Bering Sea FEP Climate Change Task Force Workplan Overview

Diana Stram
Kirstin Holsman

Ecosystem Committee update

Jan. 26, 2021

Mark Holsman

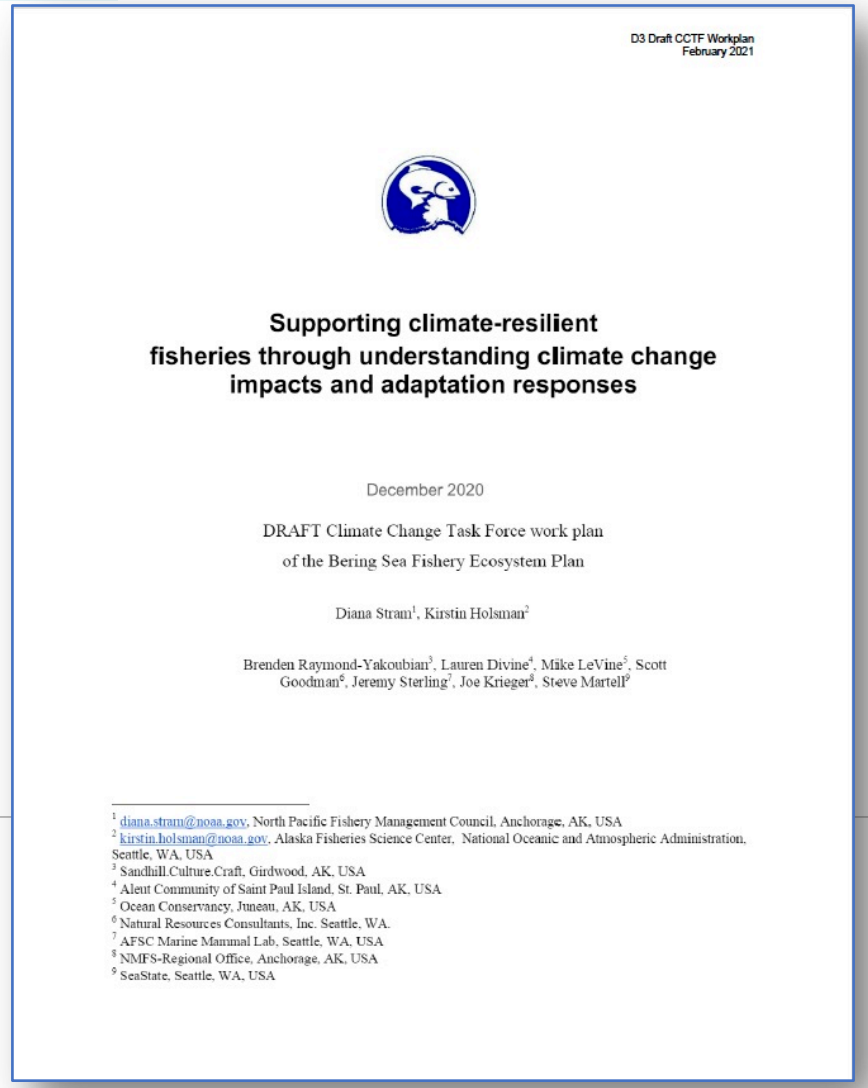
Attendees Dec. 14 & 16, 2020 (virtual)

Taskforce members in attendance:

Lauren Divine (Aleut Community of Saint Paul Island), Scott Goodman (Natural Resources Consultants/Bering Sea Fisheries Research Foundation), Kirstin Holsman co-Chair (AFSC-Seattle), Steve Martell (SeaState), Joe Krieger (NMFS-Regional Office), Brenden Raymond-Yakoubian (Sandhill.Culture.Craft), Mike LeVine (Ocean Conservancy), Jeremy Sterling (AFSC Marine Mammal Lab), Diana Stram co-Chair (NPFMC)

Members of the public and other state and agency staff:

Diana Evans (NPFMC), Sarah Wise (AFSC-Seattle), Kate Haapala (NPFMC), Steve Marx, Melissa Parks, Megan Williams, Mateo Paz Soldan, Erin Shaw, Steve MacLean (NPFMC), Teresa Peterson



D3 Draft CCTF Workplan
February 2021

Supporting climate-resilient fisheries through understanding climate change impacts and adaptation responses

December 2020

DRAFT Climate Change Task Force work plan
of the Bering Sea Fishery Ecosystem Plan

Diana Stram[1], Kirstin Holsman[2]

Brenden Raymond-Yakoubian[3], Lauren Divine[4], Mike LeVine[5], Scott Goodman[6], Jeremy Sterling[7], Joe Krieger[8], Steve Martell[9]

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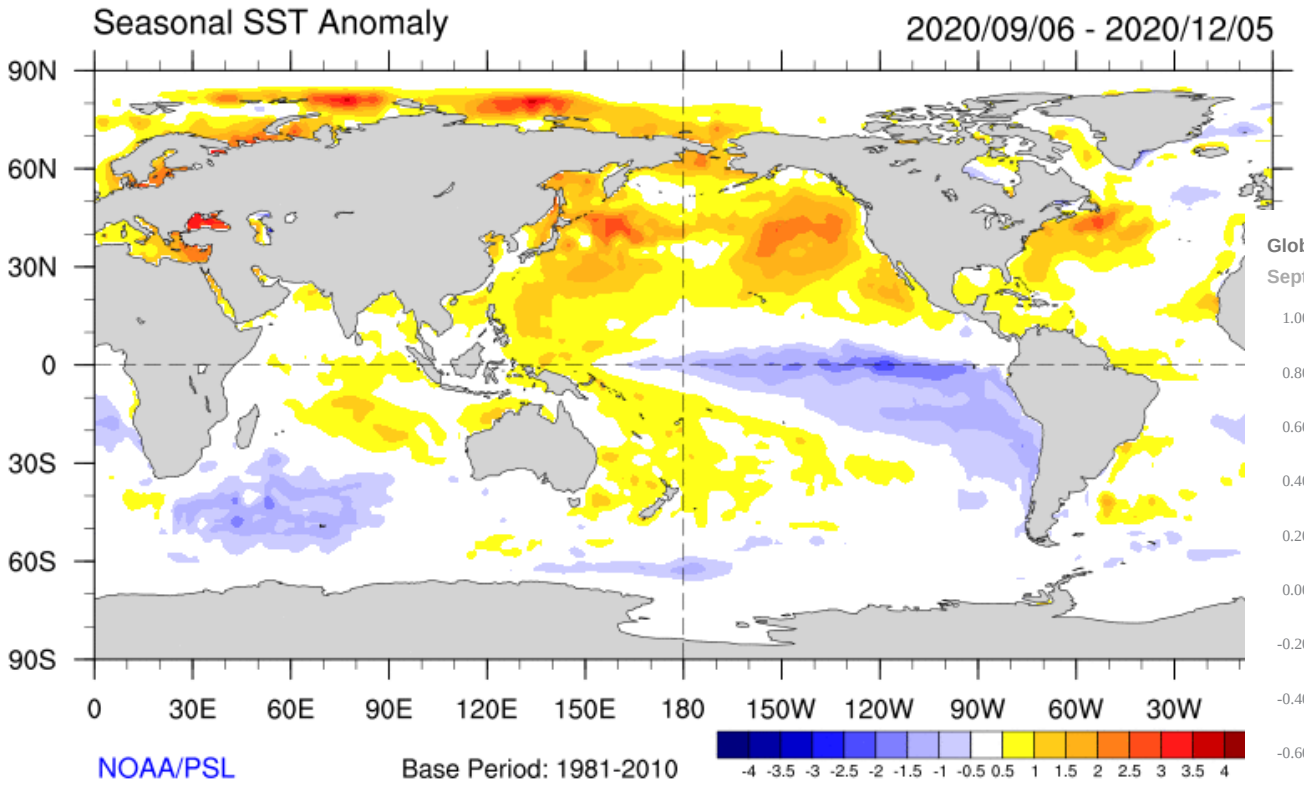
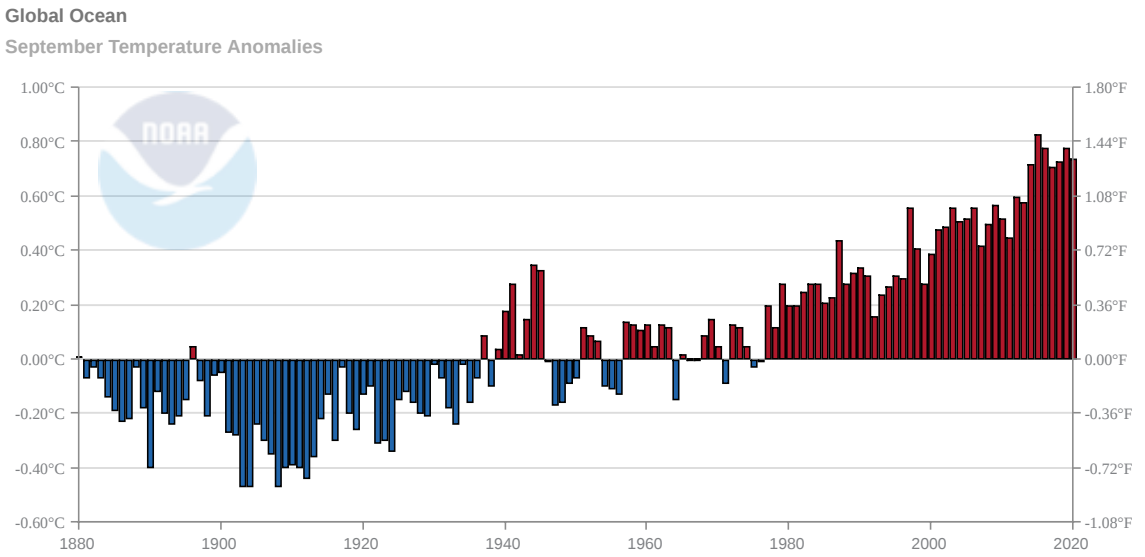
[4] Aleut Community of Saint Paul Island, St. Paul, AK, USA
[5] Ocean Conservancy, Juneau, AK, USA
[6] Natural Resources Consultants, Inc. Seattle, WA.
[7] AFSC Marine Mammal Lab, Seattle, WA, USA
[8] NMFS-Regional Office, Anchorage, AK, USA
[9] SeaState, Seattle, WA, USA

The goal of the Climate Change Module is to facilitate the Council's work towards climate-ready fisheries management that helps ensure both short- and long-term resilience for the Bering Sea.

