PICES-2025

North Pacific Marine Science Organization

Innovative Approaches and Applications to Foster Resilience in North Pacific Ecosystems

PICES

8 – 14 November 2025 | Yokohama, Japan

Town Hall Event – Progress on PICES Evolution

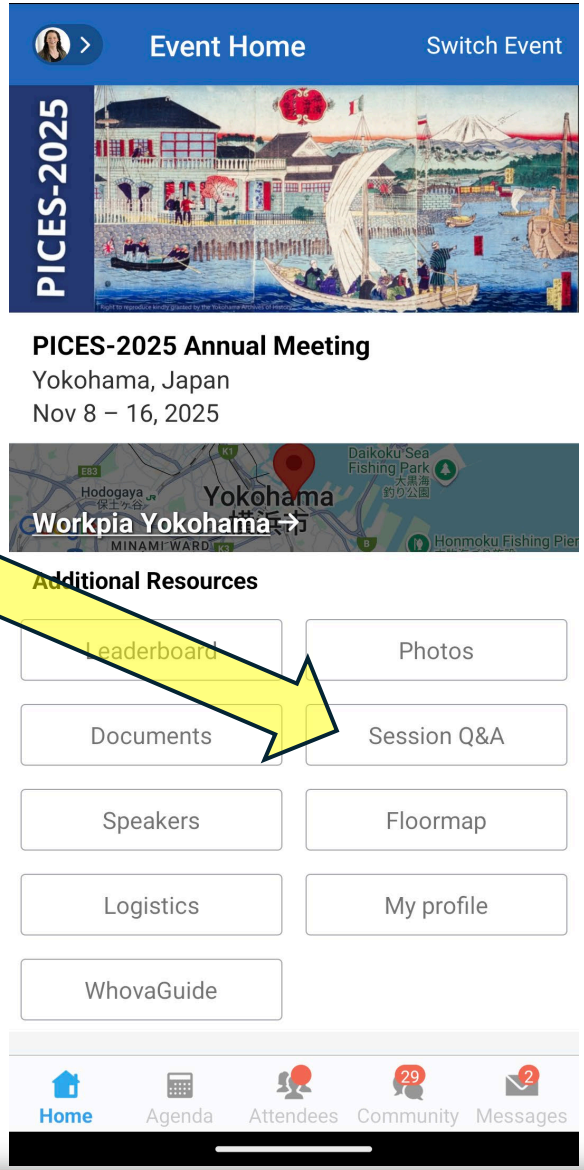
The Panel:

- **Andrew Thomson**
- **Sukyung Kang**
- **Cisco Werner**

Q&A moderated by Tetsuo Fujii, PICES Chair

If we don't get to your question today, or if you want to make a comment, please use the Whova App (next slide). You can add your thoughts any time this week, they will help guide discussions on next steps.

Town Hall Event – Questions? Comments?



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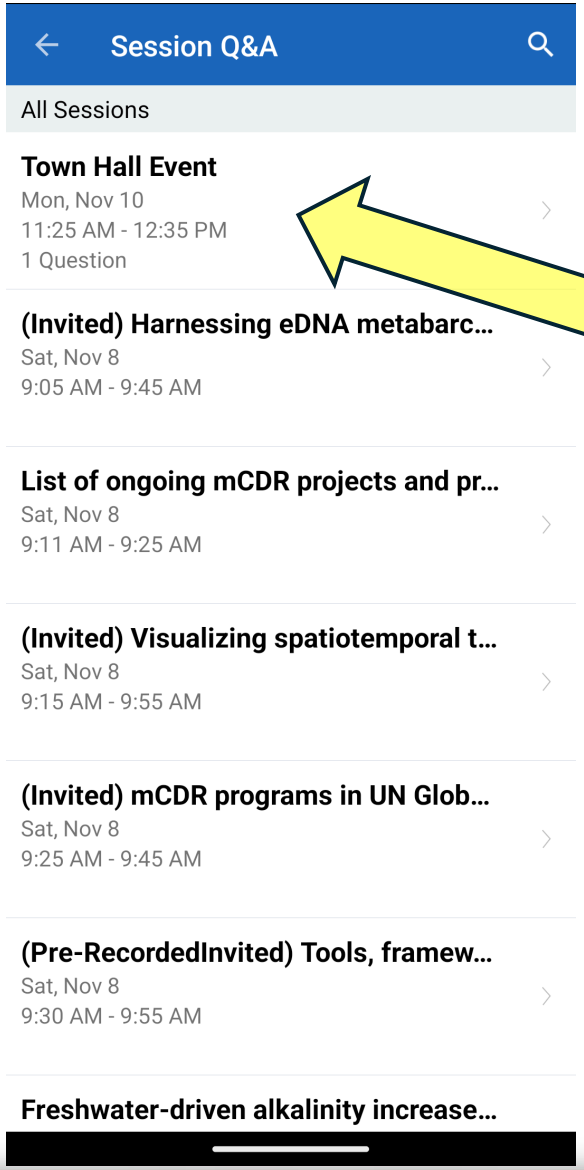

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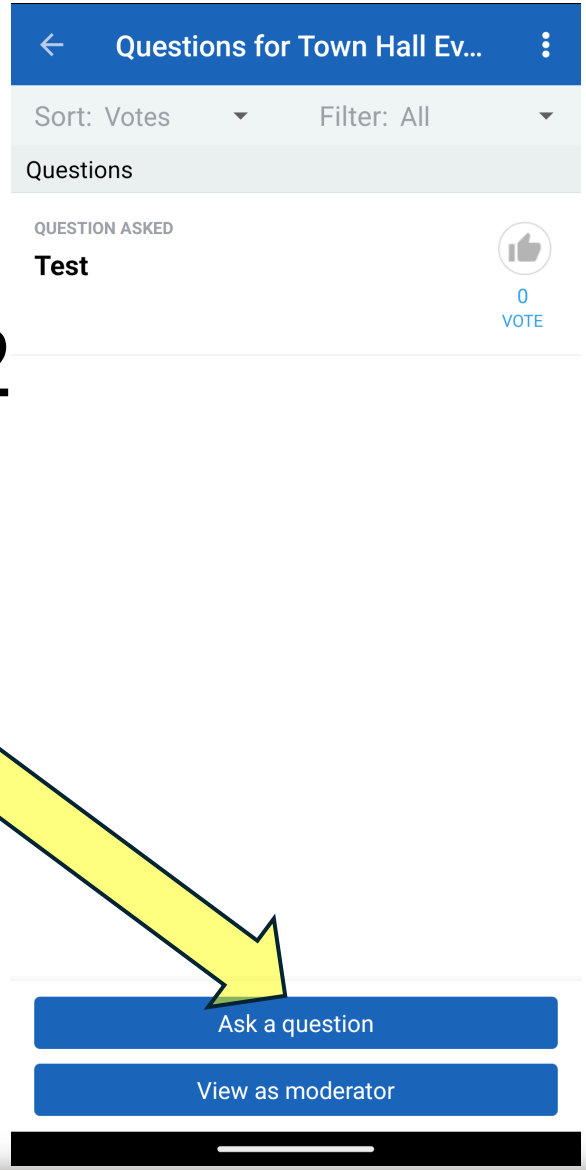

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PICES - 2025

PICES External Review: History and Timeline

Andrew Thomson

PICES Vice-Chair

PICES External Review: History and Timeline

The impetus:

