

PICES North Pacific Ecosystem Status Report and World Ocean Assessment 'Human Dimensions' Workshop

Honolulu, Hawaii 13-16 June 2013

Co-Convenors: Keith Criddle (US), Mitsutaku Makino (Japan), Ian Perry (Can), Thomas Therriault (Can)

Meeting Objectives/Background

The North Pacific Marine Science Organization (PICES) is an intergovernmental organization formed to promote increased scientific understanding of the North Pacific Ocean. One mechanism PICES has used to convey information on ecosystem status and trends is the North Pacific Ecosystem Status Report (NPESR). The two previous reports have highlighted climatic, oceanographic, and biological changes. Socioeconomic aspects have been identified as an important gap to be filled in the next iteration. Separately, the United Nations has embarked on a Regular Process for global reporting and assessment of the state of the marine environment known as the World Ocean Assessment (WOA). The objectives of the WOA neatly complement the PICES NPESR which currently is in its third cycle. The purpose of this meeting is to assemble information on social and economic – or "human dimension" – indicators for marine ecosystems in the North Pacific. This information will be used in the next iteration of the PICES NPESR and will be beneficial for the first WOA. Participants will contribute to the following workshop objectives:

- * Compile and review socioeconomic data for the North Pacific to identify human dimension indicators to be employed in the 3rd NPESR
- * Identify data gaps that would limit the application/utility of human dimension indicators
- * Identify additional socioeconomic data sources to inform the First WOA
- * Engage PICES member countries in the WOA process and strengthen linkages between PICES, other intergovernmental organizations, and the WOA Group of Experts.

Workshop Agenda

The Workshop agenda is provided as Appendix 1 to this report.

Workshop Participants

The participants to this workshop are provided in Appendix 2 to this report.

Workshop Presentations

PDF versions of the presentations given at the workshop are available at the PICES Section on Human Dimensions web page (<http://www.pices.int/members/sections/S-HD.aspx>) in the Products box for 2013.

The background to PICES, to the first two editions of the PICES North Pacific Ecosystem Status Report (see Appendix 3), and to the PICES Section on Human Dimensions were presented by Drs. Tom Therriault, Ian Perry, and Mitsutaku Makino (respectively).

In discussion, it was noted that the first PICES Ecosystem Status Report, published in 2004, had a small section on the "human dimensions", mostly relating to relatively populations and population growth in nations around the North Pacific. In the second PICES Ecosystem Status Report, there was no mention of the "human dimensions" other than for fishing as a top-down pressure. The issue of the appropriate spatial scale for information on human dimensions in the next update to the status report was discussed, and whether it should be at the ecosystem-region level, comparable to most of the natural science analyses, or whether the human dimensions need to be at a broader regional or even global level. For example, it was suggested that the human dimensions information perhaps should be its own separate chapter rather than integrated as sections in to each of the regional ecosystem-level presentations.

Dr. Alan Simcock presented an overview of the World Ocean Assessment (www.worldoceanassessment.org; see also Appendix 4 to the present report), its origins, current status, and plans for producing its first report (expected in 2014). He presented a possible structure along the lines of human activities, habitats, and ecosystem services.

Human dimensions aspects of the non-provisioning ecosystem services included the:

- hydrological cycle, e.g. human impacts of ENSO, etc.
- sea/air interactions, such as coal-burning, storms, tsunamis, etc.
- primary production and the resilience of the food web
- aesthetic, religious, and spiritual ecosystem services

The social and economic dimensions of food include:

- dependence on the oceans for food
- inter-regional dependencies
- contributions of living marine resources to food security
- human health and food from the sea (in particular shellfish)
- employment in fisheries and aquaculture: numbers, pay, safety
- fisheries and social structures
- who benefits from which fisheries areas?
- international distributions of benefits from fisheries

- economic activity dependent on fisheries and aquaculture

Human activities would be considered for their importance for economics and livelihoods and their role as stressors to marine systems. Elements to be considered include:

- nature and magnitude
- socio-economic aspects
- pathways
- major ecosystem impacts
- integration of environmental and socio-economic trends
- environmental, economic, and social influences on trends
- gaps in capacity building

Fourteen activities have been identified (see the headings in Appendix 5). He also recommended viewing the UK report "Charting Progress 2" as to how they did their economic valuations (<http://chartingprogress.defra.gov.uk/>)

Dr. Rashid Sumaila then gave a presentation on how the "human dimensions" relevant to marine systems might be defined. He noted the existence of some 'large-scale' and global indicators, such as the human development index (<http://hdr.undp.org/en/statistics/hdi/>) and the social vulnerability index (e.g. see <http://www.ihdp.unu.edu/file/get/3596.pdf>). He also presented some of the analyses and data sets that he and his team have been developing on a global basis. These data sets include both time series and snapshot views of relevant topics, such as:

- fish catches
- fishing effort
- ex-vessel fish prices
- fishing costs
- fisheries subsidies
- fisheries jobs
- recreational fisheries
- added value and multiplier effects

He noted that cultural aspects are important but often difficult to quantify.

