one publication, it could be useful to provide detailed examples of an exemplary stage, substage(s), and corresponding topic. This would illustrate which tasks fall under each and offer more practical application insights into the assessment.

All the results presented refer to the responses given by the five representatives of Spanish and French national authorities. That includes the assessment of the implementation level of each task, as well as their consideration of the relevance of each task for the planning site, their confidence level, the knowledge base supporting that task/action and the extra

justifications given. While in the body of the manuscript, results, gathered at the substage level, are shown as stacked bars representing the medians of each of these information fields, in the supplementary material the whole list of 130 tasks/actions (Table S1) can be found, as well as all the disaggregated results in the form of radar plots (Figure S1).

Besides, in the results section (“2.2. Assessment of two spatial plans in a transboundary region”), when showing the responses of practitioners and the similarities and differences between the Spanish and French MSPs, we are already providing detailed examples of some of the task/actions present in some stages and substages. Special emphasis was put on those substages, and corresponding tasks/actions, that had a degree of implementation of 3 (partially addressed) or lower, as these are the ones on which improvement efforts should be especially concentrated in the next revisions of the plans. These are some examples:

“Additionally, the geographical and temporal boundaries of the plans (substage 1.3) were based on jurisdictional boundaries, overlooking the broader biogeographical setting of the planning site” (See Table S1, it corresponds to Stage 1, substage 1.3, task/action 1.3.01) (L179); “Stakeholder engagement and participatory processes (substage 1.5) were partially addressed by both plans. However, while French stakeholders were allowed to participate in the definition of objectives, and to provide insights into societal choices, this was not the case for Spain, which followed a top-down approach. (See Table S1, it corresponds to Stage 1, substage 1.5, task/action 1.5.04) (L182); “high discrepancies were found in the identification of different options for sharing the marine space (substage 2.4). While Spain forecasted future scenarios, in terms of the spatial and temporal needs of human uses, and considered other area-based management regulations and priority areas for conservation when identifying the sharing options, that was not the case for France (See Table S1, it corresponds to Stage 2, substage 2.4, task/actions 2.4.02 and 2.4.06). (L214)

4. There is some lack of clarity about what is included in the additional/complementary fields of information. Six fields are listed in line 128, but Figure 3 at the bottom only shows four fields as also described in the discussion (line 257), while in the methods section (line 428) this difference is explained stating that “a semi-quantitative scoring was given to the first four dimensions to provide a standardized approach for examining the progress of each action/task.” For clarity, it would be beneficial to explain this earlier in the paper and more clearly explain this in Figure 3. Use of consistent terminology, such as introducing the term “dimension” when these fields are first mentioned, can prevent readers from having to piece together information from different parts of the paper, which is time-consuming.

Agreed. The structure of the journal requires giving the results first and providing the methods afterwards. Nevertheless, we have moved some content from the methods section to the results section to make it clearer (L142) “A semi-quantitative scoring is given to the first four information fields to provide a benchmark for examining the

progress of each action/task (see Figure 3) and for the potential comparison across different plans (see Table S2). This score is supplemented with two descriptive information fields (i.e., v and vi), to enable planners and stakeholders, with first-hand experience with the planning process, to justify their responses in a narrative format.”

We have substituted the term “dimension” by “information fields” and a reference to Figure 3 has been added, in which we graphically represent the results of the four semi-quantitative information fields.

5. Given that “the issues raised by the stakeholders were considered for refining the assessment tool” (line 444), it is crucial to provide details on how the stakeholders were selected. Clear information on the selection criteria and process is essential for understanding the robustness and representativeness of the stakeholder input. In line 228, it is stated that the responses reflect the information present in MSP-related official documents. I suggest inserting "ought to" as, despite high confidence levels and participants having been involved in the plans, there is always a potential for bias.

We have extended the stakeholder selection and participation process description (L556) “Once the EB-MSP assessment framework and tool were conceived, a virtual workshop with practitioners, managers and EU Commission officers was held on 11th of December 2023, with the aim of introducing the tool, gathering feedback on the challenges they faced when integrating EBA into MSP and getting recommendations for the improvement of the developed EB-MSP assessment tool to accommodate their requirements. The workshop was organized ensuring geographic and disciplinary diversity. Individual invitations were sent through the EU Member States Expert Group on Maritime Spatial Planning. The workshop was attended by 36 experts, from 10 European countries, comprising high-level policymakers, managers, and practitioners involved in conservation and MSP in Europe.”