- **PICES turned 30 in March 2022**
- **Similar organizations (RFMOs, ICES) have had periodic reviews**
- **GC concluded it was timely and initiated the process to inform future directions for PICES**

Review agreed & ToR drafted

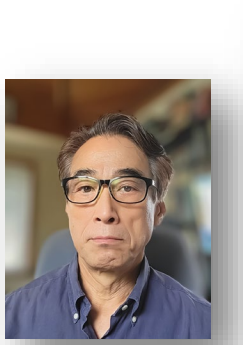
PICES External Review: History and Timeline

Review agreed &
ToR drafted

2022

2023-2024

**Review Panelists invited,
Panel formed,
attended PICES-2023,
visited Secretariat,
many interviews.**





The Panel members were chosen for their international science experience:

Eileen Hofmann (ODU, SOOS) Chair
David Checkley (SIO, OceanObs)
Fangli Qiao (UNDOS, PICES)
Jörn Schmidt (WorldFish, ICES)
Sinjae Yoo (SCOR, PICES)

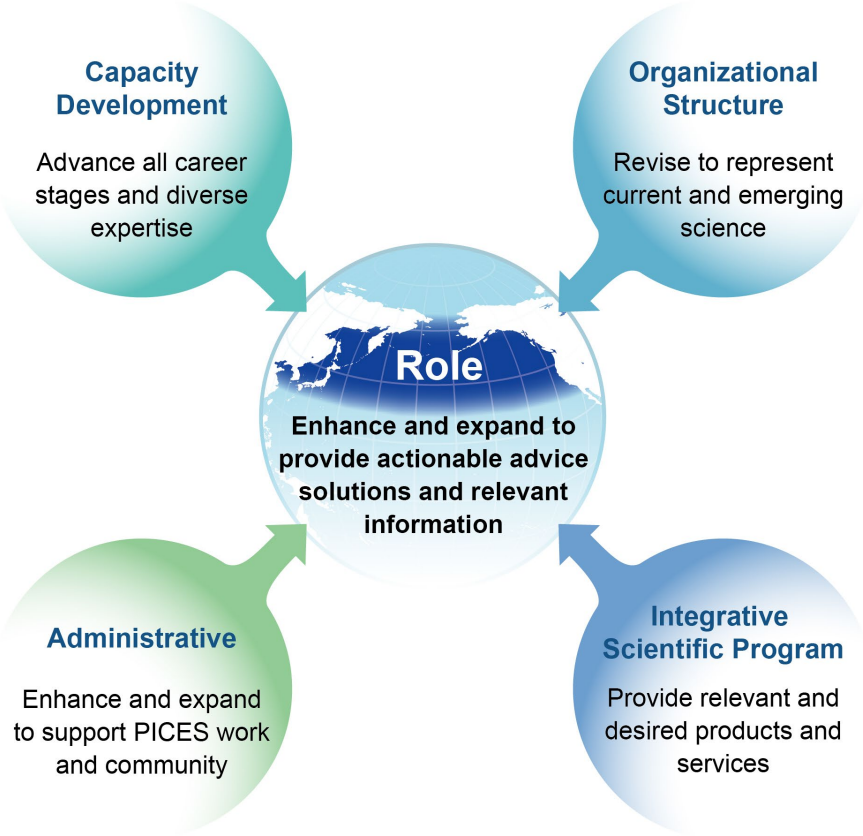
PICES External Review: History and Timeline

Review agreed & ToR drafted

Report & recommendations presented

2022 | 2023-2024 | Late 2024

Review Panelists invited, Panel formed, attended PICES-2023, visited Secretariat, many interviews.



PICES External Review: History and Timeline

Review agreed & ToR drafted

Report & recommendations presented

2022 | 2023-2024 | Late 2024 | 2024-2025 | 2026-?

Review Panelists invited, Panel formed, attended PICES-2023, visited Secretariat, many interviews.

Panel at PICES-2024, solicited comments from community & partners, SG-ERRR created

PICES External Review: History and Timeline

Now we are here....

PICES-2025 Town hall

Review agreed & ToR drafted

Report & recommendations presented

Implementation.....

2022 | 2023-2024 | Late 2024 | 2024-2025 | 2026-?

Review Panellists invited, Panel formed, attended PICES-2023, visited Secretariat, many interviews.

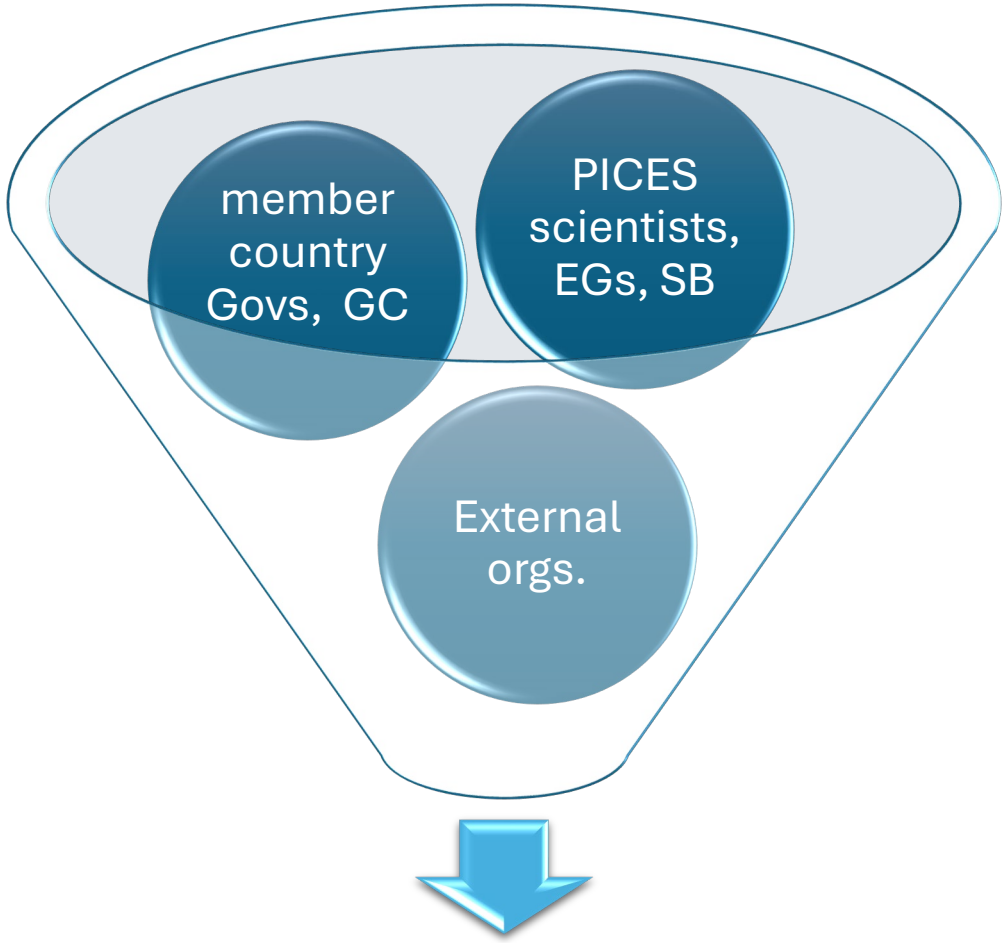
Panel at PICES-2024, solicited comments from community & partners, SG-ERRR created

SG-ERRR: Activities and progress

- The Study Group is a sub-set of Governing Council members.
- It has met online through 2025 to work on PICES response to the recommendations and implementation. SB members participated in last meeting.