Anomaly from 1961-1990 climatology, 1 degree, weekly resolution

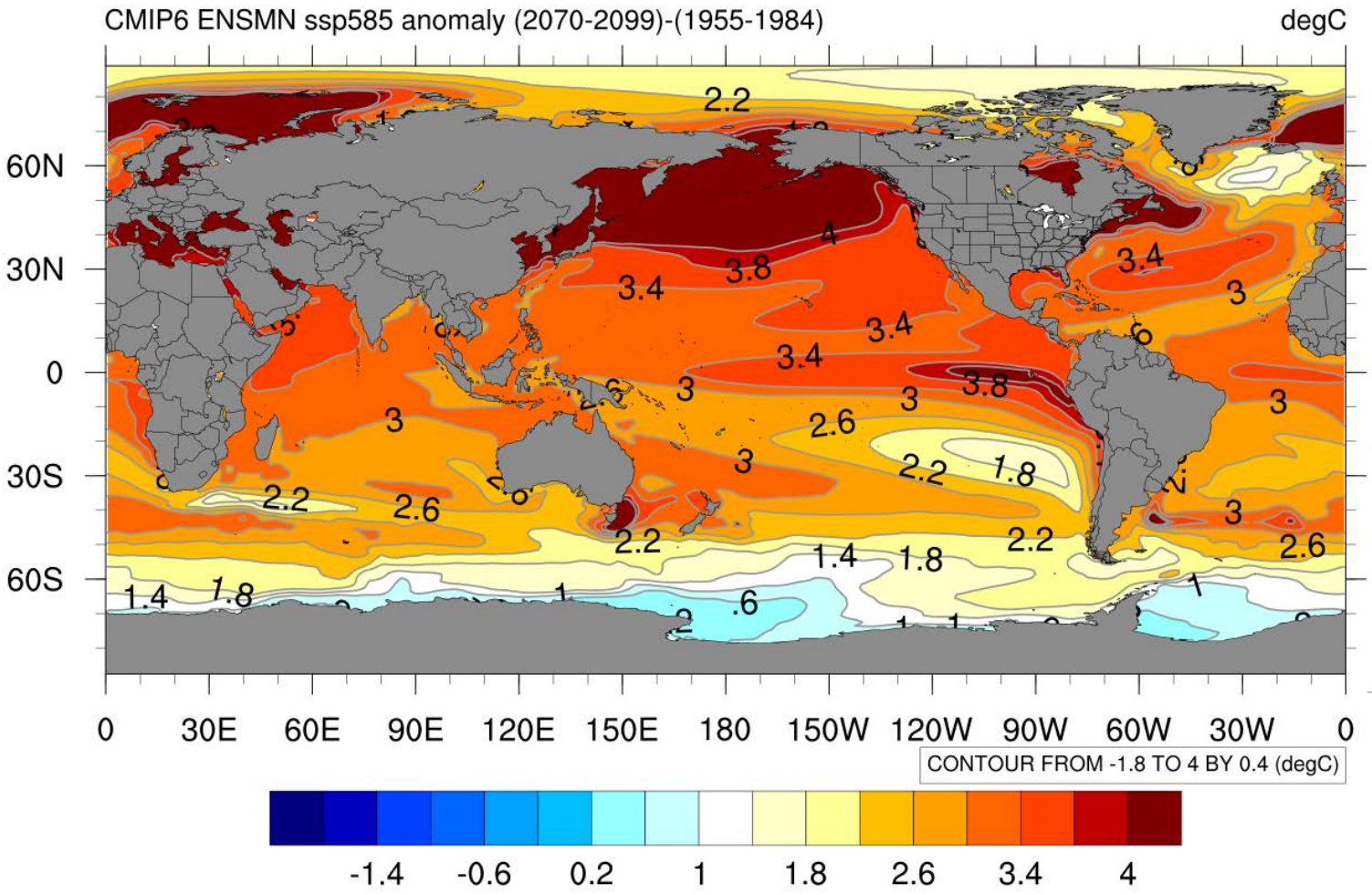


https://psl.noaa.gov/map/clim/sst.shtml



NOAA National Centers for Environmental information, Climate at a Glance: Global Time Series, published November 2020, retrieved on December 9, 2020 from https://www.ncdc.noaa.gov/cag/

CMIP6: SST Anomaly from 1955-1984 climatology



https://psl.noaa.gov/ipcc/cmip6/

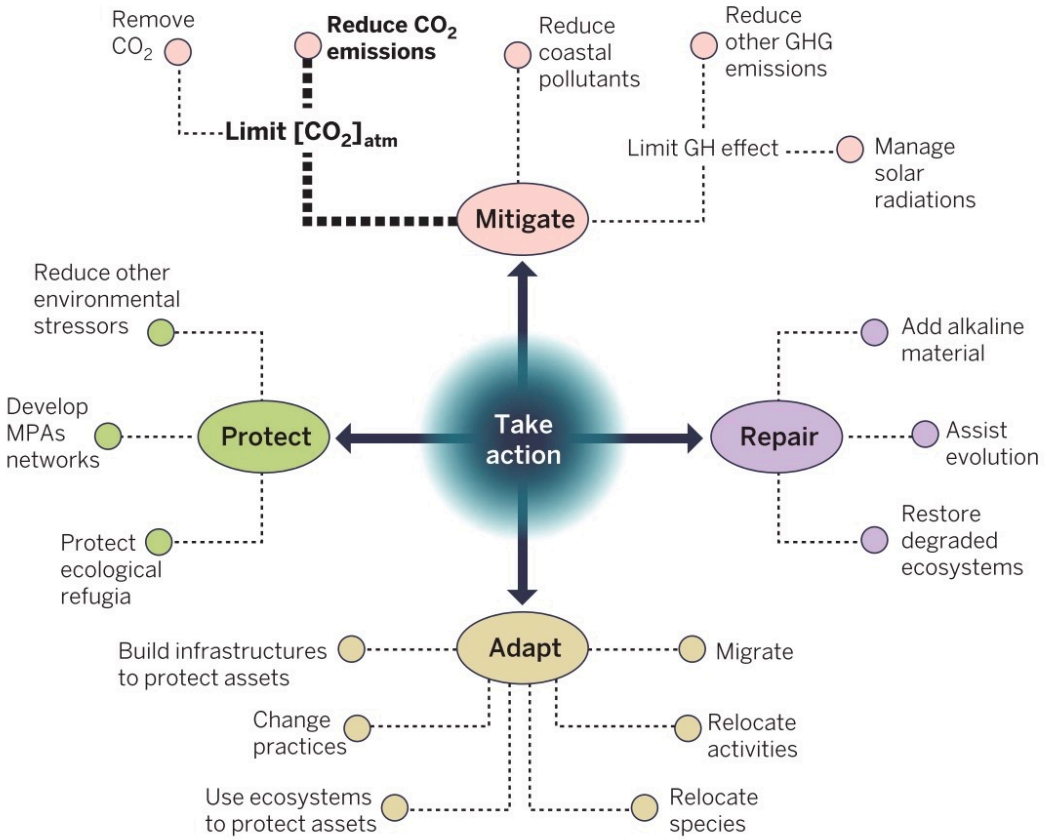
Climate Change Task Force Goals:

The CCTF aims to **operationalize the delivery of climate change information to the Council** including climate change information, tools, and recommendations that can help the Council **further its ecosystem vision statement through equitable climate change adaptation pathways, transparent communication, utilization of diverse knowledge sources, and broad engagement**. This module will support the Council's capacity to:

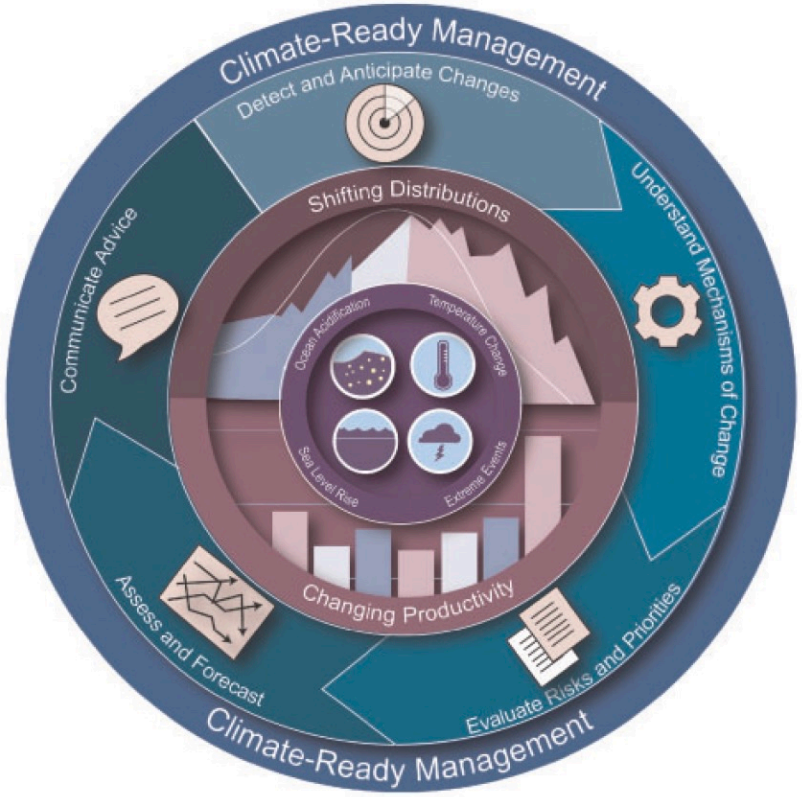
1. **More effectively incorporate climate change information from diverse knowledge holders** into the fishery management process through transparent, effective and dynamic communication and engagement with communities, fishers, managers, scientists and other Council stakeholders with the Council and Council staff; and,

2. **Evaluate and implement management measures that can**: help preserve livelihoods, economies, health and well-being across fisheries and dependent coastal communities; support near- and long-term adaptation to climate change; and ensure the continued productivity and sustainability of the coupled social-ecological Bering Sea system.

