

2021 Report of Working Group 41 on *Marine Ecosystem Services*

The PICES Working Group on *Marine Ecosystem Services* (WG 41/WG-MES) conducted its fourth and final annual meeting over two days, September 8–9, 2021. The meeting was held virtually via Zoom. Dr. Dan Lew presided over the meeting as co-chair. Ten Working Group members attended (*WG 41 Endnote 1*). In addition to the WG 41 members, six observers, including Dr. Meng Su (China), Dr. Kevin Ray (USA) and Dr. Alohi Nakachi (USA), were in attendance. Drs. Su, Ray and Nakachi have been active participants and contributors in the Working Group’s activities.

Day 1, September 8, 2021

AGENDA ITEM 1

Welcome, meeting goals and organization, introductions, adoption of agenda, review of terms of reference

The meeting began with a welcome and description of the meeting goals and format from Dr. Lew. He explained that the meeting will take place over two days, with Day 1 dedicated primarily to final progress updates on the Working Group projects and Day 2 focusing on next steps towards finishing the projects and producing outputs (PICES Press article and PICES Scientific Report *et al.*) and discussing the future for MES and the Working Group generally. This was followed by introductions from those in attendance, a review of the proposed agenda, and a vote to adopt the meeting agenda (it was adopted without change). Dr. Lew then discussed the WG terms of reference and provided a brief description of the projects. This background included a short discussion of where marine ecosystem services (MES) fit in the FUTURE social-ecological-environmental system framework (Bograd *et al.* 2019)¹. (The WG 41 terms of reference can be found online at <https://meetings.pices.int/members/working-groups/wg41>.)

AGENDA ITEM 2

Final project updates

The two Working Group projects intended to fulfill the terms of reference are the following:

Project 1. Review of MES studies in member countries

The first project is a review of MES. This project is intended to address terms of reference #1, #2, and #3 by assessing the scope of MES available in the North Pacific, reviewing the methods for assessing MES along the ecological, economic, and sociocultural dimensions, and a case study of the application of methods for assessing aquaculture-related MES in the North Pacific member countries. The review paper will provide insights into the range of quantitative and qualitative methods used to measure and value MES in the North Pacific (review of MES types and methods) as well as illustrate how different countries apply them (case studies). Thus, the paper will address the following questions:

- What are ecosystem services and MES and why are they important?
- How are they defined and classified?
- What is the range of MES in the North Pacific?
- What methods are currently available to assess MES, both in terms of measuring their levels and valuing them individually and collectively?

¹ Bograd, S. J., Kang, S., Di Lorenzo, E., Horii, T., Katugin, O. N., King, J. R., ... & Qiao, F. (2019). Developing a Social-Ecological-Environmental System Framework to Address Climate Change Impacts in the North Pacific. *Frontiers in Marine Science*, 6, 333.

- What are the similarities and differences between North Pacific member countries in terms of the range of MES and methods used to measure and value them (as illustrated through the case study)?

Note that for Project 1, it was agreed at PICES-2019 that the review of assessment methods (ecological, economic, and sociocultural methods) would be general and not geographically-constrained to what is done in individual countries (though discussion of this would help provide context). The main focus will be on providing a review of the methods used to assess MES, with particular emphasis on best practices. This is not intended as a fully exhaustive literature search and review, but rather a review that highlights the main methods and applications.

The outline for the MES review is the following:

1. Introduction
2. The growth of ES and MES: Bibliometric Analysis
3. What are MES?
4. Assessing MES (quantifying, measuring, valuing, and understanding)
 - a. Ecological
 - b. Economic
 - c. Sociocultural
5. Case study: Aquaculture
6. Discussion
7. Conclusion

Updates were provided on the first 5 sections. Sections 6–7 will be written after all other sections have been completed. Dr. Lew will take the lead on those sections.

Dr. Lew reported on his progress writing the first 3 sections. A draft of the first three sections has been completed. Dr. Lew also provided an update on the status of the introduction to the fourth section and the Section 4 economic assessment subsection. Both of those are completed and in draft form. All of the Section 4 subsections are organized loosely according to a diagram provided in the section’s introduction that explains how assessment methods that are applied to MES depend upon the scientific worldview being utilized (see figure below).