Discussion following his presentation noted that, whereas data do exist for the countries around the North Pacific, identifying which data are applicable to the North Pacific Ocean is difficult for nations which border two major oceans, such as Russia, Canada, and the United States. Next steps for the UBC Team are to develop a database of the wholesale sector, exports and imports of fisheries products, and use of the Gini coefficient (e.g. <http://data.worldbank.org/indicator/SI.POV.GINI>) to assess the equity of distribution of fishery products and poverty.

Country presentations followed, and were used to develop a table of possible indicators for the human dimensions of marine systems (see Table 1). These could form the basis for data collection and analysis towards a human dimensions contribution to the next PICES Ecosystem Status Report.

Discussion following each country presentation included the following observations:

Canada: "Stories", for example of the remote salmon processing communities along the BC coast during the early 20th Century, could be used to provide more information and understanding of human interactions and their changes with marine systems than will be possible through numbers alone.

China: illustrates a nice analysis demonstrating how aquaculture may be the only way for China to meet is expected future demands for marine protein, and discusses some of the challenges that may occur.

Japan: interesting to observe that, in Japan, aquaculture outputs appear to have been stable over the past several years, which is in marked contrast with other nations around the North Pacific.

Korea: presented the new organisational structure for fisheries and marine affairs. There was some discussion as to the availability of a marine biotoxin monitoring program, e.g. for harmful algal blooms – Korea does have such a program.

Russia: the emerging need for seafood products to have some type of 'eco-certification' (e.g. Marine Stewardship Council) was noted as a potential important human market-related driver of changes in the fishing industries in Russia and other PICES nations. This was suggested as another good topic for a narrative in the human dimensions contribution to the next PICES ecosystem report to illustrate the influences of market forces. It could include discussion of the relationships between population increases and increasing wealth leading to changing demands for fish products and the abilities to meet these demands, for example as a driver for aquaculture increases in China. The presentation from Russia also nicely illustrated how fish caught in Russia are increasingly being shipped to adjacent countries (in this case China) for processing. The presentation also noted the increasing competition for the whitefish market between the traditional Pollock and the new tilapia products.

United States: several web links to relevant data sources were presented, some of which provide data at the national level and others which provide data at state and local levels. The U.S. is also conducting detailed community-level analyses of the importance of fishing including analyses of social vulnerability and production of resilience indices, in particular to climate change. To date these have been completed for communities along the Atlantic coast. In discussion it was noted that individual States also collect relevant information within State waters (12 n mi) and have data on population censuses and demographics. Ron Felthoven noted that he had a manuscript which included information on recreational and 'subsistence' fishing.

An additional presentation was provided from China on mapping and evaluation of coastal and marine ecosystem services which lists 14 components separated into the four primary services (provisioning, regulating, cultural, supporting), for which 8 were able to have economic values calculated.

Identifying potential human dimensions-related indicators for the marine systems of the North Pacific

Using these national presentations as a starting point, a table (Table 1) was constructed of the potential HD indicators that were presented and whether they might be available in all PICES member nations.

The following points and action items were noted:

Action re baseline data (Lead S-HD co-chairs, Ian Perry, Rashid Sumaila): discussions should be conducted over this summer with Dr. Sumaila and his team at the University of British Columbia as to which data sets he has that may be accessed to provide a foundation for comparisons of human dimensions indicators presented in Table 1. The value of this is that all his data are presented all in common formats. A disadvantage that would need to be explored is that the data are at the national level (a problem for a Pacific Ocean focus for Canada, Russia, and the U.S.). These UBC data could be cross-validated with data from each PICES country to help improve the UBC data sets.

Action re how to report effort data: PICES Section on Human Dimension members are requested to report to the co-chairs over the summer about how their effort data are reported, to try to develop a common effort index.

There was discussion of how to assess the 'price of fish to consumers', with the suggestion to consider using the fish parts of the Consumer Price Index in each country as a 'standard' measure.

There was considerable discussion of Imports and Exports, and how to assess these for the Pacific Ocean. It was **recommended** that imports and exports be presented from official statistics at the national level, but to consider within each country which species may be of high importance to the Pacific Ocean and communities along the Pacific coasts, that might be used as case studies to provide detail beyond the national statistics.

It was also **recommended** to include data which are not strictly time series, for example studies that might be done occasionally, or for cultural aspects, perhaps in narratives which provide context but not necessarily in time series.

Discussion of PICES contributions to the World Ocean Assessment

The Table of Contents for the draft World Ocean Assessment was discussed, and potential contributions or data sources from the North Pacific and PICES member nations were identified: see Appendix 5.

Action re PICES contributions to future ocean assessments (Lead, Tom Therriault): It was noted that the United Nations Commission on Sustainable Development would be reviewing the oceans in 2014 (science issues) and 2015 (policy issues), and that this might be an excellent opportunity for PICES to prepare a submission or to provide information.