Management can reduce risks & support adaptation

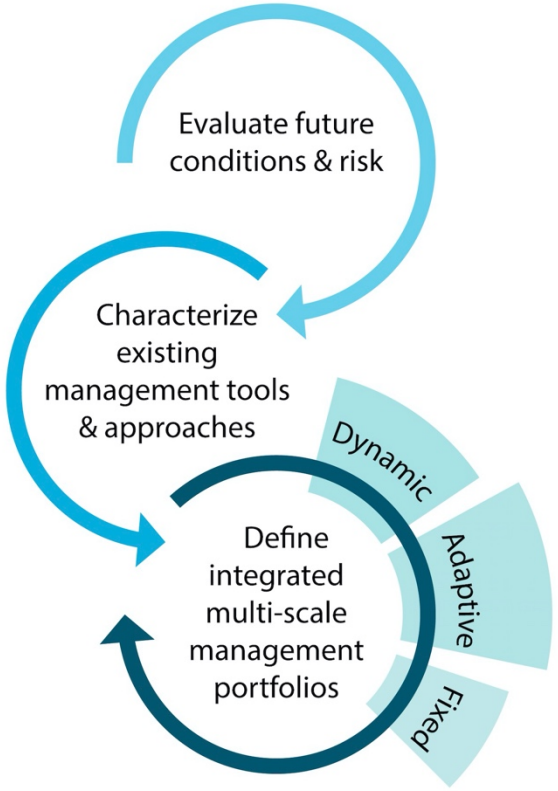


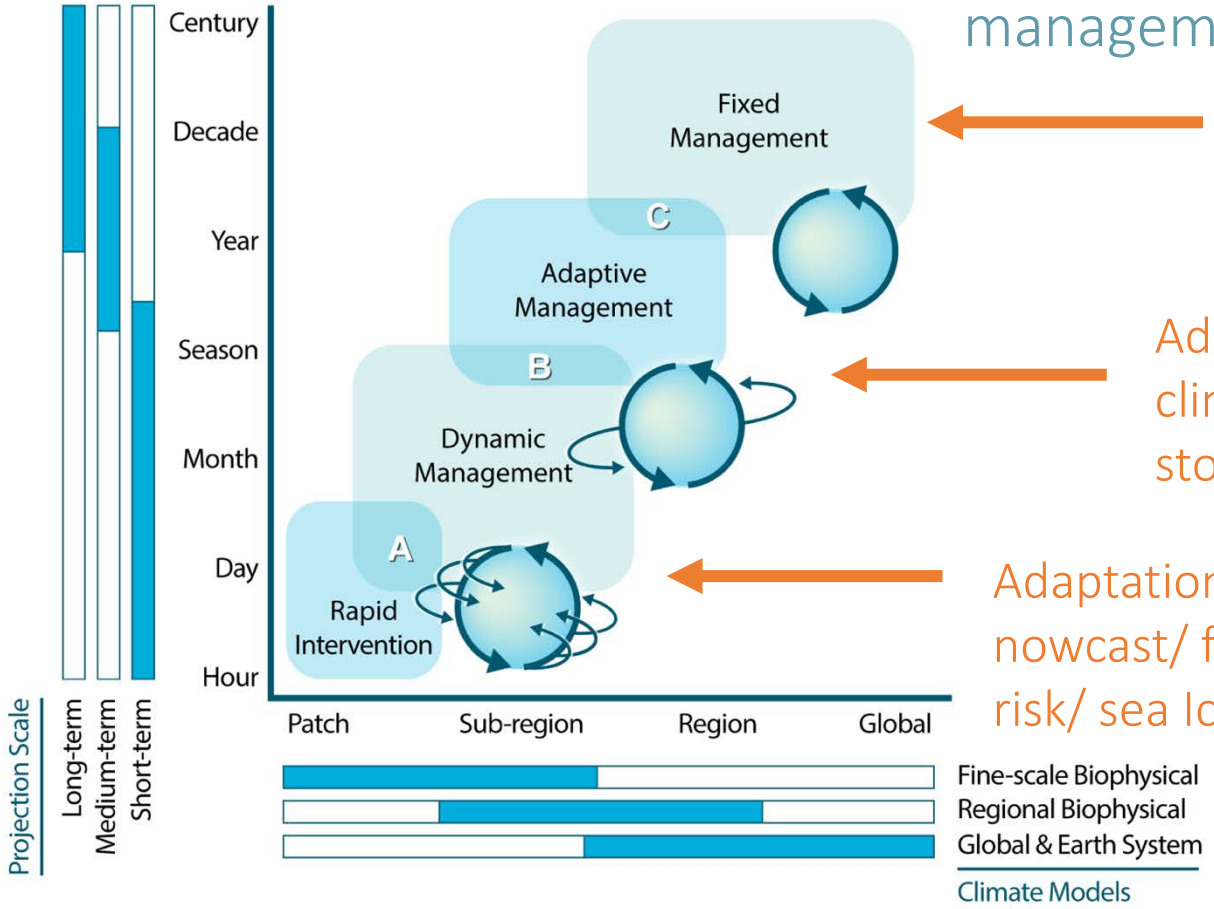
Gattuso et al. (2015). Contrasting futures for ocean and society from different anthropogenic CO 2 emissions scenarios. Science, 349(6243), aac4722. https://doi.org/10.1126/science.aac4722



Karp et al. 2019. Accounting for Shifting Distributions and Changing Productivity in the Development of Scientific Advice for Fishery Management. ICES JMS doi: 10.1093/icesjms/fsz048

Management can reduce risks & support adaptation





Consider nested scales of management & adaptation

Adaptation: increase flexibility

Adaptation: climate-enhanced stock assessments

Adaptation: nowcast/ forecast maps of risk/ sea Ice/spp distributions

Holsman et al.(2019). Towards climate resiliency in fisheries management. ICES Journal of Marine Science. https://doi.org/10.1093/icesjms/fsz031

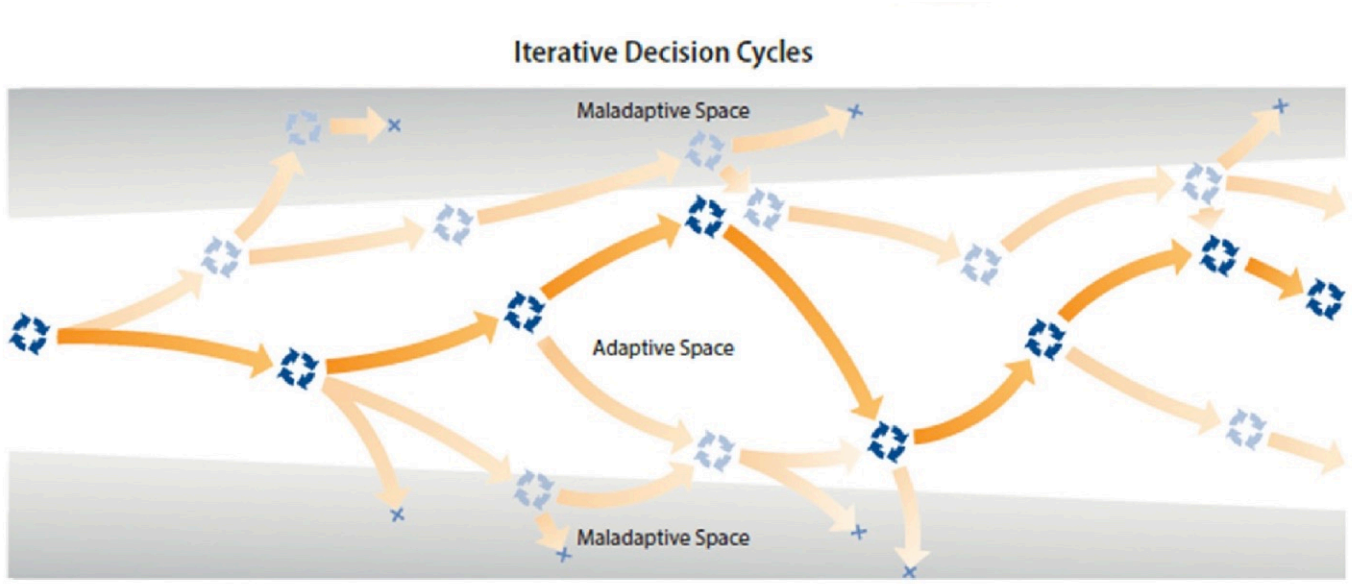
Build climate resilient adaptation pathways

Test new & existing tools

Adaptation

incremental adaptation to preserve current livelihoods, health, and well being and meet future demands

transformational adaptation, especially to address/prevent marginalization and promote equitable well being and diverse values.