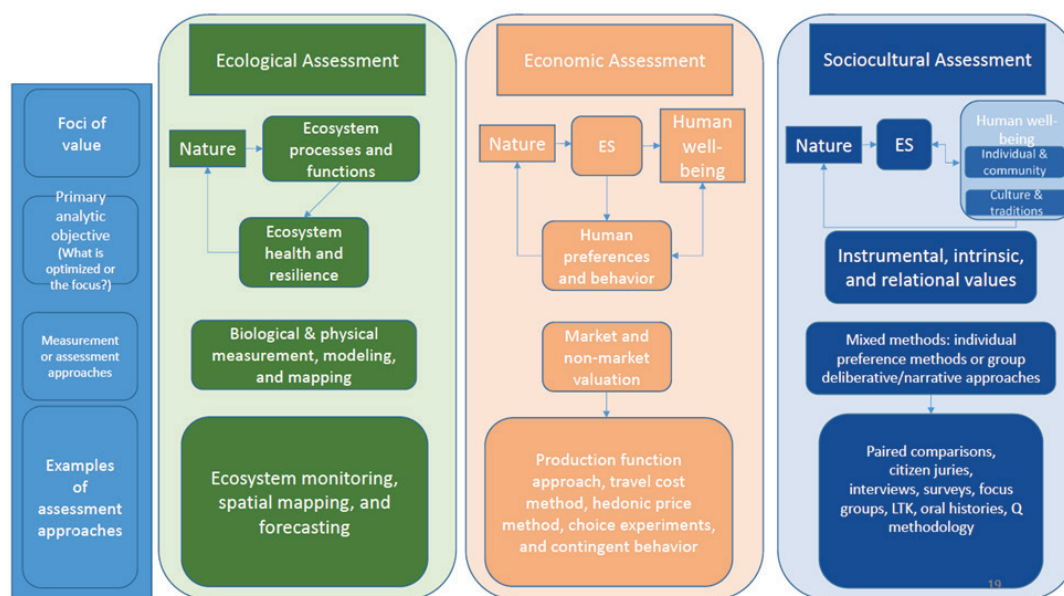


Figure. MES assessment approaches by scientific worldview

The economic subsection includes a discussion of what economic values are, the different types of economic values, and how they are derived and measured. The section culminates with a brief discussion of the types of methods and values associated with different types of MES (see table below).

Table. MES and economic valuation (similar to Goulder and Kennedy [2011]²)

Ecosystem Services (MEA classification)	Type of Economic Value	Valuation Method(s)
Food source (provisioning) Source of non-food materials (provisioning)	Direct use values • Consumptive use values	Direct market valuation Production function approach
Supporting and regulating functions (supporting and regulating)	Direct use values Indirect use values	Hedonic price methods Production function approach
Recreational benefits (cultural)	Direct use values • Non-consumptive use values Indirect use values	Travel cost method Hedonic price method Choice experiments Contingent valuation Contingent behavior
Nonuse benefits (cultural)	Existence value Bequest value Altruistic value	Choice experiments Contingent valuation

The group then heard from Dr. Kirsten Leong on her efforts to complete the sociocultural assessment subsection. She indicated it is nearing completion and follows the framework indicated in the worldview figure above. Dr. Sarah Dudas then provided an update on the ecological assessment subsection. It is also nearing completion and follows the general intuition of the worldview figure. The section includes a general discussion of the broad set of tools that could be used to assess ecosystem services from a physical and biological science perspective and discusses the role of monitoring, mapping, modeling, and forecasting as assessment approaches. See figure below.

² Goulder, L. H. and Kennedy, D. (2011). Interpreting and estimating the value of ecosystem services in: Peter Kareiva, Heather Tallis, Taylor H. Ricketts, Gretchen C. Daily, and Stephen Polasky (Eds.), *Natural Capital: Theory and Practice of Mapping Ecosystem Services*, Oxford University Press.