Next Steps

Next steps were identified as:

1. Explore the posting of pdf versions of the presentations to a PICES web site (**Lead, Tom Therriault**);
2. A PICES Press article will be written resulting from this meeting, for publication in the July 2013 issue (**Lead, Keith Criddle**). This article can be found at: http://www.pices.int/publications/pices_press/volume21/v22-n2/pp_12-13_Honolulu-Wsh.pdf.
3. The latest version of the Table of potential indicators will be circulated to participants (lead: Keith Criddle; **DONE** and included here as Table 1)
4. Members of PICES' Section on Human Dimensions are to work to populate this table with data for their nation over the summer, for presentation and discussion at the October meeting of the Section. A date of 31 July was suggested as when to have first efforts to populate this table available for sharing
5. The FUTURE Open Science meeting in April 2014 was recommended as a date for when to have the core elements of the human dimensions chapter/information available for presentation and discussion.

Any other contributions not available at the workshop are to be circulated to participants in the month of July.

The meeting adjourned on Saturday 16 June at 1500.

Table 1. Proposed list of Human Dimension indicators that emerged from the workshop. "Tier": 1= 'core' for all nations; 3=if available.

Variable	Canada	China	Japan	Korea	Russia	USA	Synoptic	tier	Notes
Landings and catch (amount): inside/outside EEZ, seaweeds, fish, shellfish and other invertebrates	X	X	X	X	X	X	X	1	
Landings and catch (value): inside/outside EEZ, seaweeds, fish, shellfish and other invertebrates	X	X	X	X	X	X	X	1	
Marine aquaculture production (value and amount): seaweeds, fish, shellfish and other invertebrates	X	X	X	X	X	X	X	1	
Exvessel price					X	X	X	2	can be derived from landings value and amount
Sport fishing (number of anglers, estimated total catch)					X	X	X	3	may be available from Rashid
Other non-commercial fishing (number of fishers, estimated total catch)						X	X	3	may be available from Rashid
Fishing costs (amount or percentage of revenues)				X			X	3	may be available from Rashid
IUU fishing (amount)				X		X	X	1	
Fishing vessels (numbers) by gear type, size and tonnage	X	X		X	X	X	X	1	
Fishing vessel power (HP) by gear type, size and tonnage		X	X	X	X	X	X	1	
Fishing companies (numbers)								3	measure of industrial concentration
Fishing effort (by gear type)		X	X	X	X	X	X	2	may be available from Rashid
CPUE (by gear type)		X	X	X	X	X	X	1	
Commercial fishers (numbers)	X	X	X	X	X	X	X	1	may be available from Rashid
Commercial fishers characteristics, e.g., average age, percentage full time vs. part time		X	X	X	X	X	X	3	
Mortality/injury rates (absolute and relative to national averages)		X	X	X	X	X	X	1	
Income of fishermen (absolute and relative to median regional income)	X	X	X	X	X	X	X	1	
Net revenues from fishing	X	X	X	X	X	X	X	3	
Fish processing plants (number, by scale and scope)	X	X	X	X	X	X	X	1	
Employment in fish processing (numbers; full time and part time)	X	X	X	X	X	X	X	3	
Processed fish products (amounts by major category, e.g., fillet, roe, surimi, mince, fishmeal)	X	X	X	X	X	X	X	3	
Fish wholesale value (value of processed products sold)	X	X	X	X	X	X	X	3	not likely to change quickly
Wholesale markets (number?)	X	X	X	X	X	X	X	3	difference between exvessel and wholesale value
Value added	X	X	X	X	X	X	X	3	may be available from Rashid
Value added multiplier	X	X	X	X	X	X	X	1	
Fishing households (number)	X	X	X	X	X	X	X	1	not likely to change quickly
Fishing villages/communities (number)	X	X	X	X	X	X	X	1	not likely to change quickly
Fishing ports (number)	X	X	X	X	X	X	X	1	not likely to change quickly
Gain coefficient—equality	X	X	X	X	X	X	X	2	measure of income distribution
Health/contamination monitoring (frequency of incidents relative to total production) per capita consumption	X	X	X	X	X	X	X	?	This may be covered by HAB working group
Seafood price to consumers (index relative to food expenditures)	X	X	X	X	X	X	X	3	
Seafood exports (national, footnotes for specifics) (amount and value)	X	X	X	X	X	X	X	1	
Seafood imports (national, footnotes for specifics) (amount and value)	X	X	X	X	X	X	X	1	
Seafood inventories (amount and value)	X	X	X	X	X	X	X	?	may be proprietary commercial information
Laws and Regulatory structure	X	X	X	X	X	X	X	3	We agreed to provide this information as an initial product of S-HD
International agreements	X	X	X	X	X	X	X	3	
Value of ecosystem services	X	X	X	X	X	X	X	3	
environmental acc/natural capital	X	X	X	X	X	X	X	3	
valuation of non-marketed goods/services	X	X	X	X	X	X	X	3	
replacement cost of ecosystem services	X	X	X	X	X	X	X	3	We will revisit this section following the 2013 PICES meeting.
Eco certification/mkt access	X	X	X	X	X	X	X	3	
includes climate induced changes in services	X	X	X	X	X	X	X	3	