Build capacity to revaluate & enable transformative actions

Fig. 1 from Wise et al. 2014. Reconceptualising adaptation to climate change as part of pathways of change and response. Global Environmental Change 28: 325–336

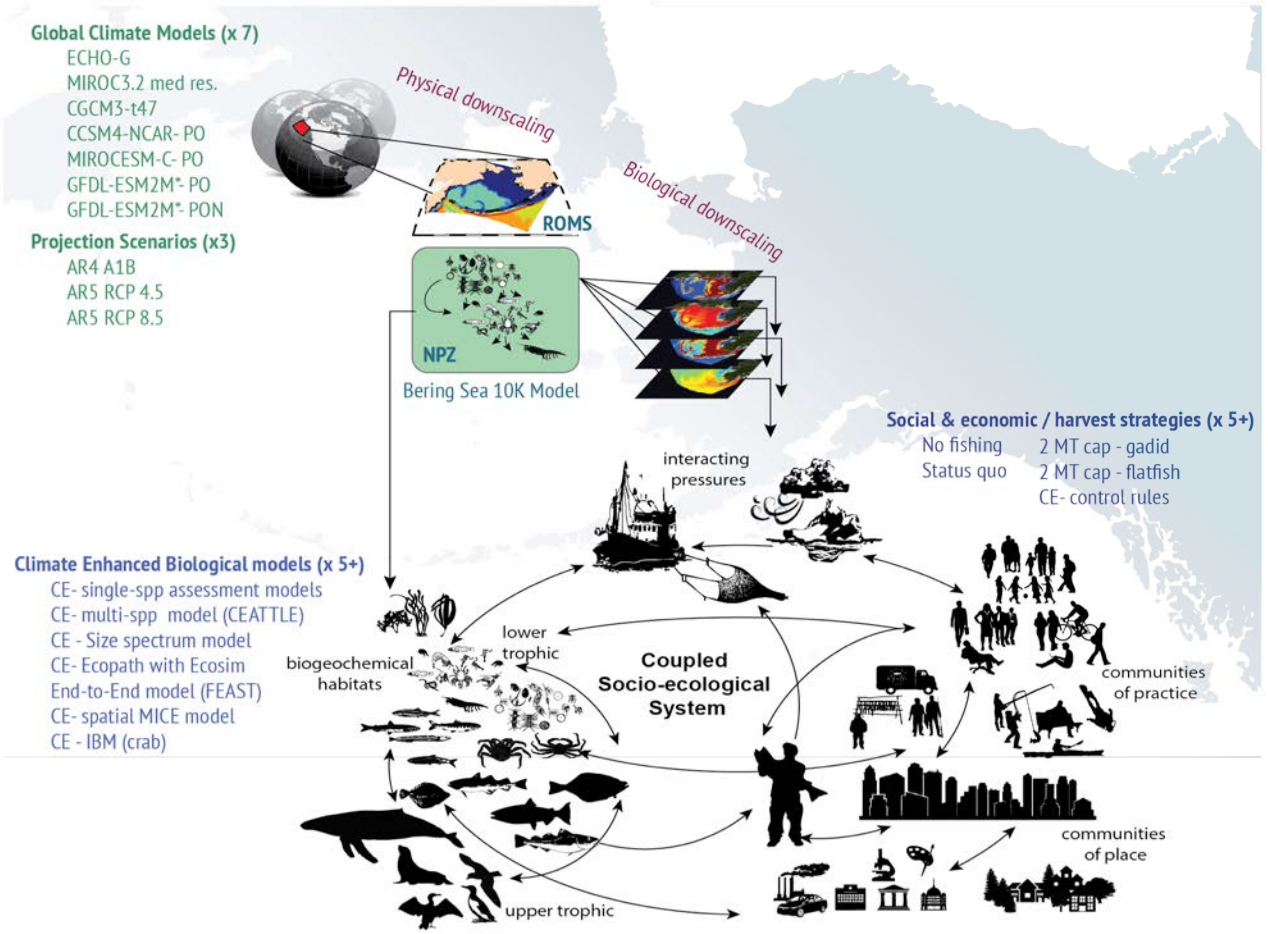
CCTF Iterative process of review and synthesis

- Objective 1: Coordinate the review of existing and emergent climate information on impacts, adaptation, and residual risk.
- Objective 2: Assess key climate change impacts, adaptation actions, and residual risk.
- Objective 3: Summarize and communicate potential risks and adaptation actions.

The Alaska Climate Integrated Modeling Project

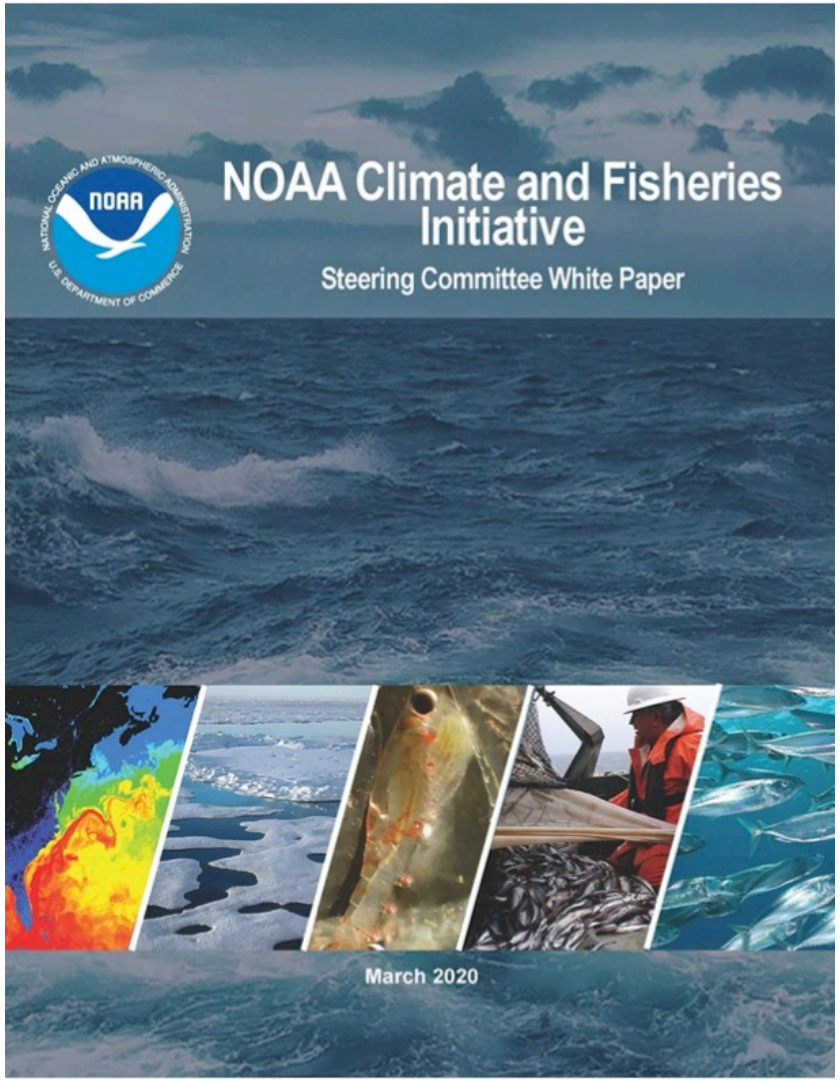
- Southeast Bering Sea
- Funding: NMFS S&T (FATE+SAAM+NPCREP), IEA, RTAP, Economic and Human Dimensions Program, AFSC, OAR)
- Operational suite of coupled socio-ecological models for climate fisheries hindcasts, forecasts, projections and Management Strategy Evaluation

www.fisheries.noaa.gov/alaska/ecosystems/alaska-climate-integrated-modeling-project

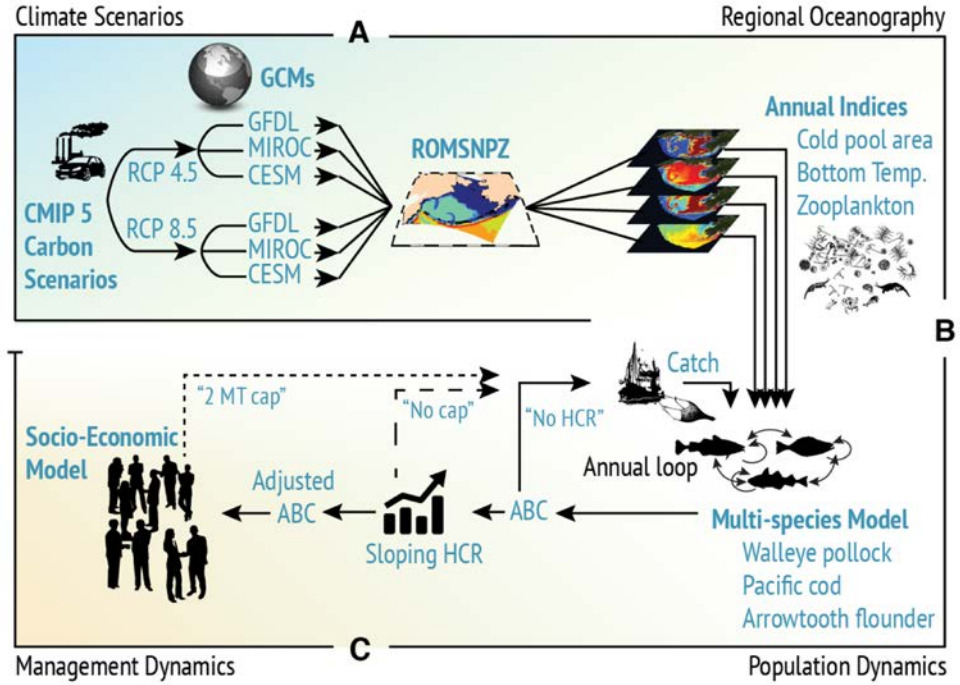


Hollowed et al. 2020. Frontiers in Mar. Sci. doi: 10.3389/fmars.2019.00775

Climate Fisheries Initiative (CFI)