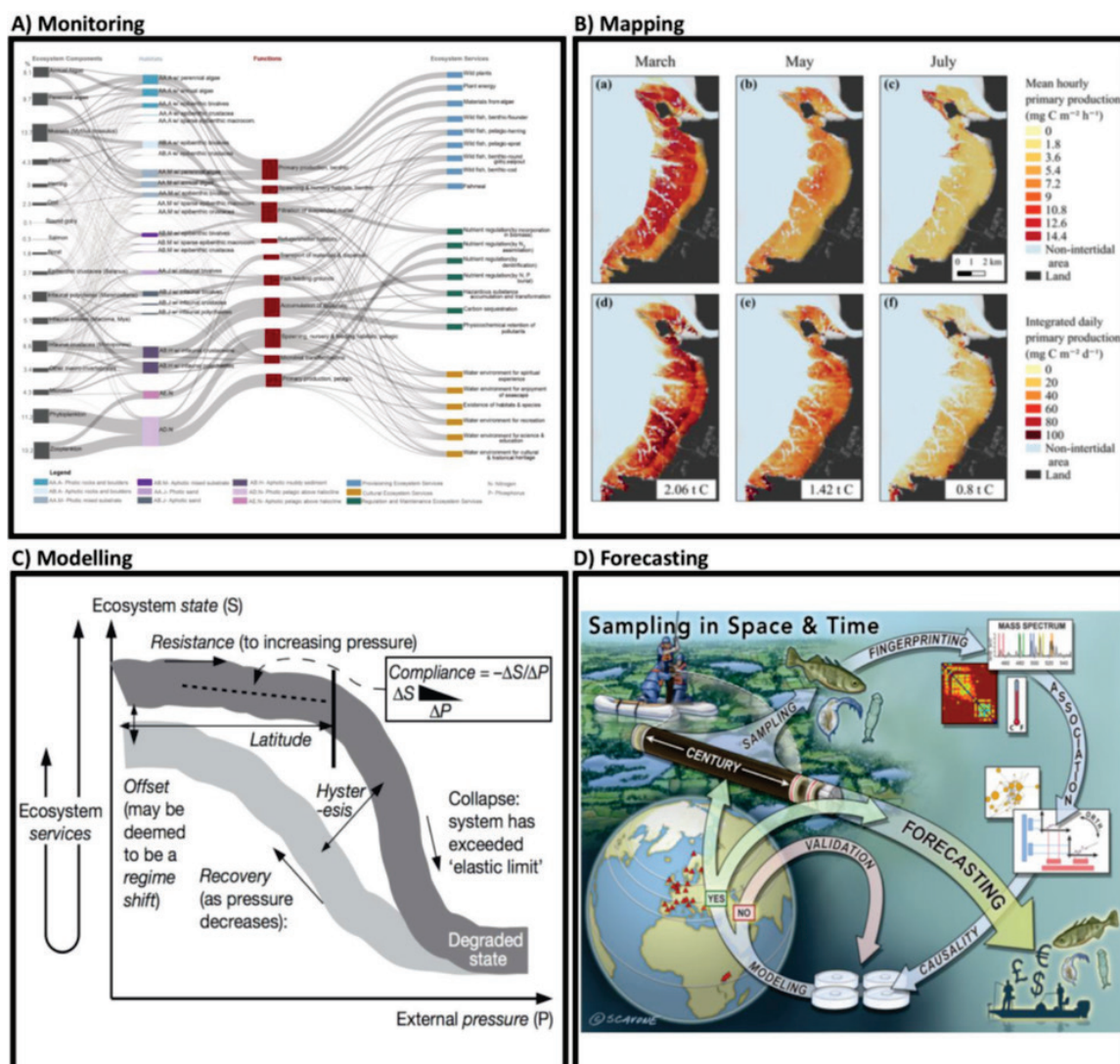


Figure. Ecological assessment methods in general.

The aquaculture case study section is composed of literature review contributions by the U.S., Japan, China, and Canada. These reviews summarize the literature on aquaculture-related MES research in member countries. Dr. Ray provided an update on the U.S. case study, recapping the approach taken (that was adopted by most of the other countries), results, and an evaluation of the results. Similar updates were provided by Dr. Hiroki Wakamatsu for Japan, by Dr. Meng Su for China, and by Dr. Gisele Magnuson for Canada. All four case studies indicate a paucity of aquaculture-related MES research in terms of numbers of studies, coverage of aquaculture species, coverage of specific MES, and spatial coverage. Dr. Wakamatsu importantly discovered that ES are frequently referred to as “multifunctional services” in the literature in Japan, though the aquaculture literature nevertheless was thin in Japan too.

Project 2. Country-specific surveys of agencies and decision makers

The second project is a survey project involving the development of country-specific surveys that will be administered to decision makers, analysts, and scientists involved in ocean and coastal management and research in each country. The goal of the study is to collect information necessary to understand how they view and use MES information, as well as the prospects and challenges currently facing each country for advancing its usage in policy and management and its integration into more integrative management frameworks (like ecosystem-based management). China, Canada, and the U.S. have versions of this web-based MES valuation survey either completed or in-progress.

