Report of the Section on *Human Dimensions of Marine Systems*

The Section on *Human Dimensions of Marine Systems* (S-HD) held its third meeting on October 19, 2014, from 18:00–19:30 h and October 22, from 14:00–18:00 h in Yeosu, Korea. Drs. Mitsutaku Makino and Keith Criddle chaired the meeting. Eleven members represented all PICES member countries except China (*S-HD Endnote 1*). The meeting agenda was adopted with some minor changes (*S-HD Endnote 2*), as captured in Dr. Makino's presentation. Very active discussions took place during the meetings.

AGENDA ITEM 2
Overview of Activities for S-HD

Dr. Criddle presented an overview/review of the activities for the Section, particularly for the benefit of the new members to S-HD. This report was based on the presentation that was given earlier in the day to FUTURE.

S-HD progress to date
- PICES-2012 — MEQ/FUTURE Topic Session (S5) on "*Social-ecological systems on walleye pollock and other commercial gadids under changing environment: Inter-disciplinary approach*" (S-HD Co-Convenors: Keith Criddle, Mitsutaku Makino, Ian Perry); 16 papers published in *Fisheries Science* (2014), vol 80(2): 103–236.
- S-HD–World Ocean Assessment Inter-sessional Workshop, June 2013:
  - Identified Tier 1, Tier 2, and Tier 3 indicator TSOs to be used to characterize the status and trends of HD of the North Pacific marine ecosystem for inclusion in the North Pacific Ecosystem Status Report,
  - HD TSOs were received from China, Japan, Russia, and USA.
- PICES-2013 — BIO/FIS Topic Session (S5) on "*Marine ecosystem services and the contribution from marine ecosystems to the economy and human well-being*" (S-HD Co-Convenors: K. Criddle, E. Golovashchenko, M. Makino, M. Pan, I. Perry);
- 2014 FUTURE OSM — Theme Session (S8) on "*Human dimension indicators of the status of the North Pacific ecosystem*" (Co-Convenors: K. Criddle, M. Makino);
- 2014 IMBER OSM — Report on social and economic indicators for status and change within North Pacific ecosystems. (K. Criddle, M. Makino);
- PICES-2014 — MarWeB Topic Session on "*Ecological and human social analyses and issues relating to Integrated Multi-Trophic Aquaculture*" (S-HD Co-Convenors: M. Hirota, M. Makino, G. Murray, N. Park);
- MarWeB (PICES-MAFF) draws on the expertise of S-HD and has yielded analytical methodologies and results, *e.g.*, the Well-Being Cube Analysis that contributes to S-HD TOR-1;
- Contributions to PICES Press:
  - Makino M., Criddle K. 2013. Why do we need human dimensions for the FUTURE program? Vol. 21(1),
  - Criddle K, Makino M. 2013. Social and economic indicators for status and change within North Pacific ecosystems. Vol. 21(2),
  - Felthoven R, Kasperski S. 2013. Socioeconomic indicators for United States fisheries and fishing communities. Vol. 21(2),
  - Murray G, D'Anna L, MacDonald P, Patterson M. 2014. Navigating change: well-being, values and the management of marine social-ecological systems. Vol. 22(1),
  - Kurilova E. 2014. Human dimensions in the Russian Federation – Effectiveness of ecosystem governance related to fishing. Vol. 22(2).

S-HD talked about the need to gather contributions for the chapter on the legal/regulatory frameworks for PICES member countries. Contributions have been received from Russia and USA; China has provided reference material. Dr. Criddle will provide template to S-HD for contributions from Canada, Japan, and Korea and for refinement of contribution from China. Contributions will be assembled and a provisional draft will be shared with S-HD members for input and refinement. The goal will be to produce a PICES Scientific Report or journal article co-authored by S-HD members.