Notes:
 We will probably want to include a narrative to set out context for understanding values reported in these categories
 We may want to organize a portion of a session at the FUTURE OSM to identify drivers of change in social ecological systems
 X = data presented in slides at mtg, ? = data likely available but not at mtg, X = data sources made available but not presented at mtg

Appendix 1: Agenda

Day 1 (13 June)

Welcome and Introductions (Co-Chairs)

Adoption of the Agenda

Introduction to the Meeting (Co-Chairs)

Meeting Objectives: Fulfilling Two Goals (Therriault)

An Introduction to the Next PICES North Pacific Ecosystem Status Report (NPESR) and the Need for Human Dimension Indicators (Perry)

An Introduction to the First World Ocean Assessment (WOA) plus outcomes from previous WOA data compilation workshops (Alan Simcock)

What Do We Mean by Human Dimension Indicators? (Rashid Sumaila)

Lunch break

What Data/Information are available for Human Dimension indicators: A Review of Member Country Data for the North Pacific (**please see Appendix 1 below**)

Canada

China

Japan

Russian Federation

South Korea

United States

Other?

End of Day 1

Day 2 (14 June)

Recap of Day 1 (Co-Chairs)

Discussion on what Human Dimension indicators should/could be developed in support of the next NPESR?

Synthesis of what we have

Identification of what we need

Recommendations for moving forward

Lunch break

Review of Chapter Outlines for WOA

Discussion of Synergies with the First WOA

Compilation of "Human Dimension" data/information in support of WOA

Tables will be developed

End of Day 2

Day 3 (15 June)

Recap of Day 2 (Co-Chairs)

Development of PICES report(s) plus report for World Ocean Assessment

Next Steps

Close of meeting

Appendix 2: Workshop Participants

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Therriault	Thomas	Canada	thomas.therriault@dfo-mpo.gc.ca
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Figure 1. Participants at the PICES North Pacific Ecosystem Status Report and World Ocean Assessment workshop, Honolulu, 13-15 June 2013. Left to right: Shang Chen, Ian Perry, Jung-Hee Cho, Ron Felthoven, Minling Pan, Sam Pooley, Rashid Sumaila, Ayeisha Brinson, Alan Simcock, Ningsheng Yang, Elena Anferova, Wenbo Yang, Yingren Li, Kyungjin Kim, Keith Criddle, Kyong Ju Cho, Xiaodong Zhong, Masahito Hirota, Juri Hori, Suam Kim, Ton Therriault, Mitsutaku Makino, Jay Nam.

Appendix 3: PICES North Pacific Ecosystem Status Report

See the web site for this item at <http://www.pices.int/projects/npesr/default.aspx>

The PICES report on marine ecosystems is intended to periodically review and summarize the status and trends of the marine ecosystems in the North Pacific, and to consider the factors that are causing or are expected to cause change in the near future. The first report, begun in mid-2002 and completed about 18 months later, can be found at http://www.pices.int/publications/special_publications/NPESR/2004/npesr_2004.aspx. It served as a pilot project to explore for what might be possible. This report was based largely on geographic locations and subjects for which time series data or information are readily available. The report also identified locations and subjects where data were collected but were then are not available. The second report, available at http://www.pices.int/publications/special_publications/NPESR/2010/NPESR_2010.aspx was published in 2010 and built upon the first status report representing a more detailed and in-depth analysis. Neither of these report included the human use and dimensions of marine ecosystems in any integrated or consolidated way.

Formation of the PICES Section on the Human Dimensions of Marine Systems in 2011 provides the opportunity to, among other goals, contribute more information and synthesis to the PICES status report process than was possible previously. The objective of this new PICES Section is to better understand and communicate the societal implications of the conditions and future trends of North Pacific marine ecosystems (FUTURE vision), to provide a forum for the integration of FUTURE-related studies using social science approaches and tools, and to facilitate the close discussions and communications among researchers from both the natural and social sciences. Term of Reference #3 for this Section is to contribute a Human Dimension Chapter to the next North Pacific Ecosystem Status Report. This present workshop provides an opportunity to get started with this goal.