ACLIM as a test bed for operationalized climate-informed fisheries advice



IPCC Assessment Reports

New science on climate change and fisheries

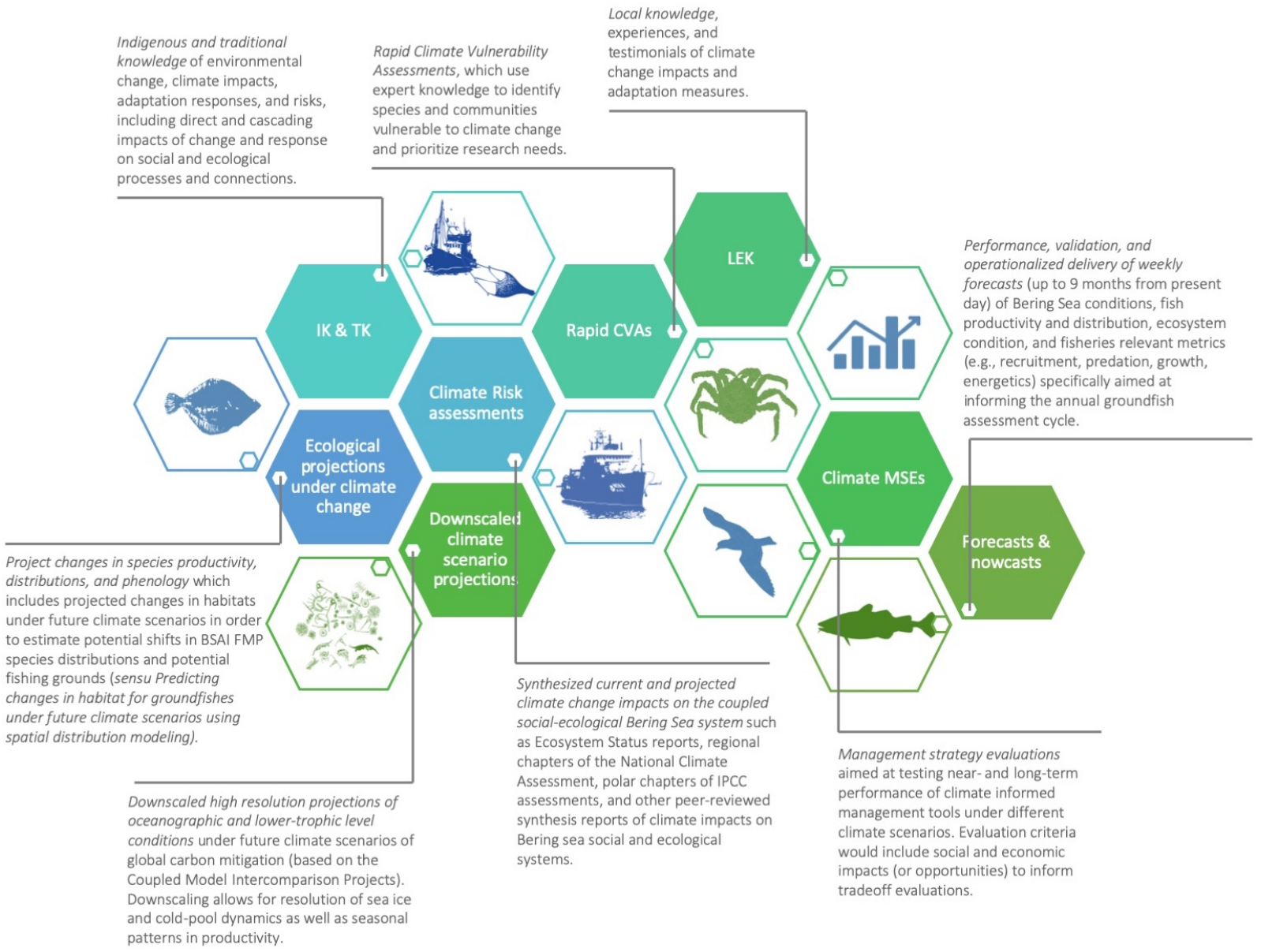
CCTF Iterative process of review and synthesis

- Objective 1: Coordinate the review of existing and emergent climate information on impacts, adaptation, and residual risk.
- Objective 2: Assess key climate change impacts, adaptation actions, and residual risk.
- Objective 3: Summarize and communicate potential risks and adaptation actions.

CCTF Iterative process of review and synthesis

- Objective 1: Coordinate the review of existing and emergent climate information on impacts, adaptation, and residual risk.
- ***CCTF Activity 1.1. Collate existing information and annually coordinate emergent information on climate impacts and adaptation actions***
- ***CCTF Activity 1.2 Support a co-production of knowledge approach to identify the key hazards, impacts and risks for the ecosystem as well as the relative efficacy of, limits to, and tradeoffs among various adaptation actions.***
- Objective 2: Assess key climate change impacts, adaptation actions, and residual risk.
- ***CCTF Activity 2.1. Synthesize the relative efficacy of, limits to, and tradeoffs among various adaptation actions across a range of potential climate and management scenarios.***
- Objective 3: Summarize and communicate potential risks and adaptation actions.
- ***CCTF Activity 3.1 Support climate-informed stock assessment through rapid communication of "red flags" and emergent fishery specific climate issues to stock assessment authors (On-ramp 1)***
- ***CCTF Activity 3.2 Summarize relevant climate change information as a 1-2 page contribution for inclusion in the annual Ecosystem Status Report (On-ramp 2)***
- ***CCTF Activity 3.2 Summarize relevant climate change information as a 1-2 page contribution for inclusion in the annual Ecosystem Status Report (On-ramp 2)***
- ***CCTF Activity 3.3 Synthesize climate impacts, adaptation responses and residual risk in a synthesis report (EBS Climate Change and Fisheries Report; On-ramp 3)***

Examples of sources of climate information (Fig. 5)



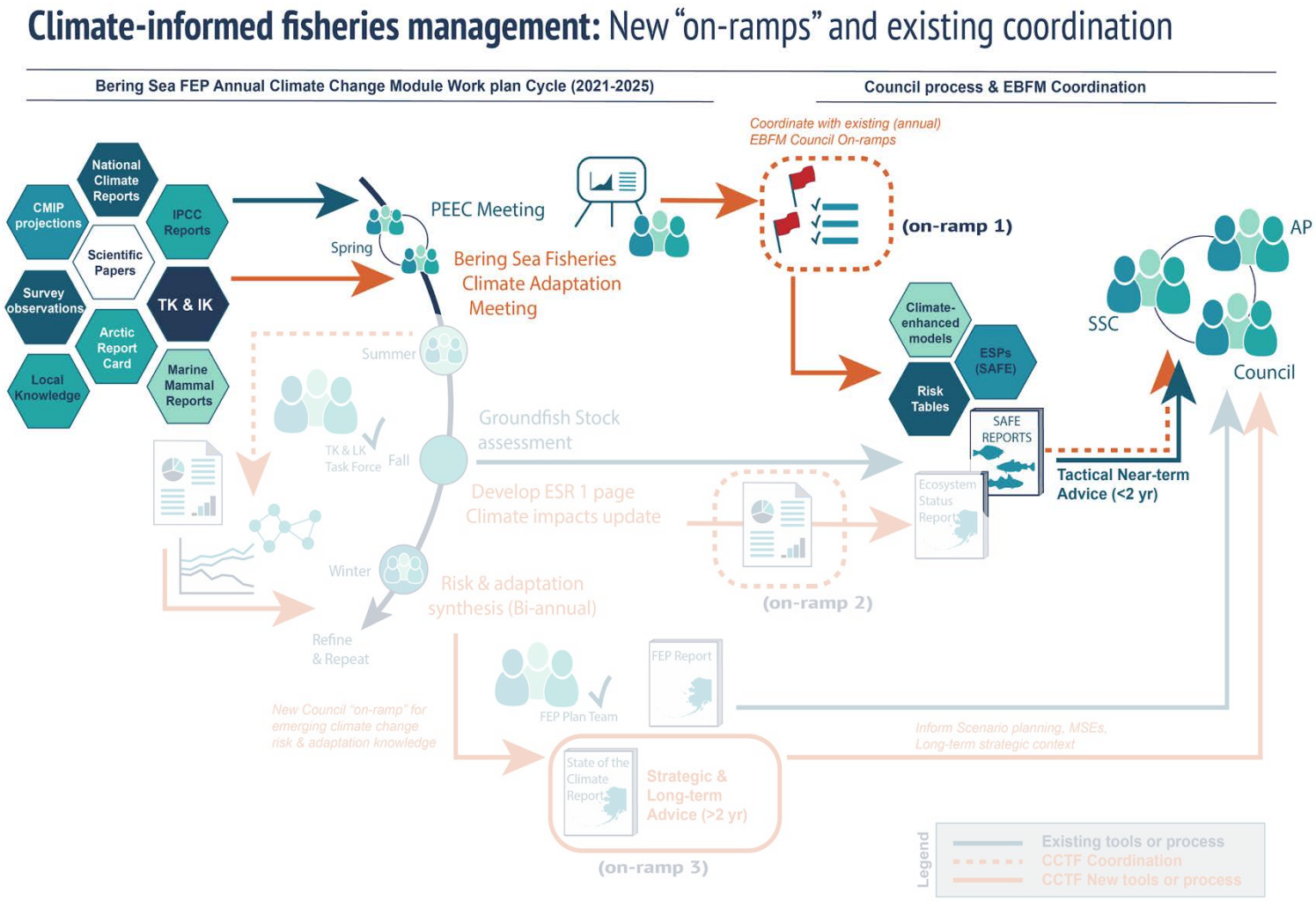
Integrating the module into existing Council process

- "complement existing delivery of EBM advice to the Council process by organizing and synthesizing the breadth of climate information"
- "systematic review of new and emergent climate change information, both immediate and long-term in scope"
- "synthesis and evaluation of key issues, emergent trends, and potential red flags relevant to the Council"
- "communication and iterative review with the LK/TK/Subsistence Task Force and FEP Team to support the diversity of perspectives and knowledge sources needed for evaluations of risk"
- "identification of climate-resilient management actions to enable adaptation to climate-driven change (this particular point would be in the form of recommendations that can be considered by the Council through the Council process)"
- "As much as possible we will work with existing teams and products (such as the Ecosystem Status Report teams) to minimize the amount of reporting and review and avoid duplication of existing efforts."