Tier 1 indicators were discussed and members were reminded of need to gather and compile time series observations (TSOs) for the next NPESR. There is a significant amount of work involved with this and S-HD members discussed the need to identify and adopt an appropriate strategy to finish assembling this database. The indicators are:

Tier 1 Indicators
1. Quantity and value of catches and landings of seaweeds, fish, shellfish, and other invertebrates from inside and outside national EEZs;
2. Quantity and value of mariculture of seaweeds, fish, shellfish, and other invertebrates;
3. Number and power of fishing vessels by gear type, length, and tonnage;
4. CPUE by gear type and target fishery;
5. Employment in commercial fishing;
6. Injury and mortality rates of commercial fishers (absolute and relative to national workforce averages);
7. Income to fishermen (absolute and relative to national workforce averages);
8. Number of fishing ports;
9. Number of fish processing plants;
10. Number of fishing villages or communities;
11. Number of fishing households;
12. Per capita consumption of seaweeds, fish, shellfish, and other invertebrates; and
13. Amount and value of seafood (seaweeds, fish, shellfish, and other invertebrates) exports and imports.

Rashid Sumaila (Fisheries Centre, University of British Columbia), has offered to query his database on global fisheries to derive North Pacific estimates of time series of:
14. Number of sport fishers and the quantity of their catches;
15. Fishing costs as a % of revenues;
16. Fishing subsidies;
17. Fishing effort by gear type; and
18. Value added multipliers for fishing and processing.

Derived Indicators
19. Exvessel price (by major product category);
20. Net revenues from fishing;
21. Value added (by major product category).

Tier 2 Indicators
1. Employment in fish processing (numbers; full/part time);
2. Processed fish products (amounts by major category);
3. First wholesale value (value of processed products sold);
4. Health/contamination monitoring (relative to production);
5. Seafood price to consumers (% of food expenditures);
6. Seafood inventories (amount and value);
7. Subsistence/home-use fishing (number of fishers, catch).

Tier 3 Indicators
1. Fishing companies (number);
2. Commercial fishers (characteristics);
3. Wholesale markets (number);
4. Law and regulatory structure;
5. International agreements;
6. Value of ecosystem services:
    a. Environmental acct/natural capital,
    b. Nonmarket values,
    c. Replacement cost/NRDA.
7. Eco-certification/market access.

Examples of the indicator TSOs have been received from China and USA; meta-analysis tables/links have been provided by Japan and Russia.

S-HD submitted a report to Science Board as a requirement for a Section to be reviewed every 3 years (Rules of Procedure 13(iii)(d)); (see *S-HD Endnote 3*).

AGENDA ITEM 3
Summary of FUTURE OSM

Drs. Criddle, Minling Pan and Makino summarized some of the key activities that occurred at the FUTURE OSM in Hawai'i (April 15–18, 2014).

Plenary, Invited, and Selected Speakers
- Jake Rice — *Adaptation to climate change requires resilience in governance as well as ecosystems*;
- Ron Felthoven, Amber Himes, and Stephen Kasperski — F*ishing community resilience and vulnerability to changing ecosystems*;
- Kristy Wallmo and Rosemary Kosaka — *Marine protected area designations off the U.S. west coast: Mixed-use designs to optimize public economic value*;
- Minling Pan — *The linkages between the economic performance indicators and ecosystem status indicators*;
- Patrick Christie, Richard Pollnac, Kristin Hoelting, and Beth Moore — *Human dimensions research to improve science networks and marine resource management effectiveness*;
- Keith R. Criddle and Mitsutaku Makino — *Preliminary analysis of trends in time series observations of human dimension indicator data for the North Pacific ecosystem*;
- Masahito Hirota — *A review of the human dimension indicators in the NPESR of Japan*;
- Keith R. Criddle — *Similarities and differences in fisheries regulatory frameworks across the PICES region*.

During the S-HD meeting at the FUTURE OSM, it was agreed to expand indicators to include other (than fishing) human uses of the North Pacific ecosystem (*e.g.*, shipping, oil/gas, minerals, marine debris, kinetic energy and indicators of management efficacy. It was also agreed that the Section should explore the possibility of engaging with international organizations (*e.g.*, FAO, Development Networks) for help in developing/maintaining TSOs of indicator data

AGENDA ITEMS 4 AND 5
Work Plan through 2020 and formation of Sub-teams

Dr. Makino reviewed the TOR for S-HD.

Objective of S-HD
To better understand and communicate the societal implications of the conditions and future trends of North Pacific marine ecosystems, to provide a forum for the integration of FUTURE-related studies using social science approaches and tools, and to facilitate discussions and communications among researchers from the natural and social sciences.