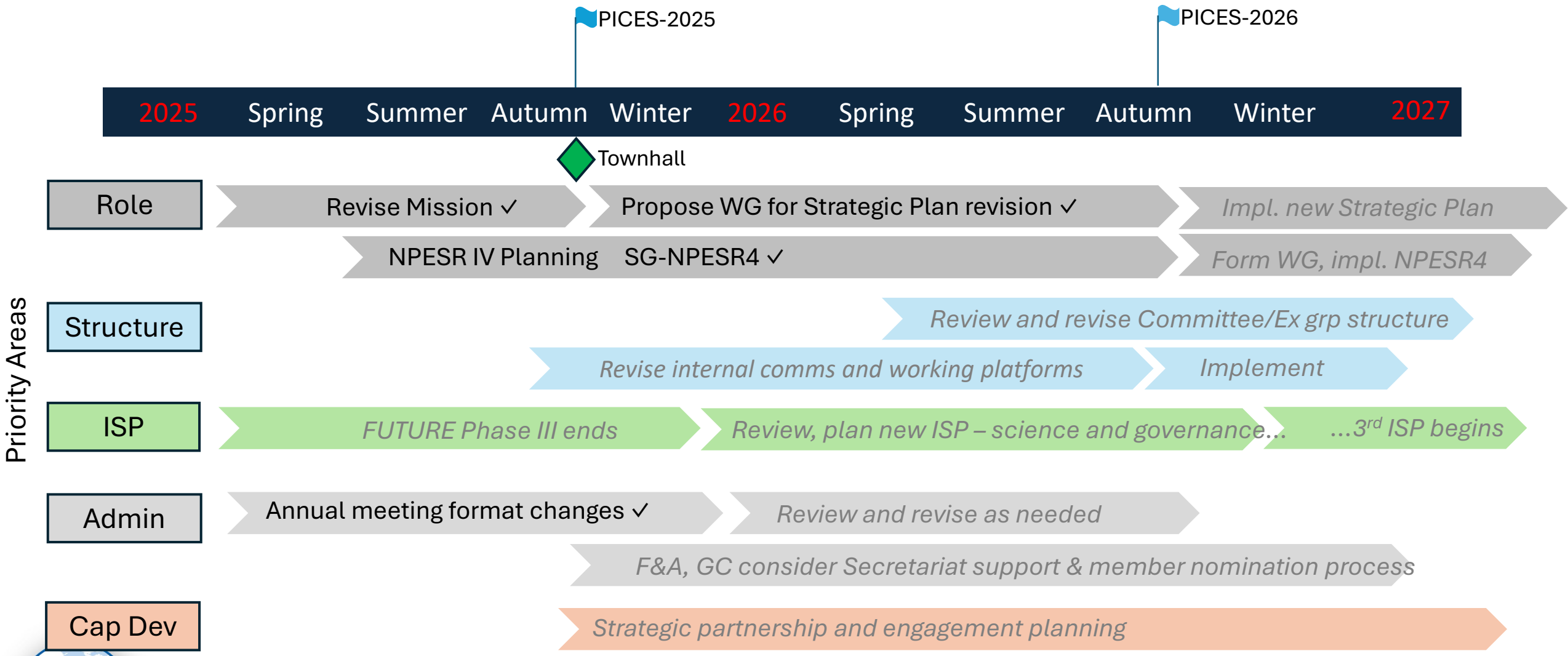
Activities include:

- Drafting a road map that identifies actions needed in the five priority areas:
  1. PICES Role
  2. PICES Structure
  3. Integrated Science Plan development
  4. Administration
  5. Capacity Development
- Drafting a revised Mission Statement
- Developing a plan to solicit needs from member countries
- Convening PICES-2025 Town Hall to share an update



An efficient organization, equipped to provide actionable science

SG-ERRR: Draft Road map



PICES - 2025

Evolving PICES Science

Toward an Integrative, Actionable Science Program

Sukyung Kang

PICES Science Board Chair

Evolution of PICES – Why this matters?

External Review conducted

Review Report provided

Solicited thoughts from wider community

2023-2024	Late 2024	2024-2025	2026-?

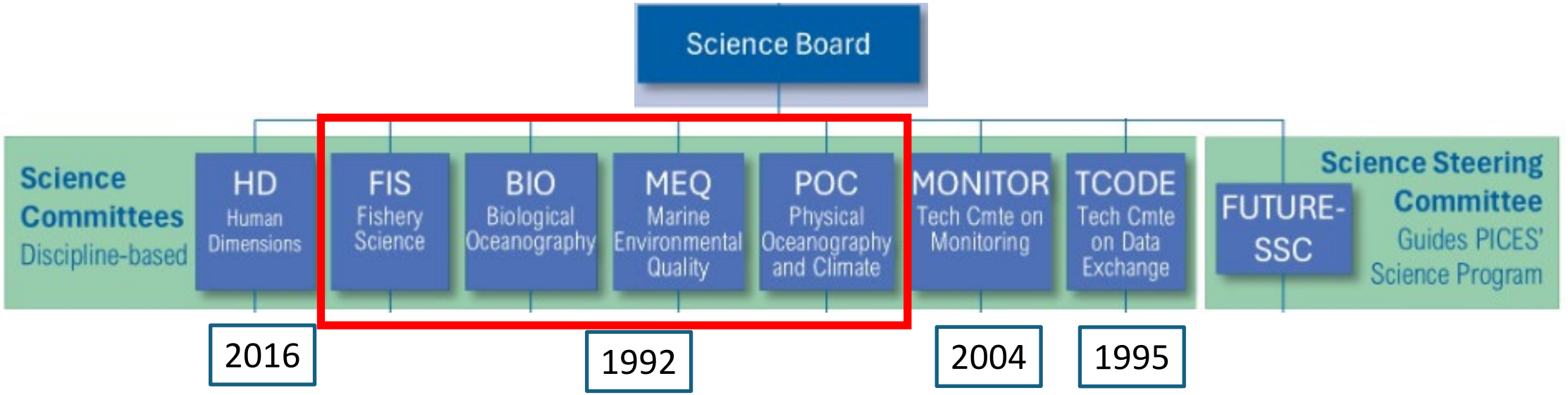
Study Group on External Review Report Response (SG-ERRR) formed.

Five Priority Areas of Review Panel Recommendations

PICES considering and managing response on:

- Revised Mission
- New Strategic Plan,
- New Integrated Science program
- Revised Committee structure
- New North Pacific Ecosystem Status Report