Products of the CCTF annual process:

On-ramp 1: Climate-informed stock assessment

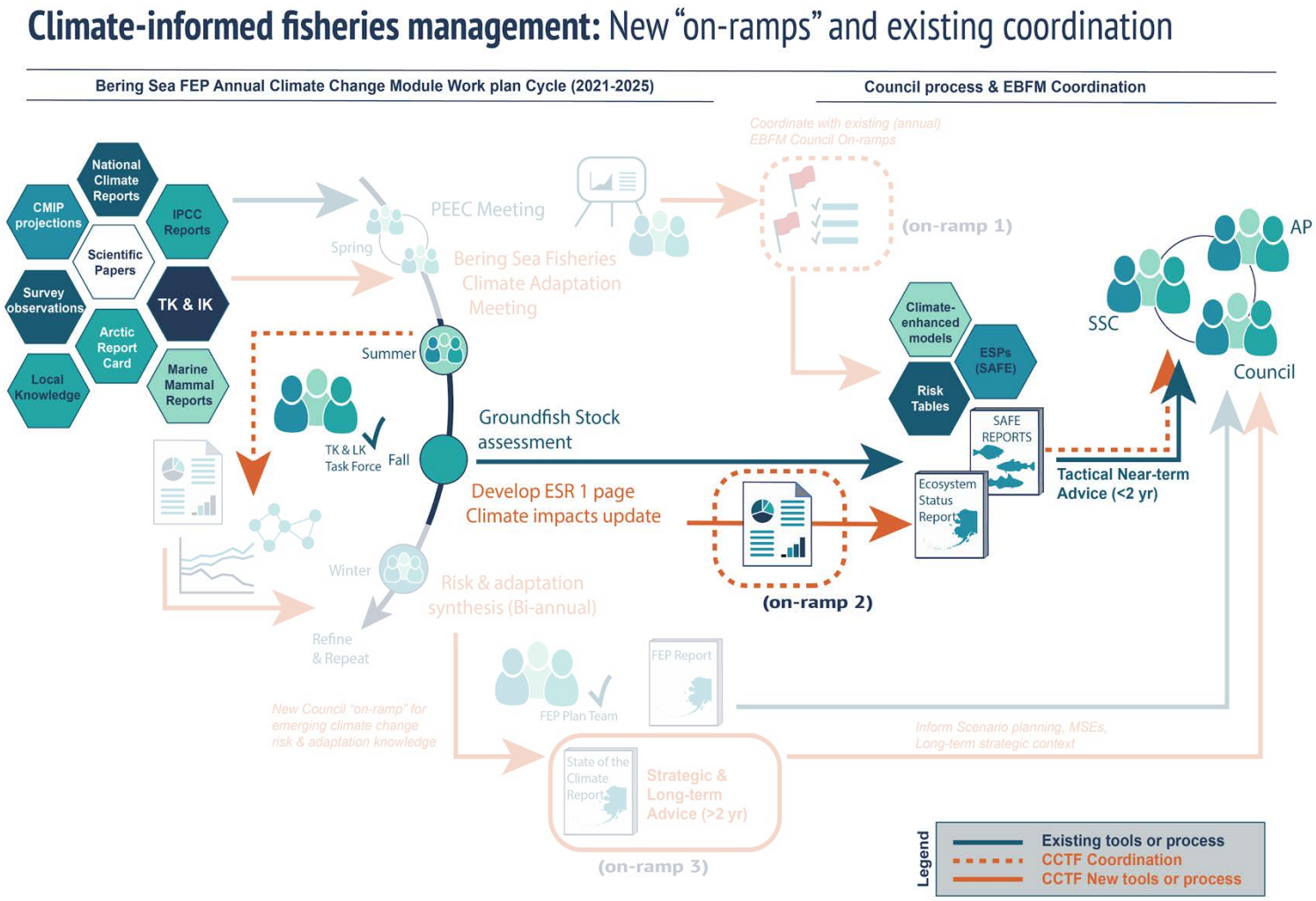
- **When**: Annually as part of the annual stock assessment cycle
- **Who**: CCTF will produce this summary based on review of contributions provided during the Climate Adaptation meetings, as well as synthetic analysis of diverse sources of climate information. CCTF will coordinate information holders with Ecosystem and Socio-economic Profile (ESP) teams and assessment authors to facilitate rapid uptake of climate information into stock assessment.
- **What**: List of potential issues, red flags, and stock-specific indicators and emergent issues for possible consideration in climate-enhanced stock assessments (e.g., OA indices, temperature indices, changes in habitat area). CCTF will coordinate knowledge holders with ESP leads to help increase the speed of uptake of climate information into tactical decision making (as is deemed appropriate).



Products of the CCTF annual process:

On-ramp 2: Climate-informed strategic advice

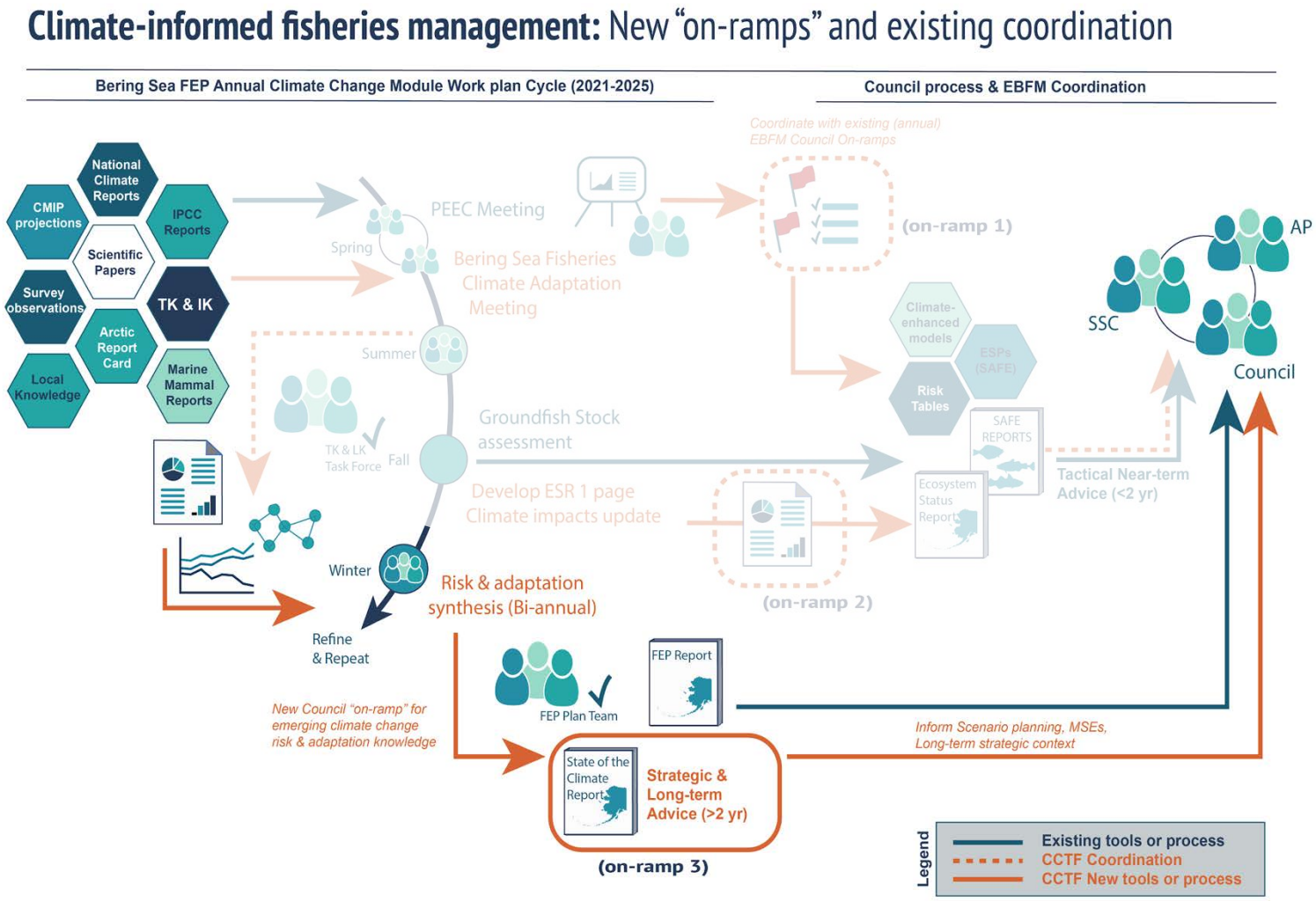
- **When**: Annually as part of the annual stock assessment cycle
- **Who**: CCTF will produce this summary based on contributions provided during the Climate Adaptation meetings (and shared with permission from knowledge holders and with clear attribution of authorship, following and consistent with the approach of the Ecosystem Status Report), and synthetic analysis of diverse sources of climate information.
- **What**: This short 1-2 page summary contribution for the ESR provides an annual process to:
  - Review climate change tactical and strategic considerations for the coming year.
  - Provide a multiyear context of climate conditions and changes in the Bering Sea (e.g., past and next 5-10 years, as well as 100+ context) to inform near term management decisions.