Terms of Reference
1a: SCIENTIFIC clarification of *differences in societal objectives and needs* among stakeholders in different sectors and countries.
1b: Development of an *inventory of potential recipients*, and their communication requirements for FUTURE and other PICES products.
2: Based on the tools in Table 3.1 of SG-HD Report, SCIENTIFIC exploration of the *consequences to and responses of human social systems* to global changes such as CC.
3: *HD Chapter* of NPESR.

4: Joint *symposium on HD of Marine Systems* with other international research programs such as IMBER, ICES, LOICZ, *etc*.

Proposed Work Plan for 2014–2020, and formation of 4 Sub-teams
TOR-1a: Differences in societal objectives and needs. **Sub-team WB** (lead: Juri Hori, Grant Murray, EunJung Kang)
▪ Ms. Hori's Cube study is progressing well; expected completion: ~2017.
▪ Dr. Murray's initiative on a social science study such as a comparative study, literature review, *etc*., of 6 MCs is highly welcomed.
▪ Results of the above studies might be published as a PICES Scientific Report on WB or as academic journal articles: ~2018.
TOR-1b: Inventory of recipients and their communication needs for PICES products (2018–2019)
▪ **Sub-team Communications** (lead: Ekaterina Kurilova, Ron Felthoven)
  Ms. Hori's and Dr. Murray's results + SG-COM results + review; close coordination with AP-SOFE is required.

TOR-3: HD Chapter of NPESR and contribution to synthesis chapter (lead: Keith Criddle and Mitsutaku Makino)
▪ **Sub-team NPESR—HD Indicator Studies**: Keith Criddle, Emanuele Di Lorenzo, Ian Perry, others? Discussions will be about their differences, time-series changes, and relationships with ecosystem indicators. The utility of the Ocean Health Index database needs to be explored. Target date for compilation of these TSOs: December 2014.
▪ **Sub-team NPESR—Legal/Regulatory Frameworks**: Keith Criddle, Mitsutaku Makino, others?
  Target date for compilation of these data: December 2014.

TOR-4: Joint International symposium (1½–2 days in 2016 or 2017) as a standalone symposium with or without international collaborators or as a set of sessions in conjunction with a symposium organized by another international organization. This is an opportunity to interface with the larger academic community and to collect studies and knowledge pertinent to our activities relating to TOR-3.
Possible sessions:
▪ Climate change and its impact on ecosystem services,
▪ Changes in social and ecological indicators and their inter-relationships,
▪ Stakeholders and their Well-Being,
▪ Resilience in various scales: fishery, community, national, and international.

TOR-2: Consequences/responses of HD to global changes such as climate change (2015–2019). This is the core part of S-HD work, and will be the main content of the S-HD final Report. **Sub-team Economics** (lead: Minling Pan)
▪ **Economic Valuation of Ecosystem Services**: Sheng Chen, Masahito Hirota, Minling Pan, Xu Wei, Osamu Tamaru, Ron Felthoven, Rashid Sumaila?, others?
  Sunny's study on ecosystem services + Minling's study on relationships btw HD indicators and ecosystem indicators (proposal of a new SG?);
▪ S-HD should make a template of its information needs and distribute it to the FUTURE APs (AICE, COVE, SOFE).

AGENDA ITEM 6
Progress reports

Study Group on *Socio-Ecological-Environmental Systems* (SG-SEES) (Chairman: Emanuele Di Lorenzo)

SG-SEES was successful in producing a modeling framework and process for the development of a SEES model. Developing the framework was a learning exercise and helped promote a transdisciplinary dialog. The SG will request a 1-year extension to plan and organize a 2- to 3-day workshop on "*Towards a transdisciplinary approach in coastal SEES*". The goal of the workshop will be to bring together a set of

invited scientists from the climate, marine ecosystem and social sciences, including PICES/ICES scientists and other members of the science community to engage/practice a transdisciplinary dialog on a selected coastal SEES issue. The format of the exchange would be different from a typical workshop in that every invited person would be asked to talk about the same subject and would have to articulate a discussion of all three dimensions (*e.g.*, climate, marine ecosystem and social systems). While this approach constitutes a challenge for participants, it would set the stage for a true transdisciplinary brainstorming discussion on a coastal issue (TBD). This workshop may be able to provide a white paper outlining the roadmap for establishing an international PICES/SCOR working group on SEES modeling.