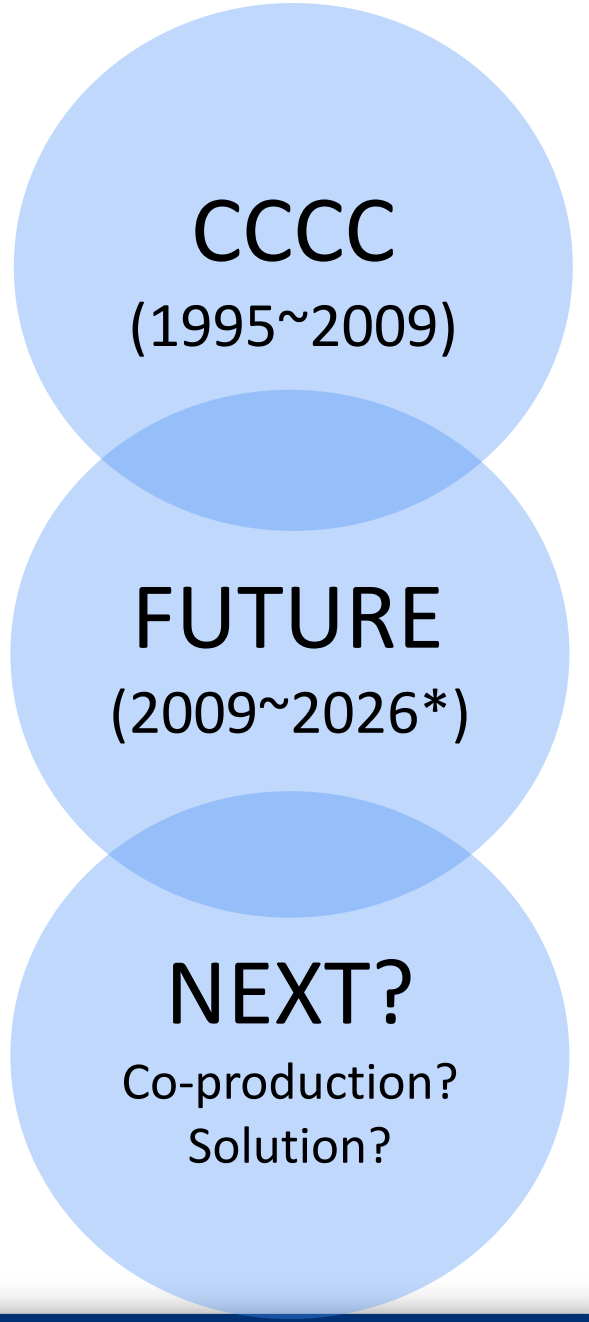
Evolution of PICES Science



- 1990s: **foundational:** physical, chemical, biological observations
- 2000s-2010s: ecosystem-based and **interdisciplinary research**
- Recent: inclusion of **human dimensions** and climate impacts

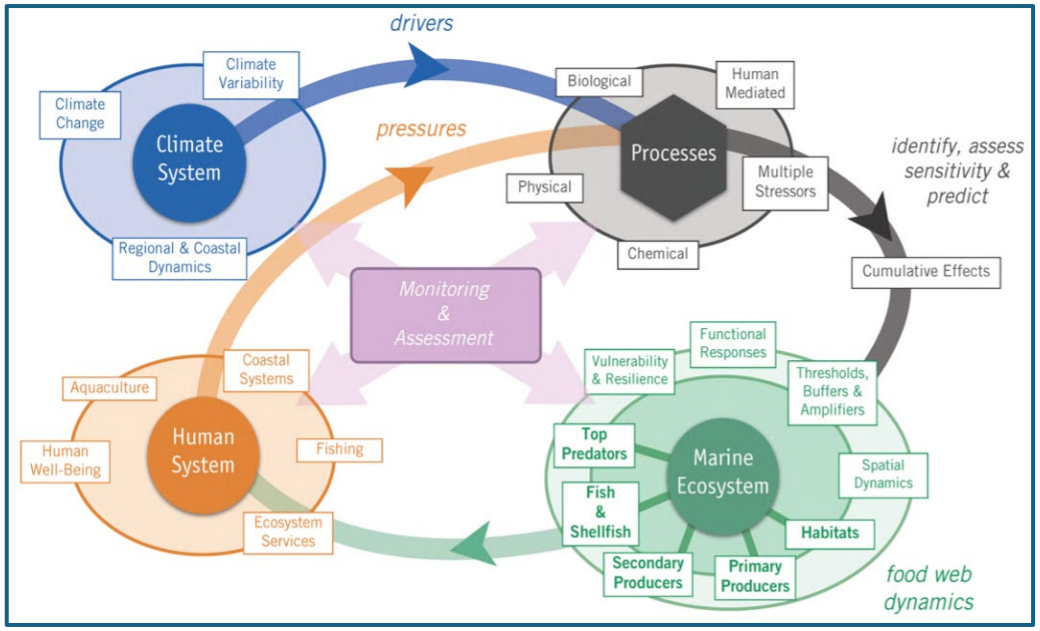
PICES Integrative Science Program (ISP)

	CCCC	FUTURE
Scientific Nature	Understanding processes : Process-oriented and observation-based	Forecasting and solutions : Forecasting- and application-oriented
Integration level	Bio-physical	Socio-ecological
Output type	Knowledge and models	Forecasts, indicators, and decision support tools
Representative slogan	Understanding how climate affects carrying capacity	Forecasting and responding to ecosystem change

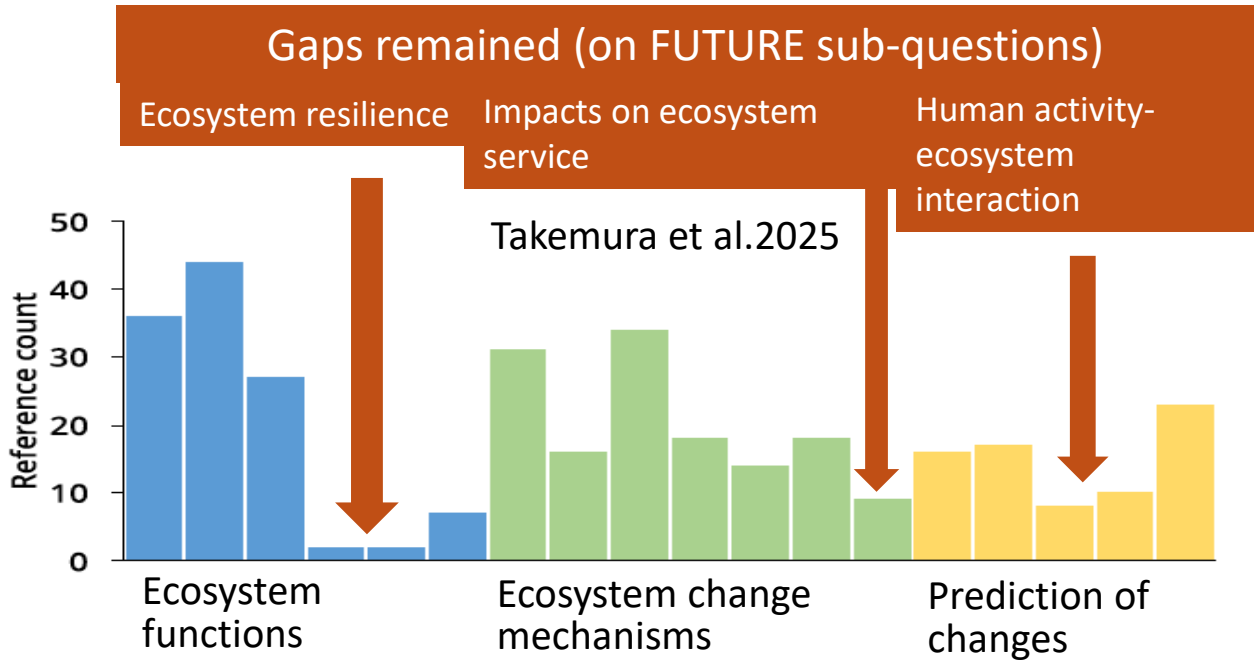


What is happening? → What can we do?