The range of topics that could be explored as contributions to the PICES status report is large – for example, see the chapter headings for the first World Ocean Assessment (see Appendix 4, below, and http://www.un.org/depts/los/global_reporting/Outline_of_the_First_Global_Integrated_Marine_Assessment.pdf). To focus this information, this Workshop considered mostly the topics under Chapter 15 “Social and economic aspects of fisheries and sea-based food” in the World Ocean Assessment draft chapter outline (see above web link). The topics in this chapter include:

- 15A. Relationship with human health: health benefits and problems from sea-based food, including the potential to supplement protein-poor diets – chemical, toxic and bacterial contamination.
- 15B. Scale and significance of employment in fisheries and aquaculture: numbers employed – relationship of earnings to local median earnings – scale of injuries to fishers compared to other industries.
- 15C. Role of fisheries in social structure: role of fishers in local societies – extent to which fishing is the sole source of livelihood – extent to which local societies are dependent on fisheries and aquaculture.

- 15D. Relationship between catch areas, ownership and operation of fishing vessels, landing ports and consumption distribution: the benefits which States (and economic operators based in them) obtain from fisheries and aquaculture.
- 15E. Implementation of international fisheries agreements.
- 15F. Effects of changes in markets: growth of long-distance transport of landed fish and shellfish.
- 15G. Links to other industries: scale of economic activity dependent on fisheries and aquaculture, both in providing equipment (especially ships) and in processing output in value chains.
- 15H. Identify gaps in capacity to engage in fisheries and to assess the environmental, social and economic aspects of fisheries.

This Workshop started by assembling basic information on human social and economic 'use' of fisheries and sea-based foods, that could lead towards a synthesis among PICES nations around the North Pacific. Participants were requested to bring data, data summaries, or as much information as possible relating to the following topics (if data are not available that is also important information, as are contacts for people who could provide this information):

1. Basic information on the fisheries sector;

- Number and size of fishing vessels
- Catch information (volume and value) by species and by gear types (comparison of diversity in catch composition and gear types)
- Resource status summary (if any)
- Number of employment in fish processing/distributing sector,
- Value added by fish processing/distributing sector
- Number of fishing ports, fish markets
- Number of fishing communities, its demographic information

2. Consumption aspects

- Types of usage, (raw, frozen, processed, fish meal, oil, etc.)
- Rates of per capita consumption (and perhaps how they are changing plus forward projections)

3. Governance information

- Main legal structures (laws relating to fisheries or resource management), including international conventions
- Governmental and non-governmental organizations relating to fisheries

4. Cultural aspects

- Any specific national culture (arts, festivals, education, etc.) which closely relate to fisheries, and are worth highlighting in World Ocean Assessment.

If data and/or summaries of this information are not available, participants were asked to identify who in their nation would be the appropriate contact.

Data gaps were also identified.

Appendix 4: World Ocean Assessment

See the web site at www.worldocean.assessment.org

Mandate:

The Regular Process was established by the United Nations General Assembly through a series of resolutions. The full texts can be found at:

<http://www.un.org/depts/los>

The objective for the Regular Process is articulated in UNGA Resolution 57/141, (2005) "to improve understanding of the oceans and to develop a global mechanism for delivering science-based information to decision makers and public".

The overall objective, endorsed by the UN General Assembly in UNGA Resolution 64/71 (2009), paragraph 177, is that:

- "The regular process under the United Nations would be recognized as the global mechanism for reviewing the state of the marine environment, including socioeconomic aspects, on a continual and systematic basis by providing regular assessments at the global and supraregional levels and an integrated view of environmental, economic and social aspects.
- Such assessments would support informed decision-making and thus contribute to managing in a sustainable manner human activities that affect the oceans and seas, in accordance with international law, including the United Nations Convention on the Law of the Sea and other applicable international instruments and initiatives.
- The regular process would facilitate the identification of trends and enable appropriate responses by States and competent regional and international organizations.
- The regular process would promote and facilitate the full participation of developing countries in all of its activities. Ecosystem approaches would be recognized as a useful framework for conducting fully integrated assessments."

Assessment process:

The task of the first cycle of the Regular Process (2010 to 2014) will be to produce the World Ocean Assessment. To this end, the General Assembly has created an Ad Hoc Working Group of the Whole, to oversee and guide the Regular Process, and a Group of Experts to carry out the assessments within the framework of the Regular Process. In addition, a much larger pool of experts has been created to assist the Group of Experts in conducting the assessments and to provide effective peer-review to ensure the high quality of the outputs. Since the Working Group meets once a year, a Bureau consisting of fifteen Member States, representing the regional groups of the United Nations, was established for the intersessional periods. The Division for Ocean Affairs and the Law of the Sea, Office of Legal Affairs, United Nations, has been designated by the General Assembly to act as the secretariat of the Regular Process and it maintains a [separate website for the Regular Process](#), including an archive of relevant documents.

Draft Structure for the assessment:

The UN General Assembly has approved the [Outline for World Ocean Assessment I](#) based on the following broad structure:

- I. Summary
- II. The context of the assessment
- III. Assessment of major ecosystem services from the marine environment (other than provisioning services)
- IV. Assessment of the cross-cutting issues: food security and food safety
- V. Assessment of other human activities and the marine environment
- VI. Assessment of marine biological diversity and habitats
- VII. Overall assessment

The comprehensive outline (see

http://www.un.org/depts/los/global_reporting/Outline_of_the_First_Global_Integrated_Marine_Assessment.pdf) has nearly 50 topics grouped within four main themes: biophysical aspects of the marine environment; food security and safety; human activities that influence the ocean; and, marine biological diversity and habitats. The first World Ocean Assessment will include a technical summary showing interdisciplinary linkages between human impacts, ecosystem services, species and habitats.