S-HD supports the SG-SEES request for a 1-year extension.

Well-being Cube (Juri Hori)

Excellent progress is being made on the structure of the well-being cube and how each cube pieces is related to the well-being in four countries (Japan, Korea, USA, and Indonesia).

IMBER collaboration (Ian Perry)

S-HD members were encouraged to contribute case studies to the IMBER ADApT project. The ADApT project has begun development of a decision support tool for the response of social-ecological systems to shocks and persistent forcing.

AGENDA ITEM 7
Study Group proposals

Study Group on *Ecosystem Reference Points as a Common Currency across PICES Socio-Ecological Systems*

This proposal is an extension of the Working Group on Development of Ecosystem Indicators to Characterize Ecosystem Responses to Multiple Stressors (WG 28). If WG 28 is extended an additional year, formation of this SG may be postponed to avoid overtasking WG 28 members. S-HD is interested in participating in this SG if it is approved. S-HD members interested in participating include Wei Xu (China), Ian Perry (Canada), Keith Criddle (USA), and Emanuele Di Lorenzo (USA). The activities of the SG would seem to fit well under FUTURE.

S-HD supports formation of this new SG but advises that the title should be changed to "Ecosystem reference points as a common currency across PICES social-ecological systems".

Study Group on the *North Pacific Ecosystem Status Report*

The S-HD supports development of a SG to oversee planning and development of the NPESR.

AGENDA ITEM 8
Topic Session proposals for PICES-2015

1. 1-day Topic Session on "*Marine ecosystem services and economics of marine living resources*" (proposed by Shang Chen; *S-HD Endnote 4a*)

   S-HD strongly supports this session proposal. This topic session will help us accomplish our terms of reference and will provide a valuable contribution to PICES understanding of the human dimensions of marine ecosystem services.

2. ½-day Topic Session on "*Experiences and lessons learned in managing shared/transboundary stock fisheries*" (proposed by Minling Pan; *S-HD Endnote 4b*)

This is also timely proposal. Previous work by PICES on transboundary resources has focused on biological and ecological issues. This topic session would build on that work to look at the social and economic aspects of transboundary stocks. If this proposal is not accepted for PICES 2015, we request that it be considered for PICES 2016.

3. ½-day Topic Session on "*The human dimension of harmful algal blooms*" (proposed by Mark Wells, Mitsutaku Makino; *S-HD Endnote 4c*)

    S-HD supports this half-day topic session for PICES 2015. We recommend that a portion of the allotted time be set aside for moderated discussion.

AGENDA ITEM 9
Work plan of each Sub-Team, including Topic Session proposals for 2016

Based on the decisions on the Day-1 meeting (Oct. 19) , the draft plan on 4 Sub-teams (Well-being, NPESR, Economics, and Community) were presented. Based on this plan, the members will consider the interaction among sub-teams, *i.e*., how the products from his/her team will contribute to other teams, and *vice versa*. Also, they will prepare the information needs to other PICES expert groups in natural sciences (what kind of natural science information does each sub-team need?). The results will be presented and discussed at the next PICES Annual Meeting in Qingdao, China.

AGENDA ITEM 10
International Symposium on Human Dimensions

S-HD members concluded that the ICES Symposium on "*Understanding marine socio-ecological systems: including the human dimensions in Integrated Ecosystem Assessments*" in Spring 2016 is a good opportunity to collect information on HD research and make connections with other HD researchers to foster understanding of our activities and to learn more about related activities being organized under ICES. However, all members agreed that it is premature for this symposium to serve as the primary symposium on PICES' S-HD activities. Instead, the results of our activities should be presented during a standalone symposium to be organized closer to the end of our Section's lifespan (around 2018–2019).

Therefore, S-HD will contribute one or two co-sponsored sessions to the ICES Symposium, if possible, and not be more heavily involved in the planning processes of the ICES Symposium. S-HD will organize its own standalone symposium later.

AGENDA ITEM 11
Concluding remarks

The Co-Chairs highly appreciated the active contributions and discussions by all the members of S-HD.