FUTURE Science Program – FUTURE Symposium at PICES 2024



- Facilitated Trans-Disciplinary Science Collaborations
- Implemented a Social-Ecological-Environmental-Systems (SEES) approach to PICES activities
- Expanded Human Dimensions into PICES activities
- Provided Assessment of Key Organizational Strengths and Gaps



W5 (2024): Exploring international knowledge co-production: Lessons learned from international marine science organizations at the science-policy interface

What does knowledge co-production look like in international organizations? How could this be applied within the context of PICES?

➡ **PICES's influence on decision-making is indirect** and it mainly happens through PICES outputs related to either country and regional level management of commitments to international treaties (from Erin V. Satterthwaite's presentation)

Figure 1. A teardrop displaying some of the many terms related to participatory and collaborative approaches.

2025 PICES – Sessions & Workshops

Climate Extreme = the hottest topics of PICES-2025

Solution

W9: Applying a Cumulative Effects Framework to Explore **Actionable, Social-Ecological Solutions** for Climate Extreme Event Impacts Across the North Pacific **(Nov 9)**

Socio-ecological Impacts

S2: Changing Ecosystem Structure Under Global Climate Change: Monitoring, Detecting, Modelling, and **Socio-Ecological Impacts** **(full 2-day session, Nov 11 & 12)**

S4: Responses of Small Pelagic Fish Communities to Recent Climate Regime Shifts and Climate Extremes **(Nov 12)**

W7: Response of Top Predators to Unusual Oceanographic, Climatic and Anthropogenic Events in the North Pacific **(Nov 8)**

mechanisms

S3: Interactions of Variability and Change in the North Pacific **(Nov 12)**

S5: Climate Extremes and Coastal Impacts in the Pacific **(Nov 12)**

management

S8: How Can Ecosystem-Scale Information be Used to Improve Our Understanding of Climate Change Impacts, and **Support Management and Conservation** in the North Pacific? **(Nov 13)**

monitoring

W10: An Examination of Shelf Data collected by Moorings and Other Fixed Stations in the North Pacific Ocean **(Nov 11)**

SmartNet – UNDOS Endorsed Joint ICES/PICES Programme

Phase II (2025-2028) Priority Topics

1. Advance Climate-Ecosystem-Fisheries Nexus science and management through collaboration with multiple UNDOS programmes and projects.

Has held and will hold a series of Joint Workshops at various opportunities, including ICES/PICES Annual Meetings, ECCWO5, and OOSC2025.

(PICES-2025) Workshop 1: Climate-ready fisheries management: reviewing effective strategies for developing decision support tools.

2. Expand capacity sharing opportunities beyond the ICES and PICES Convention Areas, with a particular focus on the Global South and SIDS

Has been promoting career development of SIDS ECOPs by leveraging existing ICES/PICES frameworks and infrastructures, and through collaboration with new partners.
(PICES-2025) Workshop 8: Engaging with Local & Traditional Knowledge Holders to Co-Design Ocean Science in Pacific Small Island Developing States. ECOPs from Pacific SIDS are invited to join the discussion.

Community–led stewardship is not optional - it is essential

3. Inform new UNDOS activities through the global survey "What is the Ocean We Want?"

https://makinolab.aori.u-tokyo.ac.jp/en/owwproject/

To assess people's perspectives on Ocean Decade Outcomes in various countries with different cultural backgrounds.

Pilot surveys were completed in 8 countries, showing country-specific priorities.

Defining Actionable Science

- Co-produced with stakeholders
- Decision-relevant and timely
- Usable outputs: tools, models, maps, early-warning systems, and policy guidance
- Aligned with management cycles

Next ISP

“Delivering integrated marine science that connects ecosystems, societies, and policy to enable sustainable action.”

- Principles: Integrative, Solution-based, Transboundary, Data-driven
- Requirement: Collaboration, Persistence, Measurable milestones

Cross-cutting Enablers

- Co-production and stakeholder engagement
- Data sharing and interoperability/sustained observing networks
- Predictive modeling and scenarios
- Capacity building and communication

Challenges & Risks

- Data sharing barriers
- Institutional inertia
- Diverse governance systems
- Funding continuity
- Balancing depth vs timeliness

Possible Candidates for the Next ISP could include……

- Climate-ready Fisheries
- Marine Heatwave Early Warning
- Marine Ecosystem Health & Biodiversity
- Climate Event Impacts and Adaptation
- Fisheries and Sustainable Use of Marine Resources
- Pollution and Habitat Degradation
- Emerging Technology and Data Needs
- Socio-Ecological and Cross-Boundary Issues
- Ocean Acidification & Carbon Solutions
- Integrated Observing Systems

Town Hall Event

“The time is now – working together.”

PICES - 2025

Advancing PICES' Mission Through Broader (External) Engagement

Cisco Werner
cisco.werner@gmail.com

Historical backdrop and context

Convention for a North Pacific Marine Science Organization (PICES); 1991-92

The purpose of the Organization (PICES) shall be:

- **to promote and coordinate marine scientific research to advance scientific knowledge** of the area concerned and of its living resources, including but not necessarily limited to research with respect to the ocean environment and its interactions with land and atmosphere, its role in and response to global weather and climate change, its flora, fauna and ecosystems, its uses and resources, and impacts upon it from human activities;

- **to promote the collection and exchange of information and data related to marine scientific research** in the area concerned.

https://meetings.pices.int/about/convention

Call for PICES' Evolution and the need for External Engagement

The *External Review Report (2024)* and *Science Board Feedback (2025*) calls for PICES to be reimagined **from a coordinating body for marine science to a regional platform for actionable, co-produced, policy-linked ocean knowledge**. Such a transformation cannot be achieved by PICES alone. Three interconnected *"limits and needs"* are:

1. PICES alone does not have the operational capacity and jurisdictional reach to deliver "actionable science".
2. Actionable, policy-relevant knowledge requires access to data, models, and decision frameworks that lie outside PICES.
3. External partnerships provide legitimacy, uptake, and amplification of PICES science.

In other words …

While PICES can lead and convene, **actionable, policy-linked ocean knowledge *demands***:

- **National engagement** to provide data, modeling, and implementation capacity;
- **Partnerships with regional and global management bodies** to ensure scientific relevance and uptake; and
- **Joint investment** in digital infrastructure and human capital (e.g., *Data Portals, Digital Twin initiatives, capacity development*).

PICES can leverage **such strategic external collaborations** to evolve from a coordinating forum into a regional engine of co-produced, operational ocean intelligence envisioned in its renewed mission.

Today’s discussion’s starting points

- **Goal:** Reimagine PICES from a coordinating body for marine science to a regional platform for actionable, co-produced, and policy-linked ocean knowledge.

- **Next step:** Translate the consensus on “actionable science” into an operational, collaborative framework that links national, regional, and global efforts.

Areas for PICES-led External Collaboration and Engagement
(with intergovernmental organizations and national science agencies)

1. **Co-Design and Co-Production of Actionable Science**

2. **Data Integration and Regional Ocean Information Systems**

3. **Targeted (3-5 year) ISP "Integrative Scientific Program"**
   (supported by Data Portals, Digital Twins)

4. **Policy and Stakeholder Engagement**

5. **Joint Capacity Development and Early Career Engagement**

1. Co-Design and Co-Production of Actionable Science

- Establish **joint mechanisms with ICES and RFMOs** for *evidence-based decision support* and *actionable science* addressing ocean-climate-fisheries interactions.

- Create **co-designed regional projects** involving Contracting Parties' and non-member national science and management agencies that link **prediction and projection models** to policy-relevant products [e.g., create a Joint Co-Production Forum (JCPF) or Strategic Partnership Group co-chaired by GC and SB].