“Each national plan was independently evaluated by completing the EB-MSP assessment framework in three virtual workshops with five representatives of the MSP competent authorities.” (L161)

6. Figure 3 I find somewhat overburdening at first glance for the following reasons:

- o Each description of the substages is duplicated per country, adding to a visual overload. It’s also rather difficult to match each description to the corresponding coloured segments of the circular diagram, as there are no connecting lines; the very small colour segments make it hard to distinguish exact differences between the plans. Additionally, if the “implementation degree” (the first assessed dimension in Figure 3 with blue colour) is the most important (which it seems to be given it’s the only dimension which find itself mentioned in the conclusion in line 351) and the other dimensions (confidence of

respondent, knowledge base, and relevance of statement) are secondary, then the results regarding the “implementation degree” should be more prominently displayed (in Figure S1 it’s comparatively better to see). Currently, it is placed in the middle and is the least distinguishable. A potential solution could be to move it to the outside of the circular diagram or even present it all as bar charts for better visibility and comparison. The term “dimension(s)” should be reserved solely for the assessed dimensions in Figure 3. Therefore, using the term for “social and economic dimensions” in line 148 could cause confusion.

We agree that the graph shows a lot of information. Following the reviewer’s suggestion, to improve the ease of interpretation, we have moved the implementation level to the outer part of the diagram, to make it clearer.

We have used equal diagrams to show the results of the assessments of both countries because it is the type of graphs that the user can obtain using the assessment tool. Once the users fill in the required information in the web app, the results will be shown as graphs of aggregated data (e.g., median of the values obtained in a substage or topic) displayed in stacked bars or disaggregated through radar plots. In the web app, by placing the cursor over each of the colours, the information corresponding to the score given by the user in that task/action (in the case of radar plots) or substage (in the case of “flowers”) is shown. In addition, all the responses are also stored in a table, which can be downloaded as an Excel spreadsheet. The tool enables the visualization of the results in the form of a report, providing in a "single image" all the graphs produced.

In order to avoid confusion, we have substituted the term “dimension” by “information fields” and a reference to Figure 3 has been added, in which we graphically represent the results of the four semi-quantitative information fields.

o The number of actions and tasks carried out in each assessed country per substage is not shown. Instead, “the use of common criteria facilitates the comparison between different plans” (line 266) using a scale of 1-5, referred to elsewhere as benchmarking criteria (line 420) and dimensions (line 427). Again, consistent use of terminology would be beneficial. Also, while the term "benchmark" usually implies comparison with established standards or datasets, since this tool sets a new standard for assessment, "benchmark" might indeed be appropriate for this adherence scale. However, it would be helpful to clarify this context better.

The number of actions and tasks per substage is shown in Figure 2, and all of them were responded to during the assessment process. We have stressed this idea in L139 when describing the information fields to be responded to during the assessment

The terminology has been checked and corrected when needed. Also, to avoid confusion, we have substituted the term “dimension” by “information fields” and a reference to

Figure 3 has been added, in which we graphically represent the results of the four semi-quantitative information fields.

L330 when talking about the benefits of using a standardised criteria “Moreover, the use of common criteria and benchmarking as the proposed here, facilitates the comparison between different plans, which is especially valuable in transboundary contexts.”

o While the evaluation aims to identify “commonalities and differences” as well as “equivalence” between individual plans, the assessment of “coherence” (lines 126-127) is arguably not clearly addressed. A coherence assessment of a plan could be interpreted as an analysis of the logical consistency, alignment with overarching goals, and integration of various components within the plan. This aspect is not clearly articulated or evaluated in the current results, and providing a more explicit analysis of coherence would strengthen the findings.

In the manuscript we have indicated that the EB-MSP assessment framework and tool could be used “to evaluate national spatial plans within transboundary regions to identify commonalities or differences and determine coherence and/or equivalence between individual national plans (where coherence refers to using the same methods and equivalence to using different methods but with the same outcome (Elliott et al., 2023))”. This additional clarification has been included in the text (L131). These aspects have been comprehensively analysed in the results (“2.2. Assessment of two spatial plans in a transboundary region”) and discussion (“3.2. EB-MSP assessment outputs”) sections, when comparing the approaches used in the Spanish and French MSPs and the EB-MSP assessment outputs.

Further explanations have been also given in the discussion section (3.2. EB-MSP assessment outputs):

“Assessment results in Spain and France indicate that although both countries produced outputs of similar scope and fulfilled their legal obligations (i.e., approval and implementation of the spatial plan), differences in the outcomes of each plan (i.e., efficient marine management) could be expected depending on the specificities of each planning process. In the best case, there needs to be coherence between areas across boundaries, in which the same methods leading to the same outcomes are required; failing that, at least equivalence of outcomes is needed even if the methods used in either side of the boundary are different (Elliott et al 2023). Thus, there is a need to promote transboundary coordination and cooperation in the region, including the establishment of better dialogue channels between stakeholders from the same sectors (Pınarbaşı et al., 2020; Gómez-Ballesteros et al., 2021). As such, the EB-MSP assessment results might facilitate the path for the future development of collaborative planning and governance approaches to address common challenges (e.g., Moodie and Sielker, 2021), learning from each other’s strengths and begin to jointly create more appropriate solutions for this ecologically relevant transboundary area” (L407-421).

EDITORIAL POLICIES AND FORMATTING

Editorial Policy:

An updated and completed version of our Reporting Summary is uploaded with the revised manuscript

DATA:

"Data Availability" statement has been added