S-HD Endnote 1

S-HD meeting participants

Members   Observers

Keith Criddle (USA, Co-Chair)   Xu Wei (China)
Emanuele Di Lorenzo (USA)   Meryl Williams (Malaysia)
Masahito Hirota (Japan)
Juri Hori (Japan)
EunJung Kang (Korea)
Ekaterina Kurilova (Russia)
Mitsutaku Makino (Japan, Co-Chair)
Minling Pan (USA)
Naesun Park (Korea)
Ian Perry (Canada)
Osamu Tamaru (Japan)

S-HD Endnote 2

S-HD meeting agenda

1. Adoption of the agenda
2. Overview of activities for S-HD
3. Summary of FUTURE OSM
4. Discussion of the Work Plan through 2020
5. Formation of Sub-teams
6. Progress reports
7. Discussion of Study Group proposals
8. Discussion of Topic Session proposals for PICES 2015
9. Discussions on the work plan of each Sub-Team, including Topic Session proposals for 2016.
10. Discussions on the Joint Int'l Symposium on HD (timing, structure, speakers, *etc.*)
11. Concluding remarks (Co-Chairs)

S-HD Endnote 3

Report of the *Section on Human Dimensions of Marine Systems* (S-HD) for 2011–2014

The Section on *Human Dimensions of Marine Systems* (S-HD) was created in October of 2011 at the PICES Annual Meeting in Khabarovsk, Russia, based on the preceding activities by Study Group on *Human Dimensions* (SG-HD) whose lifespan was 2009–2011. The objective of S-HD 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. The S-HD has no parent committees, but reports directly Science Board. Drs. Mitsutaku Makino (Japan) and Keith Criddle (USA) have chaired the Section since its establishment.

Membership
Twenty-four members from all the 6 PICES member countries (MCs) are participating to S-HD activities. Its composition is 3 from Canada, 6 from China, 3 from Japan, 3 from Korea, 5 from Russia, and 4 from USA (Annex 1).

S-HD main activities in the past 3 years

Section Meetings and Workshops: S-HD has held its meeting at every PICES Annual Meeting since its establishment, and also organized an inter-sessional workshop in June 2013 to select HD indicators for inclusion in the North Pacific Ecosystem Status Report (NPESR). In this inter-sessional workshop, S-HD identified Tier 1, Tier 2, and Tier 3 indicators to be used to characterize the status and trends of human dimensions of the North Pacific marine ecosystem (HD TSOs (time series observations)). As of October 2014, HD TSOs were received from China, Japan, Russia, and USA.

Topic Sessions

S-HD organized or co-sponsored Topic Sessions at every PICES Annual Meeting since its establishment. A Topic Session at PICES-2012 was on walleye pollock under global change. Contributed papers from that session were published in a special issue of a peer reviewed academic journal, *Fisheries Science* Vol. 80. A Topic Session at PICES-2013 was on marine ecosystem services and the contribution from marine ecosystems to the economy and human well-being. The Topic Session at PICES 2014 is on Integrated Multi-trophic Aquaculture, which is planned in collaboration with the PICES-MAFF Marine Ecosystem Health and Human Well-Being (MarWeB) project. At the FUTURE Open Science Meeting (April 15–18, 2014), S-HD organized a Theme Session on "*Human dimension indicators of the status of the North Pacific ecosystem*". A part of the main results from these activities were summarized and shared with two other international research programs. For example, Prof. Keith Criddle (Co-Chair of S-HD) made a presentation at the IMBER Open Science Conference in June 2014 in Bergen, Norway, on "Trends in time series observations of human dimension indicator data for the North Pacific ecosystem".

Support for the PICES-MAFF project on Marine Ecosystem Health and Human Well-Being:

The MarWeB project, which is funded by the Ministry of Agriculture Forestry and Fisheries (MAFF) of Japan, is scientifically supported by many members of S-HD. The analytical methodologies and results developed by the MarWeB project have been fed into S-HD activities. Amongst others, the Well-Being Cube Analysis has been applied to three PICES member countries: Japan, Korea, and USA in order to fulfill S-HD TOR-1 (Annex 2).