- Develop **multi-agency "solution-based science" pilots**, modeled on ICES–PICES collaborations such as the **Climate Change in the World's Oceans** conferences and **SmartNet (UNDOS-endorsed)** initiatives.

2. Data Integration and Regional Ocean Information Systems

- Implement PICES's plan to become a **"primary data portal" for the North Pacific**, aggregating interoperable datasets from member and partners/collaborating organizations.

- Collaborate with national agencies and intergovernmental organizations on **common metadata and FAIR-compliant data management protocols**.

- Provide RFMO-relevant data products (e.g., NPESR indicators, ADRIFT debris movement, HAB trends) in **accessible, user-oriented formats**.

3. Targeted ISP

- Transition to a new **Integrative Science Program** (ISP) building on past efforts, explicitly linking **ecosystem, social, and economic systems**.

- Develop *joint thematic initiatives* with (for example) ICES, WestPac, IWC, WCPFC, ISC, and others focused on:
  - **Climate extremes and coastal impacts**
  - **Ecosystem resilience and sustainable fisheries**
  - **Ocean-based climate solutions and carbon cycling**

- Align ISP themes with **UN Decade of Ocean Science (UNDOS)** and **global frameworks** (SDG 14, BBNJ, …)

4. Policy and Stakeholder Engagement

- Convene **multi-disciplinary workshops and training courses** that include **policy makers, and member and non-member national agencies** to co-develop actionable products. These would **not** be limited to member nation representatives.

- Design **policy-relevant deliverables** (e.g., annual ecosystem health snapshots, coastal impact forecasts) jointly with national agencies (member and non-member nations).

- Support **regular dialogues with intergovernmental organizations** to align ecosystem modeling outputs and management indicators.

5. Joint Capacity Development and Early Career Engagement

- For example, use **SmartNet** (ICES–PICES UNDOS program) to expand joint ECOP and technical training workshops, with a focus on:
  - Coastal adaptation and forecasting
  - Marine ecosystem data literacy
  - Cross-Pacific exchanges between government scientists and early-career researchers.
- Strengthen **mentorship pipelines** that connect young scientists in member agencies with ICES/PICES WGs and resource management and advisory bodies.

Possible 5-Year Targets (2025–2030)

Goal	Target by 2030	Partners/Leads
Actionable Science Mechanism	Establish a formal Co-Production Forum linking PICES Science Board and Governing Council with (for example) ICES, ISC, and WCPFC for shared project planning.	PICES GC & SB, ICES, and intergovernmental organizations (WCPFC, ISC, etc.)
Data Integration	Operationalize a North Pacific Ocean Data Hub (with open access metadata repository and visualization tools).	PICES WG52, BECI, TCODE, national science agencies
Integrative Science Program	Launch the first phase of a new ISP (2026–2030) under the SEES framework, co-designed with ICES and UNDOS SmartNet.	PICES SB, S-CCME, SmartNet, UNDOS partners
Ecosystem Forecasting & Indicators	Co-develop ecosystem status and projection products (NPESR IV, 2025+) aligned with RFMO and national management needs.	SG on NPESR IV, S-CCME, WCPFC, national science agencies
Policy Interface	Hold biennial N. Pacific Science–Policy Dialogues with Contracting Parties, RFMOs, and agencies to review progress on actionable science delivery.	PICES GC, ISC, WCPFC, national management agencies
Capacity Development	Double ECOP and interdisciplinary participation across PICES programs; institutionalize joint PICES–ICES–UNDOS training series.	AP-ECOP, SmartNet, ICES

Strategic Outlook

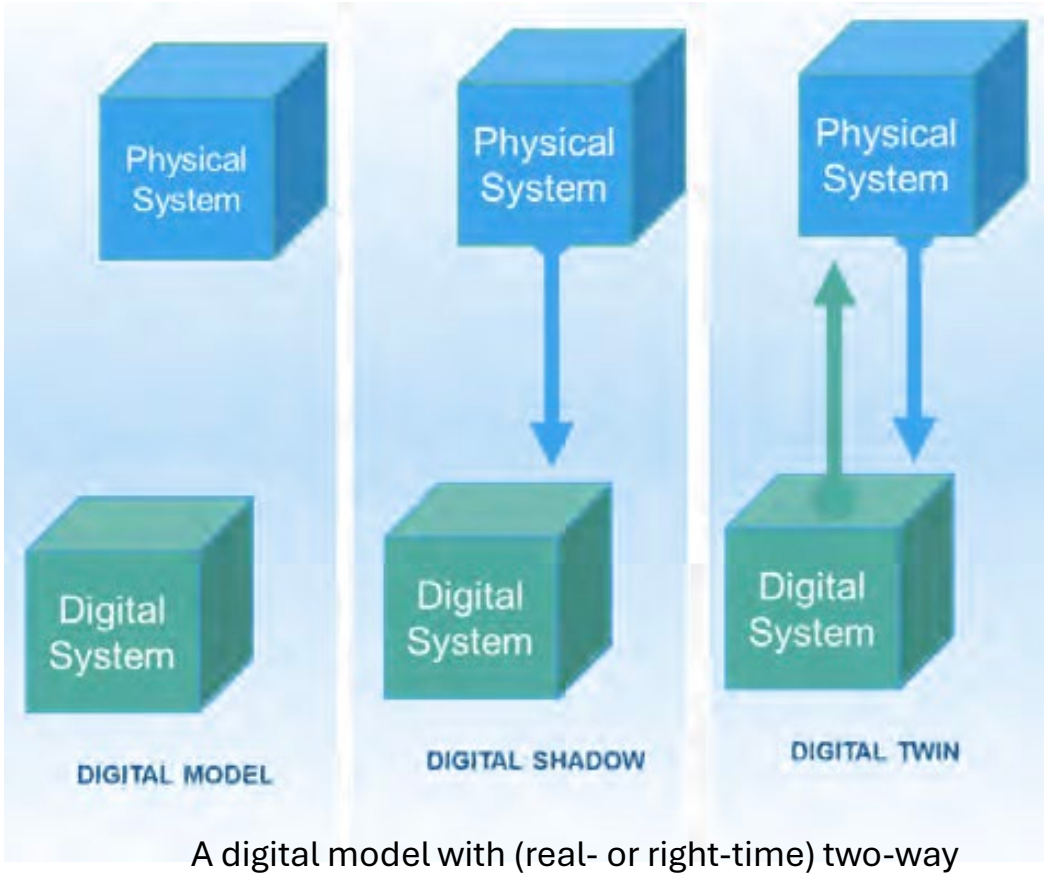
These collaborations could/should:

- Position **PICES and its (international and national) partners**, with a stronger actionable science mandate.
- Create **operational pathways** for member (*and non-member*) country agencies to use PICES outputs for management and adaptation.
- Deepen the **science–policy interface** through co-production, ensuring PICES remains a trusted regional broker of actionable, transboundary marine science.