The process of developing this structure started from the Drivers-Pressures-State-Impacts-Response (DPSIR) framework (Fig. 1). This framework was recommended by the Assessment of Assessments (the start-up phase of the Regular Process). The DPSIR represents a systems-analysis view – the driving forces of social and economic development exert pressures on the environment. As a consequence, the state of the environment changes. This leads to impacts on, for example, human well-being and ecosystem health that can lead to a response in social controls on human activity. This in turn feeds back onto either the driving forces, the pressures, the state of the environment or the impacts directly, through adaptation or through curative action. The DPSIR approach offers at least three possible approaches for structuring the Assessment: (a) Pressures; (b) Habitats; and (c) Ecosystem Services.

Using pressures as the basis of the structure of the World Ocean Assessment I has the advantage that the human activities creating the pressures are commonly linked with data collection and regulation. For instance, permits that are issued for offshore oil and gas development require specific monitoring and reporting obligations be met by operators. It would not, however, give an integrated view of the combined effects of the impacts of different pressures.

Using marine habitats as the basis for the structure has the advantage that “habitat” is the property that inherently integrates many ecosystem features, including higher and lower trophic level species, water quality, oceanographic conditions and many types of anthropogenic pressures (1). The cumulative aspect of multiple pressures affecting the same habitat, that is often lost in sector-based environmental reporting (2), would be captured by using Habitats as assessment units. It would not, however, give a coherent view of the economic and social aspects of the various human activities.

Using ecosystem services as the basis for the structure would follow the approach of the Millennium Ecosystem Assessment (3). This has the advantage of broad acceptance in environmental reporting (3). It includes provisioning services (food, construction materials, renewable energy, coastal protection) while highlighting regulating services and quality-of-life services that are not captured using a pressures or habitats approach to structuring the Assessment. However, it would not give a focused view of the situation of specific species and habitats of high importance.

The UN General Assembly highlighted (4) the cross-cutting issues of food safety and food, where the most significant ecosystem provisioning services come together with the social and economic issues of the highest importance. Given that all three approaches have their own particular advantages and disadvantages and the importance of reflecting the cross-cutting issues, the Group of Experts proposed a combination of all three approaches.

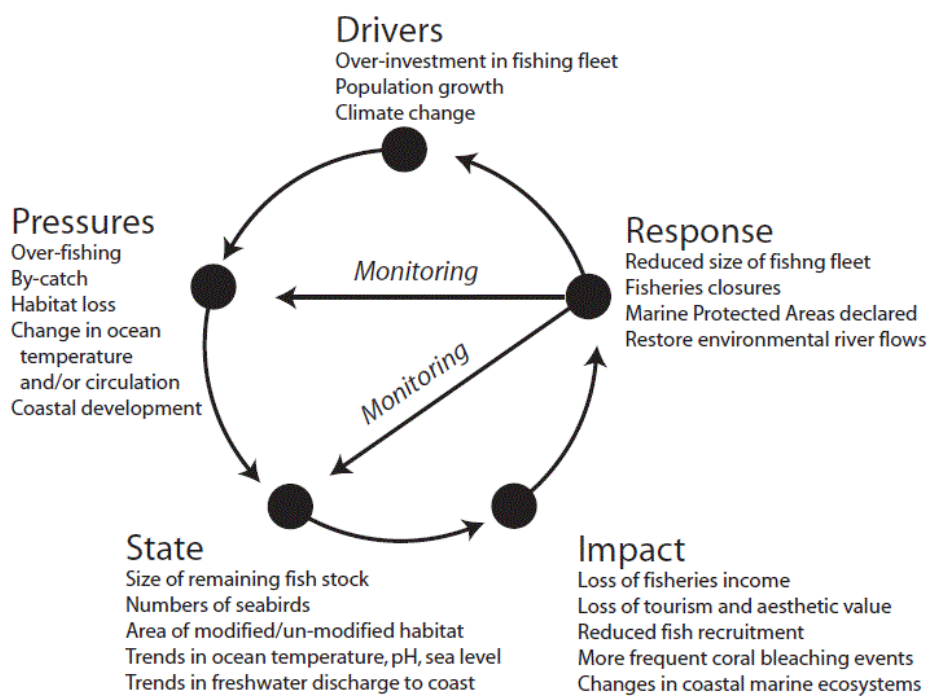


Fig. 1. Diagram of World Ocean Assessment Drivers-Pressures-State-Impacts-Response (DPSIR) framework.