Contributions to PICES Press

In order to facilitate close discussions and communications among researchers from both the natural and social sciences (see objective above), the S-HD members have contributed the following 5 articles to the PICES Press, and two more articles are now being drafted;
- Why do we need human dimensions for the FUTURE program? Vol. 21, No. 1, Winter 2013 (by Mitsutaku Makino and Keith Criddle);
- Social and economic indicators for status and change within North Pacific ecosystems. Vol. 21, No. 2, Summer 2013 (by Keith Criddle and Mitsutaku Makino);
- Socioeconomic indicators for United States fisheries and fishing communities. Vol. 21, No. 2, Summer 2013 (by Ronald Felthoven and Stephen Kasperski);
- Navigating Change: Well-being, Values and the Management of Marine Social-Ecological Systems. Vol. 22, No. 1, Winter 2014 (by Grant Murray, Linda D'Anna, Patricia MacDonald and Michele Patterson);
- Human dimensions in the Russian Federation – Effectiveness of ecosystem governance related to fishing. Vol. 22, No. 2, Summer 2014 (by Ekaterina Kurilova).

Other academic activities

As the institutional base for the human dimensions of the member countries, S-HD is gathering information on the legal and regulatory foundations of fisheries management in PICES member countries. So far, summaries have been received from China, Russia, and USA. The results will be discussed by the S-HD members and will be submitted to an international peer reviewed journal (*e.g.*, *Marine Policy*).

Future plans

The plan for the rest of S-HD's lifespan, until 2020, is summarized according to the following five main elements in its TORs (see Figure 1 for the year plan, and Annex 2 for the S-HD TORs).

TOR 1a: SCIENTIFIC clarification of differences in societal objectives and needs among stakeholders in different sectors and countries

S-HD has accumulated knowledge on human well-being (WB) and the analytical method to quantitatively compare the differences of WBs in various countries and sectors, as mentioned above. Based on these, S-HD will organize a sub-team of WB researchers (Sub-Team WB) which will conduct intensive discussions on this theme. For example, WB Cube Analysis (mentioned above) will be applied to all the six PICES member countries. A social science study on WB, such as a comparative study, literature review, *etc.*, of the six member countries is also anticipated. The results of above studies might be published as PICES Scientific Report on WB or in an academic journal.

TOR-1b: Development of an inventory of potential recipients, and their communication requirements for FUTURE and other PICES products

Based on the results of TOR1a and the Study Group on *PICES Communication* (SG-COM: 2007–2009), and in close coordination with AP-SOFE, the inventory of potential recipients, and their communication requirements will be developed around the last 2 years of S-HD's lifespan. A specialist in communication (Ms. Ekaterina Kurilova of Russia) is participating in S-HD activities, and will take the lead. A sub-team could be organized.

TOR-2: Based on the tools in Table 3.1 of SG-HD's PICES Scientific Report, SCIENTIFIC exploration of the consequences to, and responses of, human social systems to global changes such as climate change

This is the core part of S-HD work, and will be the main content of the S-HD Final Report to be published in 2020. As the first step on this activity, S-HD will make a template of its information needs and distribute it to the FUTURE APs (AICE, COVE, SOFE). Based on the results provided by the APs, S-HD will discuss the relationships between the global changes and HD, and consequences to, and responses of, human social systems. In order to facilitate such activities, S-HD will organize two sub-teams as follows.

Until now, S-HD members have accumulated information and analytical tools on the economic valuation of ecosystem services (for example, Dr. Shang Chen of China). Also, HD indicators were collected at the S-HD–World Ocean Assessment Inter-sessional Workshop in June 2013, and their relationships between ecosystem indicators have been discussed (for example, Dr. Minling Pan of USA). These activities will be further developed and facilitated by organizing a sub-team on this theme (Sub-Team Economics). The community responses and resilience to ecosystem changes are another important part of the TOR-2. NOAA's expertise on community analysis will be a good basis for discussion on this theme by a Sub-Team Community.

TOR-3: HD Chapter of NPESR

The Sub-Team NPESR will be organized and will facilitate the collection of HD Indicators and the legal/regulatory information from the 6 PICES member countries. The discussion part of the HD Chapter of the next NPESR will be about the time-series changes, relationships with ecosystem indicators, and their differences amongst the PICES member countries.