Jingzhu Shen provided an update of China’s MES valuation survey, which had been completed in 2020 and basic results were reported in previous meetings. Since then, it has been written up into a manuscript.

The Canadian and U.S. MES valuation surveys are both still in preparation but are both moving toward implementation. Dr. Magnusson provided an update of Canada’s MES valuation survey, which is undergoing final checks before being implemented in mid-September in 3 waves. They expect to begin analysis of the data in October. Dr. Lew provided an update on the U.S. survey, indicating that it is still undergoing some internal review and approvals, but that a final version should be ready for implementation later in the fall after final edits and programming are completed and the sampling frame is updated and finalized.

AGENDA ITEM 3

Discussion on project next steps and other Working Group goals

The team briefly had a discussion about finishing the MES review report sections and the MES valuation surveys. Dr. Lew made clear that although the WG is officially ending, the work done in the WG will continue until the products (discussed on Day 2) are completed.

The discussion of “Other Working Group goals” was moved to Day 2 due to running out of time.

Day 2: September 9, 2021

AGENDA ITEM 1

Introduction

Dr. Lew welcomed everyone back and brief introductions were made again because of some new faces (individuals who were not there on the first day). Dr. Lew then provided a recap of Day 1 and the meeting goals. Since it was not completed on Day 1, the “other Working Group goals” item was discussed next. In short, he provided information about the new proposed expert group on Climate Extremes and indicated to the WG members that there is a particular lack of expertise in social sciences in the initial WG membership. He encouraged those interested in the topic (social and natural scientists alike) to let him know so they can be put in contact with the climate extremes WG organizers.

AGENDA ITEM 2

Discuss Working Group products/outputs

Dr. Lew led a discussion of the Working Group products. The “required” product for this WG is a PICES Press article. Dr. Lew indicated that he would take the lead in writing it and Dr. Dudas indicated a willingness to help with it. The article is expected to summarize WG 41’s activities over its lifespan and provide a summary of the projects and findings.

Dr. Lew then informed the group about PICES’ policies about publications from its expert groups (see figure below). He asked the individual project contributors to consider that process when putting together manuscripts.

- PICES requires manuscripts produced by its expert groups to be approved by parent committees, SB, and GC.
 - <https://meetings.pices.int/publications/ApprovedPub>
 - “All PICES publications generated by PICES activities require review by their parent committees. Then they can be recommended by Science Board to Governing Council for approval, before they can be posted on the PICES website. And, when a scientific paper is published that was a product of a PICES supported event (such as a capacity-building event, workshop or working group), it is important that PICES be acknowledged within the publication.”

Figure. PICES publication procedures

Dr. Lew then led a discussion of other Working Group products. First was a PICES Scientific Report, which Dr. Lew suggested would be an appropriate outlet for the MES review report. A discussion about whether to organize it as an edited volume of individual contributions (with authors specific to their contribution) or as an integrated report (with all contributors as co-authors). The group agreed that the edited volume of individual contributions is more appropriate. Dr. Lew will edit the contributions to the PICES Scientific Report.

Next, a brief discussion about potential other products (journal articles) took place. Dr. Lew laid out several potential ideas, with the group gravitating towards the MES valuation surveys (cross-country comparison) as the principal one (Drs. Wallmo and Dudas indicated willingness to participate).

AGENDA ITEM 3

Group discussion of Working Group experience and its future

The group then had a discussion about the WG as a whole, their experience with it, and its future. In general, people noted that the MES valuation survey, once completed in Canada and U.S., may provide additional insights about the need and desire for MES information and MES values in general. That would help identify potential directions for any future working group. People also generally agreed the WG was useful to themselves and to their governments. The MES review is viewed as a good first step to better understanding MES. Dr. Magnusson also noted that the view we have brought into this group is primarily a federal/national government view, given the composition of the group. Dr. Dudas suggested marine spatial planning might be a good outlet for MES information and could be a focus for a future working group.

Bottom line: We will not be suggesting another MES-related expert group until we have results from the MES valuation surveys and have determined whether the results indicate a particular need. There was also some desire to get feedback/input from the HD committee about what further questions about MES could and should be explored.

However, the group decided to resubmit the topic session approved for PICES-2020 that had been cancelled due to COVID-19 (WG 41 Endnote 3). Drs. Dudas and Li will remain as the co-convenors.

In terms of reflecting back on the WG experience, Dr. Lew noted a number of challenges and positives associated with the group. The positives included:

- learning more about MES and different countries’ perspectives and experiences,
- the effort some of the WG members and contributors made to make progress on the WG projects, and
- the relationships that were developed that will hopefully be ones that lead to future collaborations.