Regional workshops

The purpose of the regional workshops is to identify regional experts who might participate in the production of the first global ocean assessment while simultaneously making an inventory of existing assessments and useful data sets and identifying regional capacity building needs for the conduct of state of marine environment reporting. Regional workshops have been carried out (as of February 2013) in:

- 1) Santiago, Chile to cover the eastern Pacific Ocean;
- 2) Sanya City, China to cover the East Asian Seas, including the Indonesian archipelago.
- 3) Brussels, Belgium to cover the North Atlantic Ocean, the Baltic Sea, the Mediterranean Sea and the Black Sea.
- 4) Miami, Florida, USA to cover the wider Caribbean.
- 5) Maputo, Mozambique to cover the Western Indian Ocean Region.

Appendix 5: World Ocean Assessment

World Ocean Assessment questions posed by Dr. Alan Simcock, with responses from the workshop for the North Pacific.

Title	Questions	
The oceans' role in the hydrological cycle	What are populations and areas in each State threatened by sea-level rise?	NOAA climate service
Sea/air interaction	What estimates have been made of the economic and social effects of <i>El Niño</i> and similar recurrent events?	
Primary production, cycling of nutrients, surface layer and plankton	What are the current estimates of heavy metals being released from coal-burning power stations?	
Ocean-sourced carbonate production	What estimates have been made of the economic and social effects of ocean storms and tsunamis?	
Aesthetic, cultural, religious, spiritual ecosystem services	What estimates have been made of the inherent variability and resilience of the base of the food web?	
Oceans and seas as sources of food	Have any estimates been made of possible economic and social effects of changes in ocean-sourced carbonate production in the formation of atolls and beaches?	
Social and economic aspects of fisheries and sea-based food	What surveys are there of human interactions with the oceans and seas on the aesthetic, cultural, religious and spiritual levels?	
	Are there any data on burials at sea?	
	Scale of human dependence on the oceans and seas for food, and variations between different parts of the world.	
	How far do different parts of the world depend on other parts of the world for fish and seafood?	
	Estimates of the potential contribution of living marine resources to food security.	
	Information on the relationship with human health: health benefits and problems from sea-based food, including the potential to supplement protein-poor diets — chemical, toxic and bacterial contamination.	
	Scale and significance of employment in fisheries and aquaculture: How many are employed? What is known about the relationship of their earnings to local average earnings? How does the level of death and injuries to fishers compare to other industries?	
	Information on the role of fisheries in social structure, the role of fishers in local societies, the extent to which fishing is the sole source of livelihood, and the extent to which local societies are dependent on fisheries and aquaculture.	
	Information on the relationship between the distribution of catch areas, ownership and operation of fishing vessels, landing ports and consumption.	
	Information on the economic benefits which States (and economic operators based in them) obtain from fisheries and aquaculture in the waters under their own jurisdiction, under agreements with other States for fishing in their waters and from international waters.	
	Information on the effects of changes in markets and the growth of long-distance transport of landed fish and shellfish.	
	Scale of economic activity dependent on fisheries and aquaculture, both in providing equipment (especially ships) and in processing output in value chains.	
Shipping	Proportion of world trade carried by sea (some UNCTAD statistics available)	
Cargo	Major inter-regional shipping movements (oil, other bulk, container) (historic and forecasts) (some historic UNCTAD statistics available)	
	Shipping movements at pinch-points (Dover Straits, Bab-el-Mandeb, Strait of Hormuz, Malacca Strait, Panama Canal, Suez Canal, Gibraltar Strait, Cape Horn — what others?)	Unimak Pass, AK, (Aleutian Isl)
	Size of fleets registered in different countries. Proportion of different trades carried by different fleets. Which States receive the economic benefits from the different shipping trades?	Korea (Cho to look), Japan (Makino to look),
ferries	Scale of passenger and vehicle movements on international ferries.	Korea to Japan, Russia to Japan and Korea, China to Korea and Japan, Can to US,
	Scale of passenger and vehicle movements on internal ferries in States with archipelagos	Japan, Philippines, Indonesia, Korea, Can (BC Ferries), US (AK Marine Highway)
cruising	Scale of passenger cruising in different areas (Caribbean, western North America, Mediterranean, Baltic and North Sea, Eastern Asian Seas)	Hawaii