DT-NPO: An Enabling Tool for a Broad External Engagement Strategy

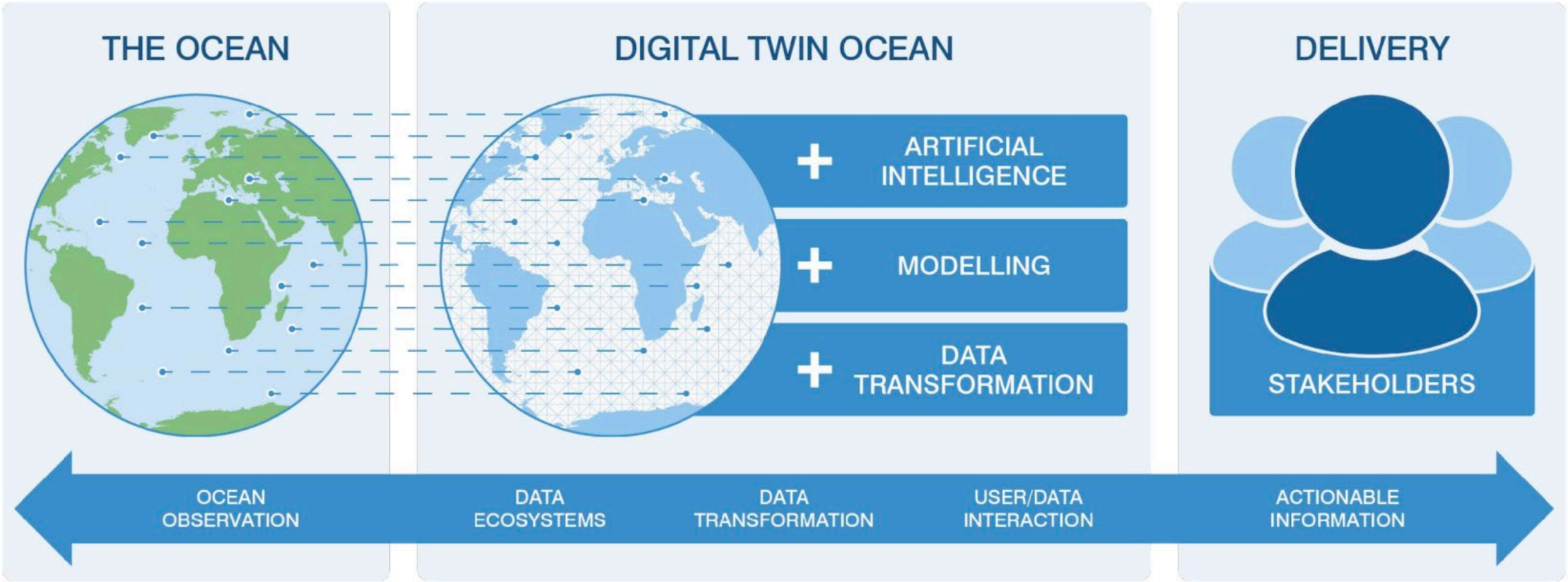
Create a **Digital Twin of the North Pacific Ocean (DT-NPO):**

- a continuously evolving, high-fidelity digital replica of the coupled ocean–climate–ecosystem–human system …
- **integrating observations, models, and data streams across PICES member nations** …
- to support forecasting, decision-making, and adaptation under a changing climate.



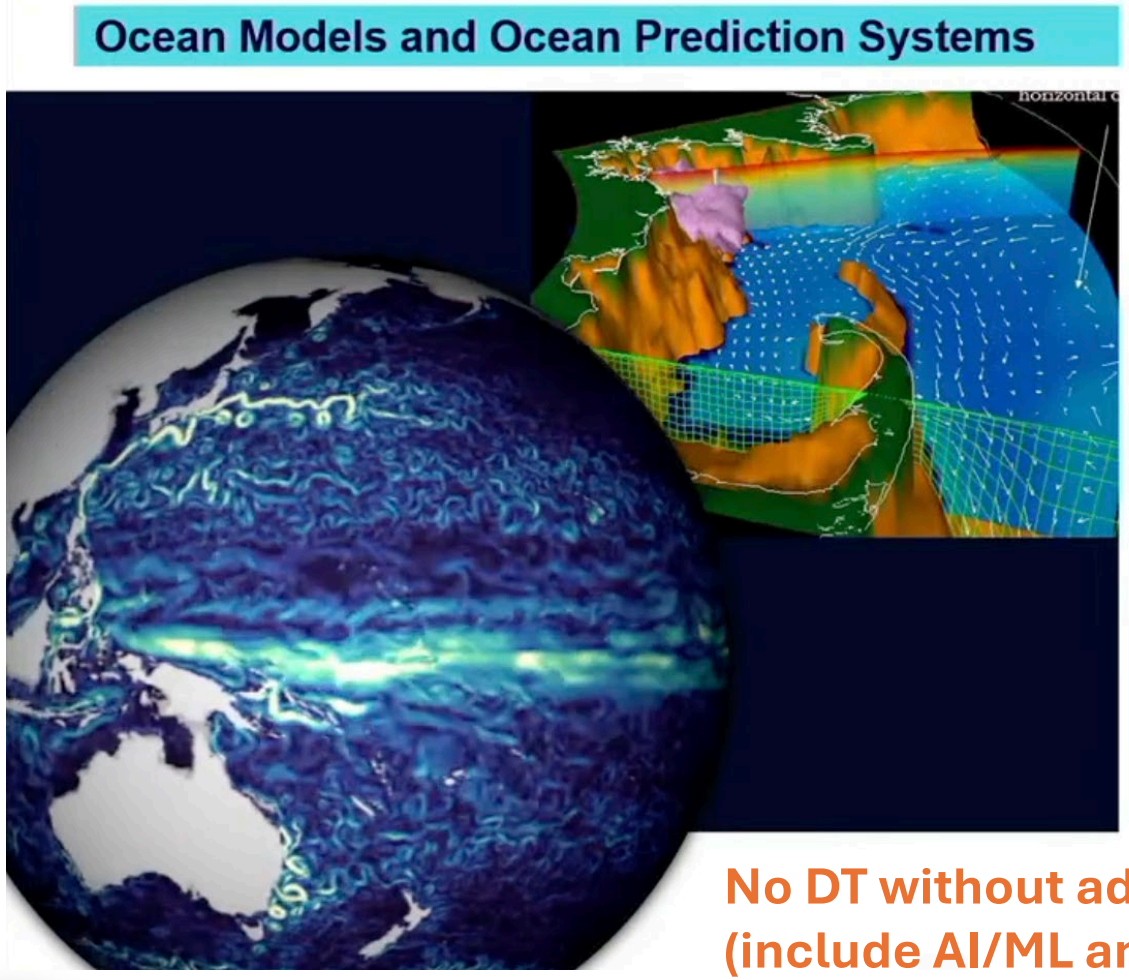
A digital model with (real- or right-time) two-way information flows. This can enable autonomous optimization, and remote and autonomous operation.

https://www.g7fsoi.org/wp-content/uploads/2022/11/NOC-IMFe-Summary-Report3-V3.pdf



https://www.g7fsoi.org/wp-content/uploads/2022/05/Session-1_John-Siddorn.pdf

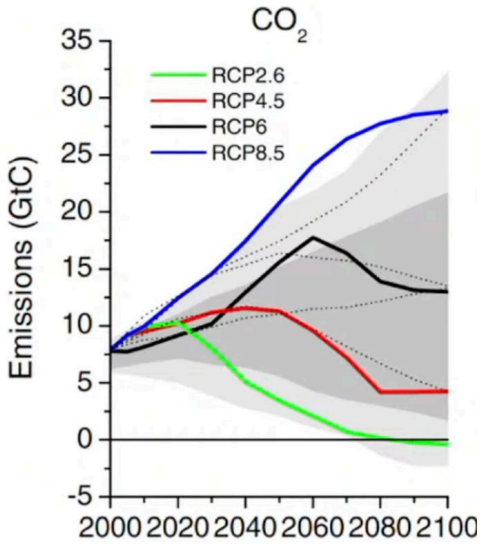
No DT without data
(need observing systems)



https://www.youtube.com/watch?v=sGRajCDRiAk

https://oceanpredict.org/docs/Documents/OPST/Meetings/OPST-8-Nov-2023/Presentations/3.4-DigitalTwinOcean-MartinVisbeck.pdf