Some of the identified challenges included:

- the difficulties in getting the group organized and its membership filled by appropriate and willing members from the PICES nations,
- the often-slow progress made even more difficult by the pandemic and unforeseen setbacks, and
- some persistent challenges due to language differences that made communicating sometimes difficult.

Several other WG members echoed these, and added that working with experts in other disciplines was a real benefit of the group. A common communication platform for sharing documents and communicating was something several members indicated would be great to have and would have helped this group function better.

AGENDA ITEMS 4–5

Wrap up and meeting adjournment

Dr. Lew thanked the members and attendees for their valuable contributions and indicated he was looking forward to finishing up the projects with all the contributors. The meeting then adjourned as per the agenda.

WG 41 Endnote 1

WG 41 participation list

Members

Shang Sunny Chen (China, Co-Chair)
 Dan Lew (USA, Co-Chair)
 Sarah Dudas (Canada)
 Gisele Magnusson (Canada)
 Wei Liu (China)
 Hiroki Wakamatsu (Japan)
 Changsu Lee (Korea)
 Jungho Nam (Korea)
 Kirsten Leong (USA)
 Kristy Wallmo (USA)

Members unable to attend

China:, Jingmei Li, Benrong Peng
 Japan: Aoi Sugimoto
 Korea: Hye Seon Kim, Seung-Hoon Yoo

Observers

Rosemary Kosaka (USA)
 Alohi Nakachi (USA)
 Kevin Ray (USA)
 Jingzhu Shen (China)
 Meng Su (China)
 Julia Yazvenko (PICES)

WG 41 Endnote 2

WG 41 meeting agenda

Day 1: September 8, 17:00–19:00 Pacific Time

1. Welcome
 - a. Meeting goals and organization
 - b. Introductions
 - c. Adoption of agenda
 - d. Brief review of working group Terms of Reference and activities/projects
2. Brief updates/reports on projects
 - a. Project 1: Review of MES report
 - i. Sections 1-3 (Lew)
 - ii. Section 4
 - iii. Introduction and Economic subsection (Lew)
 - iv. Sociocultural subsection (Leong/Nakachi)
 - v. Ecological subsection (Dudas)
 - vi. Section 5 (aquaculture case studies)
 1. U.S. (Ray)
 2. Japan (Wakamatsu)
 3. China (Su)
 4. Canada (Magnusson)
 - b. Project 2: MES valuation survey
 - i. China (Li)
 - ii. Canada (Magnusson)
 - iii. USA (Lew)
3. Discussion
 - a. Project next steps
 - b. Other Working Group goals
4. End of Day 1

Day 2: September 9, 17:00–19:00 Pacific Time

1. Introduction
 - a. Recap of Day 1 and meeting goals for Day 2
 - b. Finish incomplete items from Day 1 agenda
2. Discuss Working Group products/outputs
 - a. “Required” products
 - i. PICES Press article
 - b. Other products
 - i. PICES Scientific Report (an “edited” volume of individual contributions or an integrated report)
 - ii. Potential journal articles
3. Group discussion of Working Group experience and its future (if any)
 - a. Positives and negatives
 - b. Should it continue in some way as a group within PICES?
 - c. Future topic sessions or workshops to propose for PICES-2022?
4. Wrap-up and final thoughts
5. End of Day 2/Meeting adjourns

WG 41 Endnote 3

Proposal for a Topic Session on
“*Marine Ecosystem Services – Connecting science to decision making*”
resubmitted for PICES-2022

Convenors: Sarah Dudas (Canada) and Jingmei Li (China)

Duration: ½ day

Marine Ecosystem Services provide a conceptual framework to understand and communicate the value our coastal and marine ecosystems have from ecological, economic, and socio-cultural perspectives. All species and habitats provide ecosystem functions and produce ‘services’. This session seeks to bring together natural scientists (ecologists, biologists, oceanographers, etc.) studying species and habitats that provide these services with the social scientists (economists, anthropologists, sociologists, etc.), policy makers, managers, and others that use the concept of MES to affect decision making. The session will include discussions on ecological, economic, and socio-cultural metrics to identify synergies between them. An objective of this session will be to help bridge the gaps in communication and understanding about ecosystem services between natural and social scientists in PICES nations and to illustrate the range of applications studying marine ecosystem services.