Products of the CCTF annual process:

On-ramp 3: Operational synthesis of climate change impacts, risks, and adaptation

- **When**: The report will be bi-annual and in coordination with the Ecosystem Health Report (FEP report)
- **Who**: CCTF will produce this report with input from contributing authors and review from stakeholders and will provide it to the Council and public
- **What**: EBS Climate Change and fisheries report
  - Synthesis of diverse knowledge about climate change effects, evaluation of the scope of impacts from such change, suggestions about tools to aid in decision-making, and on-ramps for climate information into the Council process
  - Evaluation and summary of key risks and short-, medium-, and long-term adaptation measures across a range of climate scenarios (updates to Table 1)
  - Recommendations for short-, medium-, and long-term actions that could be considered and initiated through the Council process
  - Review of additional ways in which climate information can be on-ramped and operationalized within the Council process (through coordination with LK/TK/Subsistence Taskforce)

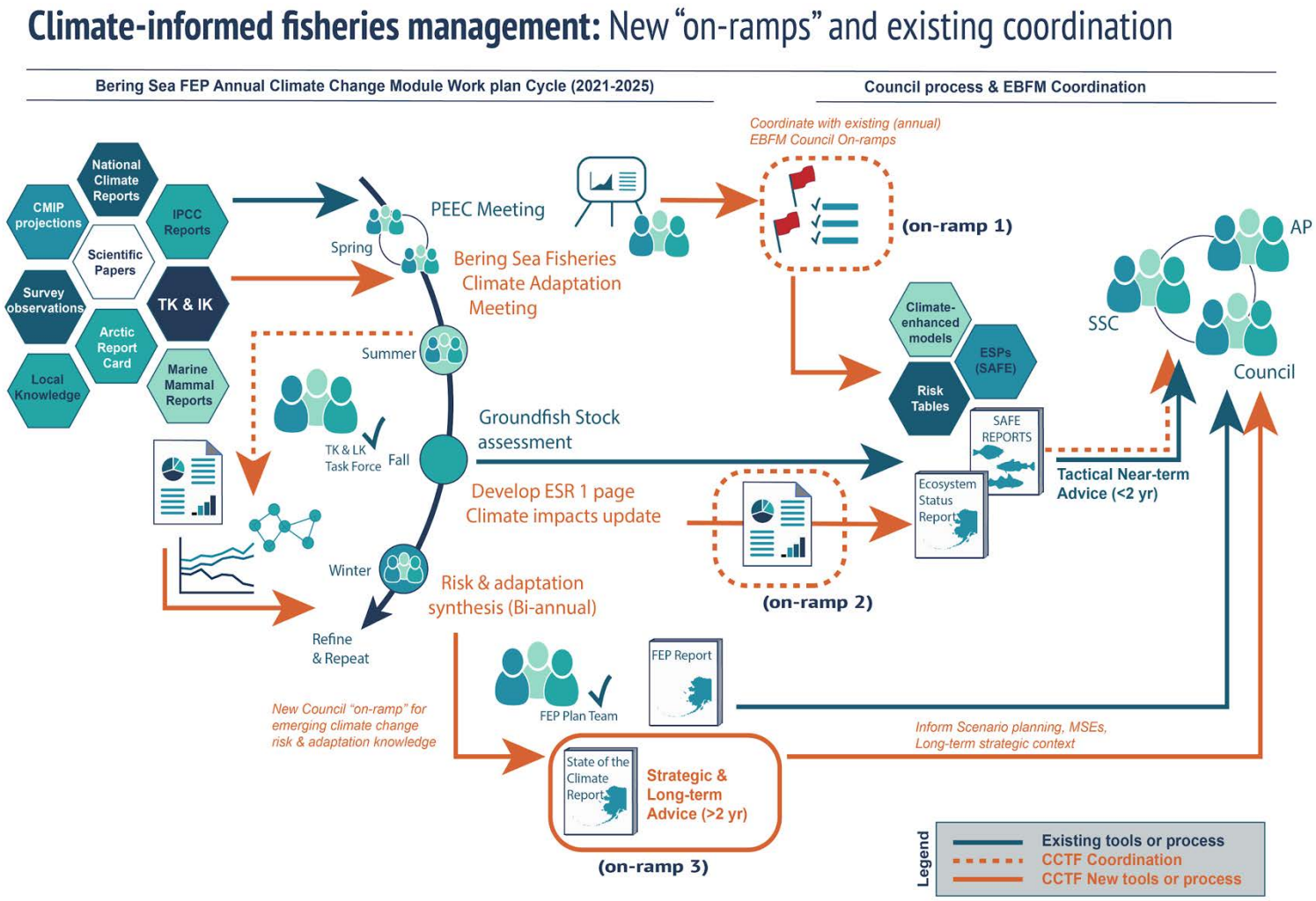


Products of the CCTF annual process:

CCTF additional products (Iteratively devel.):

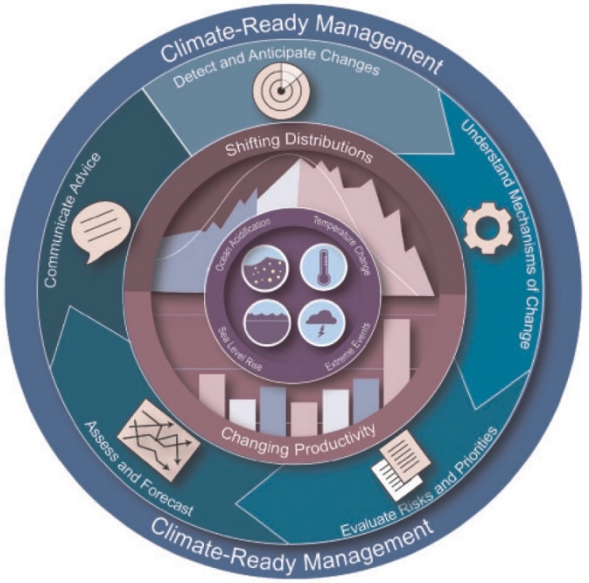
- Synthesis Report Appendices:
  - Adaptation Briefing Note
  - Resilience Briefing Note
  - Climate Briefing Form and Process
  - Table of climate change drivers, impacts, potential policy/management responses, targets, and gaps/needs
  - Adaptation and Climate Testimonial workshop summaries
- Coordination with LK/TK/Subsistence Taskforce and the BS FEP Team to communicate issues/topics of joint relevance,

- Periodic updates with SSC, Plan Teams, and Ecosystem Committee to provide interim synthetic climate information



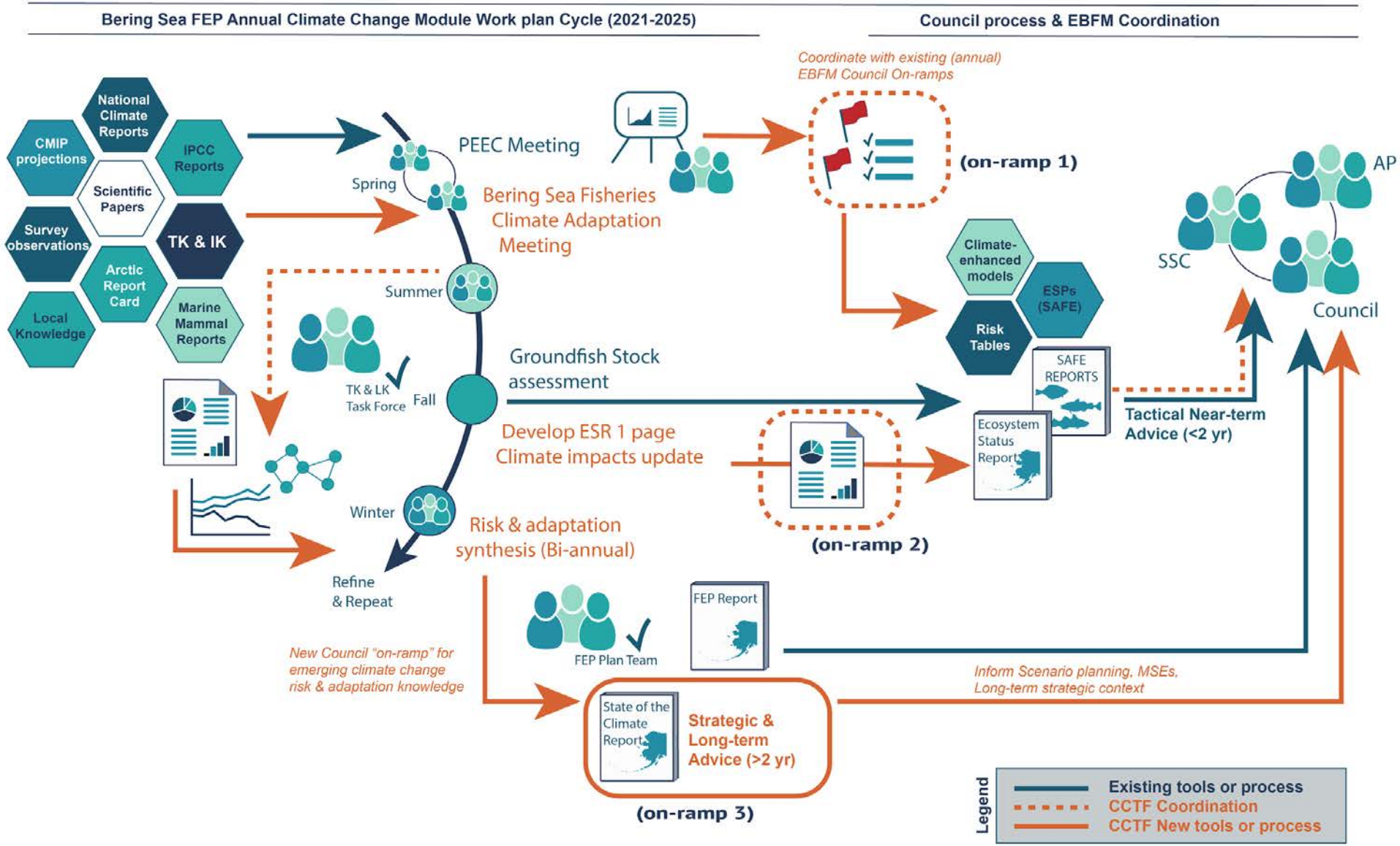
Feedback from Ecosystem Committee

- How frequently would you like to hear from the CCTF? 6 mo? Annually?
- 2021-2022 Can we include a climate topic/breakout session in the Ecosystem workshop? Or should we start the "Bering Sea Fisheries and Climate Adaptation meeting" in 2021?
- Workplan feedback or questions?