TOR-4: Joint symposium on HD with other international research programs such as IMBER, ICES, LOICZ

This is a good opportunity to collect studies and wide range of knowledge relating to S-HD activities. A draft session structure would be as follows;
Session 1: Climate changes and its effects to the ecosystem services
Session 2: Changes in social and ecological indicators and their inter-relationships
Session 3: Stakeholders and their Well-Being
Session 4: Resilience in various scales: community, national, and international

A detailed plan for an international symposium, including its timing and counterpart, will be discussed at PICES-2014.
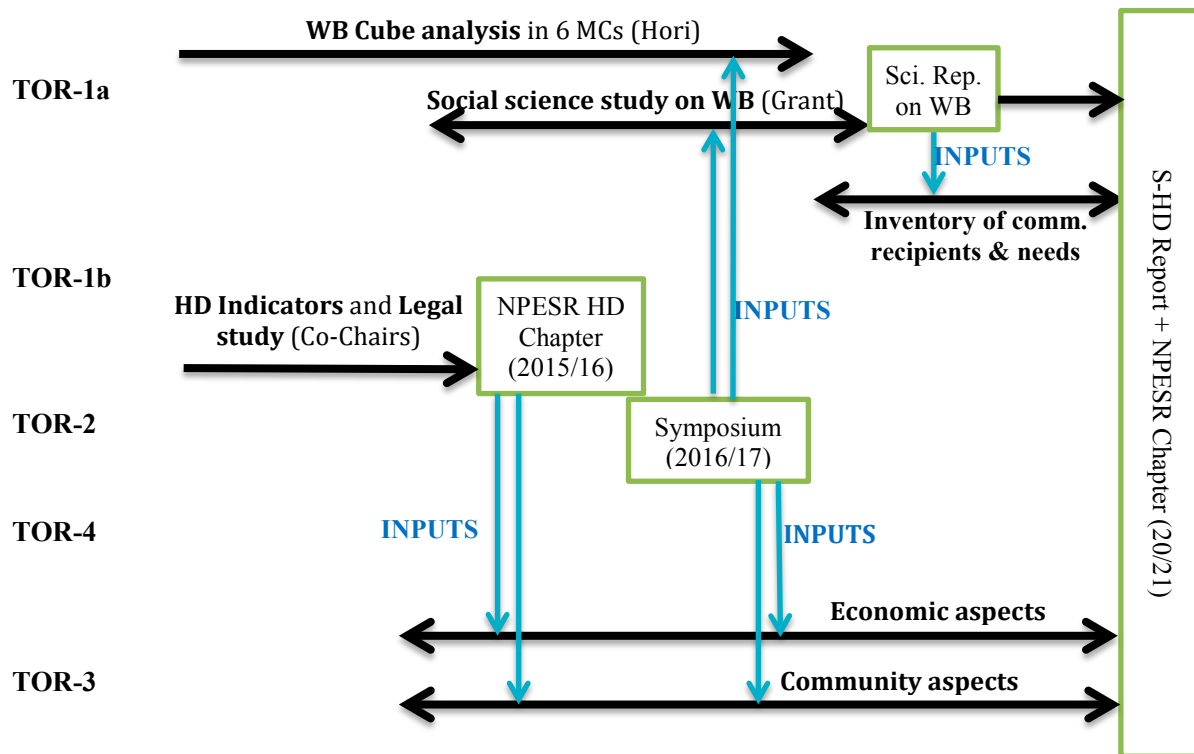
Figure 1. Timetable of S-HD activities until 2020.

Annex 1: S-HD members (as of October 2014)
Grant Murray (Canada), Ian Perry (Canada), Robert Stephenson (Canada), Shang Chen (China), Feiyan Du (China), Yangguang Gu (China), Yue Hao (China), Ningsheng Yang (China), Shouying Zeng (China), Masahito Hirota (Japan), Juri Hori (Japan), Mitsutaku Makino (Japan), Dohoon Kim (Korea), Jungho Nam (Korea), Naesun Park (Korea), Elena N. Anferova (Russia), Ekaterina V. Golovashchenko (Russia), Ekaterina Kurilova (Russia), Olga N. Lukyanova (Russia), Tatiana Semenova (Russia), Keith Criddle (USA), Emanuele Di Lorenzo (USA), Ron Felthoven (USA), Minling Pan (USA).