General Social	How many seafarers are there from the different States? What is known about incomes of sea-farers from different countries? What is known about work-related death and injuries to sea-farers?	
General Economic	What are numbers and sizes of vessels being built, and where is the ship-building being carried out? What are the numbers and sizes of the vessels being broken up, and where is the ship-breaking being carried out? To what extent are vessels being lost at sea during last voyages to ship-breaking yards? Where are the major sources of ships' bunkers? What is known about the quality of the hydrocarbons being provided as ships' bunkers? Where are the major sources of insurance, chartering and navigation services for shipping? What levels of turnover are occurring in these fields? Throughput of major ports, both bulk and container (IAPH statistics available) in relation to international trade. Planned major port developments.	China? (Min of Environment)
Ports	Delays and congestion in ports (Information available for India) and economic impact on States served.	Kiimat, BC (Enbridge Northern Gateway), Russia: Sakhalin, Posiet, China: check Min of Transport
Cargo	Throughput of main passenger ports in relation to ferries and cruising	Port of Seattle (moved to inclusive fee structure), NRC Marine Debris Study
Passenger General	Extent to which waste and sewage reception facilities are charged separately from port dues.	
Submarine cables and pipelines	Extent to which internet and telecommunications depend on submarine cables (as opposed to satellites).	
Cables	Extent of submarine electric interconnectors between and within States.	
Pipelines	Which fleets are carrying out the laying and maintenance of submarine cables? Extent of international and national submarine pipelines for oil and gas transport (as opposed to pipelines connected to offshore hydrocarbon production facilities).	
Coastal, riverine and atmospheric inputs	Which fleets are carrying out the laying and maintenance of submarine pipelines for transport? Proportion of coastal population served by sewage treatment plants (primary, secondary and tertiary levels of treatment) (GPA reports contain information).	Korea has info (82% coverage of coastal), J Nam as contact
Municipal wastewater	Treatment arrangements for sewage discharges from ships (especially cruise ships) Levels of contamination of shell-fish from sewage.	
Land-based discharges - point sources	Levels of sewage-related disease. Location and scale of industries that have produced particular problems with hazardous substances: mining, metal refineries, coal-burning power plants, mercury-cell chlor-alkali plants, phosphogypsum processing plants, polyvinyl-chloride plants, titanium-dioxide plants, other major chemical plants.	
Land-based discharges - diffuse sources	Location and scale of industries that have produced particular problems with nutrients: breweries, distilleries. Scale of nuclear power production. Scale of use of lead in petrol. Scale of use of cadmium in plastic production	US Dept Agriculture, Korea-conversion of farmland to urban=less eutrophic, more pollutants, Russian exports to China Russia, esp Sakhalin, USA, AK (Chucki Sea, N Slope, etc)
Offshore hydrocarbon industries	Scale of production of hydrocarbons offshore, in comparison to land-based production, both in terms of quantity and in terms of gross domestic product. Where are offshore installations being constructed, and on what scale? What is the scale of employment on offshore installations, and from where is the work-force drawn? What is known about incomes of workers on offshore installations? What is known about work-related death and injuries on offshore installations?	US BOEM for general info,
Other marine-based energy industries	Where is there already significant energy production from wave, wind, ocean thermal differences and tide? How does this compare with other energy production? What are the expected economic performances of wind, wave, ocean thermal and tidal power generation?	OR wave system (see BOEM), Can wind farm off HG, Japan, both bottom of sea and floating, 1 in central Jap

Offshore mining industries	Scale and significance of sand and gravel extraction	Korea (end use conflict, issue permit for extractions), China (limited local scale extractions)
<i>Sand and gravel</i>	Economic value of marine sand and gravel extraction, as compared with land-based (including river-based) sand and gravel extraction. Levels of employment in sand and gravel extraction.	
<i>Other seabed mining</i> Solid waste disposal	Where is there other significant sea-bed mining? What is known about the economic value of such mining? Information on the relative costs of dumping solid waste at sea and other means of disposal.	
Marine debris	Information on incidents involving explosives or hazardous liquids or gases previously dumped at sea (for example, munitions brought up in fishing nets), at sea. Information on economic incentive schemes to reduce or capture marine debris (for example, paying fishermen to bring debris caught in their net back to port rather than dump it in the sea gain)	Hawaii, atoll leaching, limited info Korea has buy-back program, Japan Tsunami Marine Debris (modeling, patterns, invasive species, reporting), NOWPAP workshop Oct 2013, Pacific garbage patch, DoD landfills close to eroding shorelines in AK, Japan (land reclaimed for ports, airports, etc), Korea, Hawaii (Waikiki), China (coastal province development plans) AK (relocate coastal communities on eroding sandbars) Can (some background info from I Perry).
Land/sea physical interaction	Economic value of land reclaimed from the sea Economic and social costs of land erosion.	
Tourism and recreation	Location and scale of coastal tourism and recreation. To what extent is information available on tourism in the immediate coastal zone as compared with tourism elsewhere? Scale of employment in coastal tourism and recreation. What is known about the levels of income of those working in tourism in relation to average national wages? What is known about the turnover of the tourism industry in relation to gross domestic product? Scale of desalination. What proportion of drinking water supplies depend on desalination?	
Desalination	What is known about the cost of water supplied by desalination as compared with other forms of water supply? Where is there already significant use of marine genetic resources for any purpose? What economic value does any such use have?	
Use of marine genetic resources	How many people are currently engaged professionally on marine scientific research? What is known about the expenditure by public authorities, by commercial undertakings and by independent non-profit institutions on marine scientific research?	China (SOA), Korea (R&D Office)