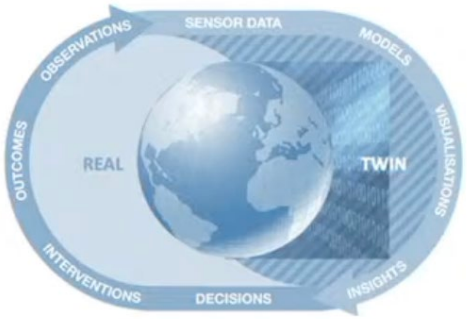
No DT without advanced ocean models
(include AI/ML and couple w/ other models, e.g., terrestrial, socioeconomic, etc.)

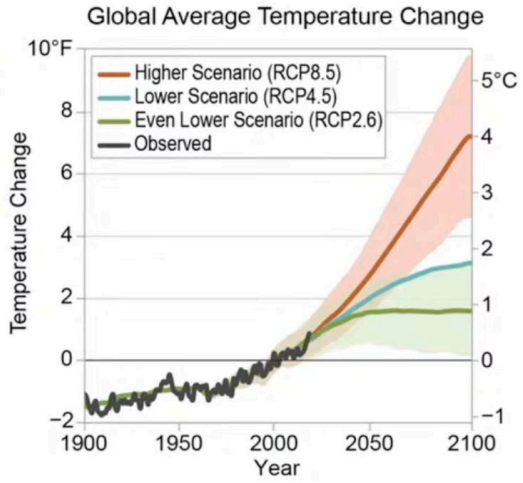


Earth System (IPCC) "proto" DT

"What if?" question

How would global temperatures change in response to various CO_2 scenarios?





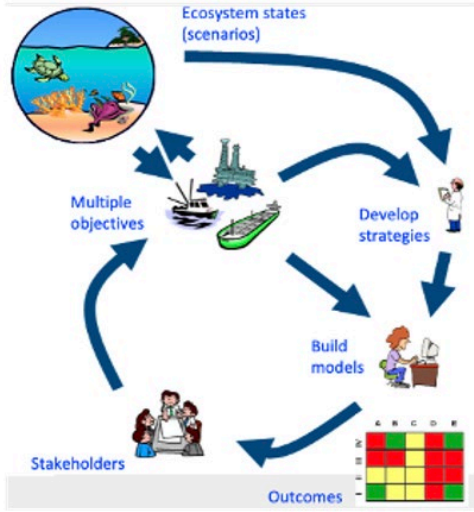
https://oceanpredict.org/docs/Documents/OPST/Meetings/OPST-8-Nov-2023/Presentations/3.4-DigitalTwinOcean-MartinVisbeck.pdf

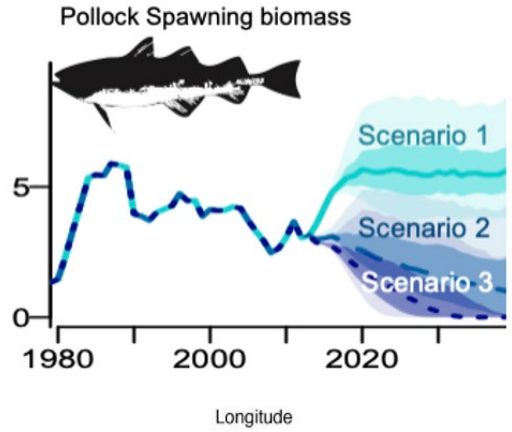
https://www.youtube.com/watch?v=GRajCDRiAk

Within PICES S-CCME/ACLIM "proto" DTs

"What if?" question

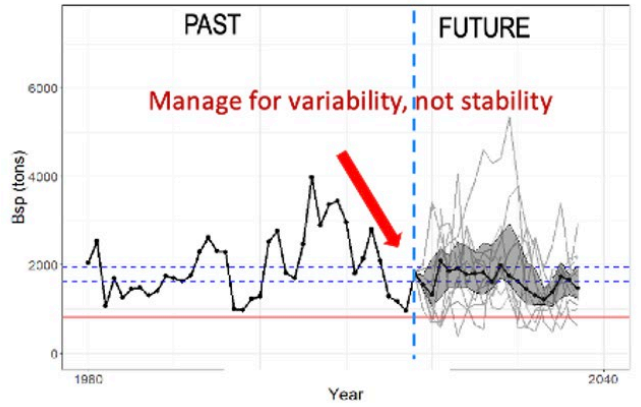
Under various climate scenarios and management strategies, what is the range of advice options?





Ecosystem-based fisheries management forestalls climate-driven collapse
KK Holsman, AC Haynie, AB Hollowed, JCP Reum... - Nature communications, 2020

Modified from Éva Plagányi, FAO Fisheries Sustainability Symposium, Rome, Nov 2019



Steps towards a DT (S-CCME/ACLIM)

Category	S-CCME/ACLIM Strengths	Gaps for Full Digital Twin Realization
Scientific Modeling	Strong coupled ecosystem modeling and scenario analysis.	Needs real-time data assimilation and feedback loops.
Stakeholder Integration	Solid co-production and adaptive management design.	Limited digital interactivity or persistent user interface.
Technical Infrastructure	Robust regional simulations using High Performance Computing.	Requires cloud interoperability, APIs, and standardized IMFe(*)-like framework.
Governance & Longevity	Sustained by a “network” of partner institutions.	Needs a more formal institutionalized digital governance for continuity.

(*)Information Management Framework for the environment
https://www.g7fsoi.org/wp-content/uploads/2022/11/NOC-IMFe-Summary-Report3-V3.pdf

DT-NPO Outcomes

A North Pacific Ocean "*collaboratory*"(*)

Scientific:

- Real-time understanding of North Pacific ocean–climate–ecosystem states.
- Improved process insight via AI–model fusion.

Operational:

- Enhanced forecasts for fisheries, HABs, extreme events, climate anomalies…
- Linked national and regional data systems.

Policy and Societal:

- Actionable intelligence for adaptive fisheries and coastal resilience.
- Strengthened trust and cooperation among PICES nations.

Capacity and Visibility:

- Establish PICES as the North Pacific contribution to the DT-Ocean under the UN Ocean Decade.

(*)https://www.umces.edu/chesapeake-global-collaboratory

Concluding Remarks

The DT-NPO can be a component of *reimagining* PICES's mission—***from coordinating science to delivering predictive, actionable knowledge***. By uniting member and non-member partner nations' data systems and models, PICES can build an enduring digital **infrastructure supporting sustainable oceans and resilient coastal societies**, and address the "charge" of

- Evolving PICES **from a coordinating body** for marine science into an **operational, collaborative body that links national, regional, and global efforts leading to actionable, co-produced, and policy-linked ocean knowledge.**

“Until now, PICES members … have shunned any sort of advisory capacity for PICES... However, I believe that once PICES has developed its periodic ecosystem status reports, their availability will constitute a form of useful, yet apolitical, advice that members will welcome.”

(Warren Wooster, 2000)