Annex 2: S-HD Terms of Reference
1. Clarify differences in societal objectives and needs among stakeholders in different sectors and countries.
2. Explore the consequences to and responses of human social systems to factors such as climate-induced changes in marine ecosystems.
3. Contribute a Human Dimension Chapter to the NPESR.
4. Facilitate cooperative research activities and organize a symposium on human dimensions of marine ecosystems and organize a symposium on the human dimensions of marine ecosystems.

S-HD Endnote 4a

**Proposal for a 1-day Topic Session on
"*Marine ecosystem services and economics of marine living resources*" at PICES-2015**

Convenors: Shang Chen (China), Minling Pan (USA), Ian Perry (Canada), Keith Criddle (USA), Mitsutaku Makino (Japan)

Marine ecosystem services (MES) are benefits people obtain from the seas and oceans. Marine ecosystems provide ecological products and services, such as seafood, regulation of climate, reduction of storm disasters, waste purification, recreation and leisure, and biodiversity maintenance. Assessing the value of MES has become an emerging and somewhat challenging subject in the scientific world and is receiving increasing attention from politicians. The United Nations' Millennium Ecosystem Assessment reports published in 2005 focused on discovering changes in global ecosystem status and services. The ongoing World Ocean Assessment program has an urgent need for knowledge on MES. The United Nations Environmental Program formed the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES) in 2012. The IPBES aims to develop and use knowledge on ecosystem services and biodiversity to improve national, regional, and global ecosystem management. The goals of this session are: (1) to provide marine scientists, economists, and ecologists with a venue to exchange results from research on MES, on the economics of marine ecological resources, and on the contribution of the marine environment to the marine and coastal economy, and (2) to provide scientists around the North Pacific a chance to discuss collaboration on scientific projects.

S-HD Endnote 4b

**Proposal for a ½-day Topic Session on
"*Experiences and lessons learned in managing shared/transboundary stock fisheries*" at PICES-2015**

Convenors: Minling Pan (USA), Shang Chen (China), Keith Criddle (USA), Mitsutaku Makino (Japan)

The fisheries management for a shared/transboundary stock—a stock that straddles jurisdictional boundaries—is a complex balancing act that will become even more challenging as the distribution of stocks shift in response to climate change. Some of these stocks may only involve users with different interests within a single jurisdiction, other stocks may involve users from different jurisdictions within a nation, or users from multiple nations. Achieving conservation objectives for shared/transboundary stocks will require adoption of management regimes that consider biological, economic, and social criteria and elicit effective cooperation among groups. The objective of this session is to gather empirical studies involved with shared/transboundary stock management and discuss the experiences, challenges, lessons learned, and decision making processes that lead to successful management.

S-HD Endnote 4c

**Proposal for a ½-day joint S-HD/S-HAB Topic Session on
"*The human dimensions of harmful algal blooms*" at PICES-2015**

Co-Convenors: Mark Wells (USA) and Mitsutaku Makino (Japan)

Harmful algal blooms (HABs) comprise a spectrum of ecological, economic, and human health impacts. High biomass phytoplankton blooms in coastal and shelf waters, most often stemming from anthropogenic inputs of macronutrients, can massively shift ecosystem structure away from the support of higher trophic levels, lead to hypoxia and associated ecological impacts in deep waters, and thereby dramatically affect the human dimension. Smaller biomass blooms of toxic cells can selectively impair ecosystem components, decimate aquaculture industry success, or substantially impact human health. In some instances there are clear effects from direct human activity on HAB development; in others the oceanographic conditions regulate the success

of harmful species. Despite the obvious relationship between HABs and human wellness, there has been little formalized linkage between ecological and human wellness research. This topic session is aimed at initiating this linkage by stimulating the cross-thinking needed to better assess human-HAB interactions. Presentations are invited on the distributions and character of HAB events, particularly for PICES member countries and their national interests, and the potential social-economic consequences of these societally-defined (harmful) algal bloom events. This session will provide the foundation for more coordinated efforts between the HAB and Human Dimension Sections to generate inputs useful to Ecosystem Based Management activities, and to guide goals for the FUTURE program.