Karp et al. 2019. Accounting for Shifting Distributions and Changing Productivity in the Development of Scientific Advice for Fishery Management. ICES JMS doi: 10.1093/icesjms/fsz048

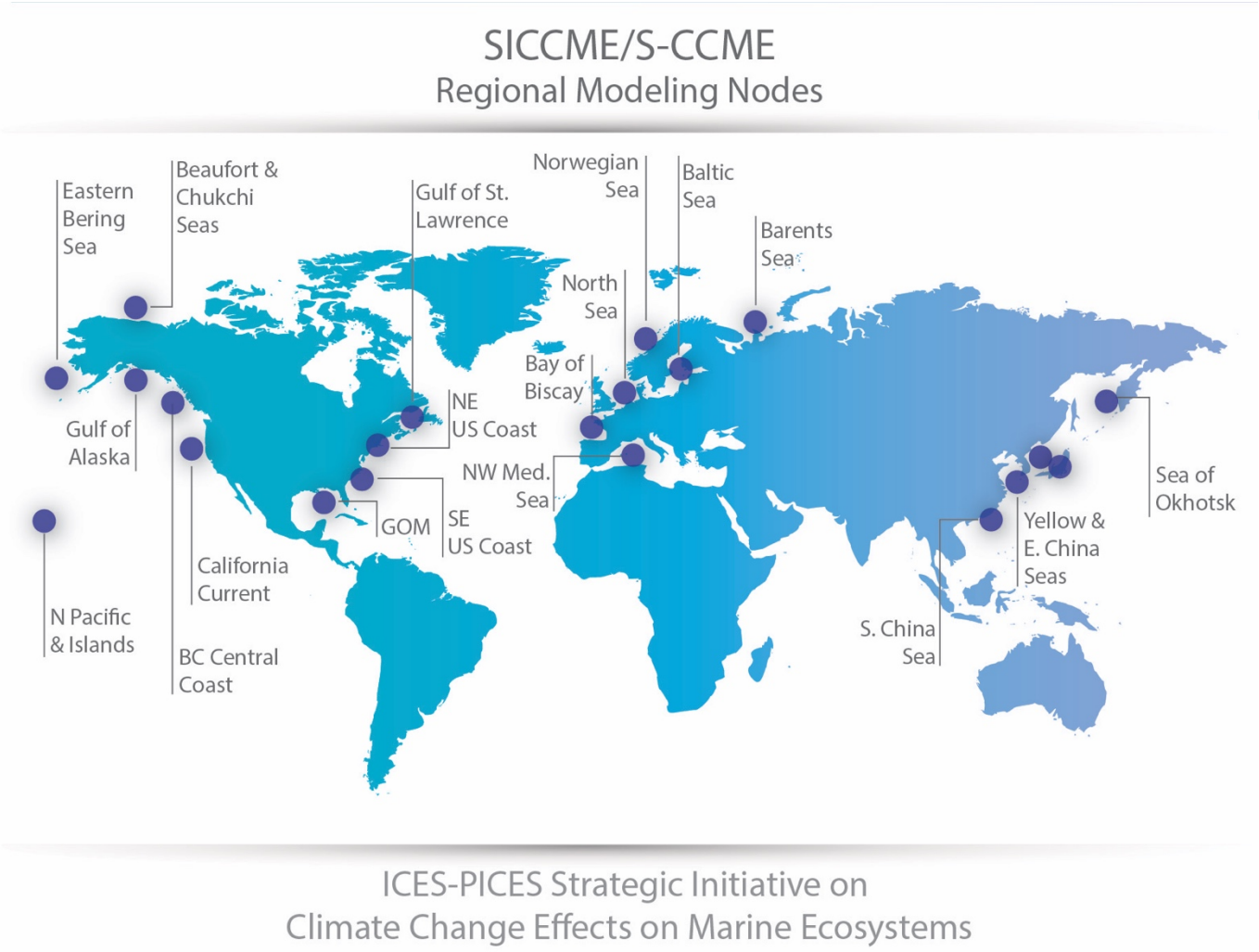
Climate-informed fisheries management: New "on-ramps" and existing coordination



Glossary of Terms

- IPCC : United Nations Intergovernmental Panel on Climate Change
- NOAA : National Oceanic and Atmospheric Administration
- NMFS : National Marine Fisheries Service
- Council : North Pacific Fisheries Management Council
- CE - : “Climate Enhanced” -
- GCM : General Circulation Model (Global in scale)
- RCP : Representative (carbon) Concentration Pathway
- FEP : Fisheries Ecosystem Plan
- ROMS : Regional Ocean Modeling System
- NPZ : Nutrient Phytoplankton Zooplankton Model
- CEATTLE : Climate Enhanced Assessment with Temperature and Trophic Linkages & Energetics Model
- FEAST : Forage and Euphausiid Assessment in Space and Time model
- SES : coupled Social-Ecological System

EXTRA SLIDES



ICES/PICES Strategic Initiative on Climate Change Impacts on Marine Ecosystems

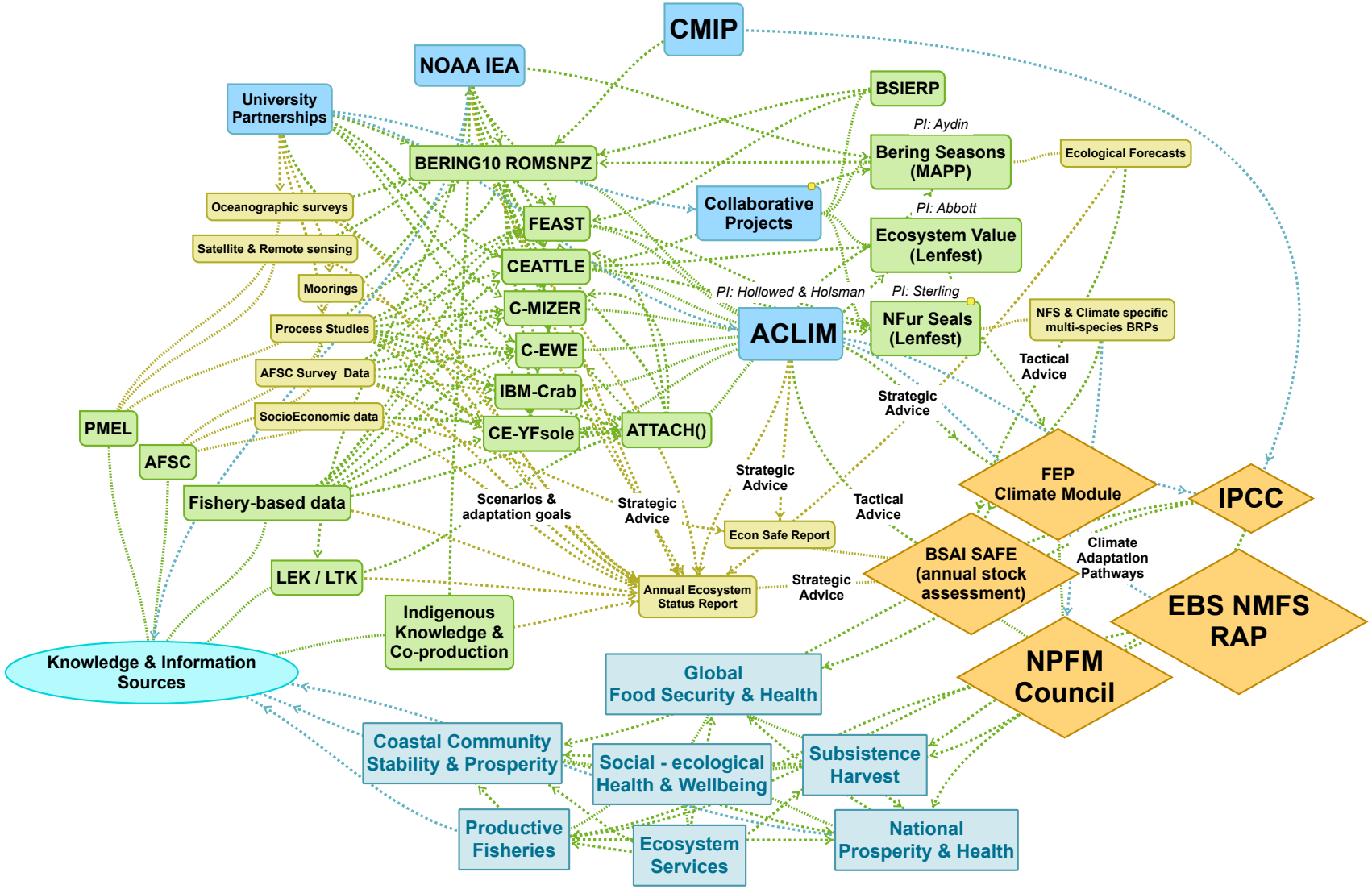
2011- present

Chairs:

Kirstin Holsman (USA, PICES)
Shan Xiujuan (People's Republic of China, PICES)
Christian Möllmann (Germany, ICES)
Mark Payne (Denmark, ICES)

PICES S-CCME: https://meetings.pices.int/members/sections/S-CCME#products
ICES SICCME : https://www.ices.dk/community/groups/Pages/SICCME.aspx

AFSC multiple projects & science



Indicators

FEP Goals Climate Change Module

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Climate driver/pressure/change

	A	B	C	D	E	F
1	**Climate driver/pressure/change**	**domain**	**Climate indicators**	**sources**	**Notes**	
2	Changes to sea ice	Changes in safety at sea	distance from coast guard centers to fishery centroids	?	Response time for emergencies at sea, cost of saftey operations - f	
3	Increased storm frequency and strength	Changes in safety at sea	Wind strength-days	see Lisa Pf[illegible]er 's work (NWFSC)	Decreased predictability and increased variability in weather patterns, with a variety of effects, including for safety	Centroids of abundance
4	Increased storm frequency and strength	Harbor/infrastructure of small boat harbors	annual cost of armoring and reinforcing/ maintence	Could[illegible]act fisheries management b[illegible]cause t[illegible]e is a lack of infrastructure for small sca[illegible] fishing boats (e.g., pribs)		
5	Changes to sea ice	Changes in subsistence resource access	Sea ice thickness	[illegible] and LK reports, remote sensing, [illegible]ycast models	Reflects sea ice stability, strength, seal breeding potential, access to hunting grounds	Decreases in ice and impacts of that on subsistence resources and hunting
6	Changes to productivity	Changes in marine mammal subsistence resource access	Seal counts [illegible]d [illegible]ter rep[illegible]rt	[illegible]K and LK reports	Seal counts already included in ESR	
7	Economic stability of coastal communities					
8	Multiple climate drivers	Changes to wellbeing	[Lau[illegible]and [illegible]enden - [illegible]lp!]			
9	Multiple climate drivers	Changes to social cohesio[illegible]	? [Lauren[illegible]nd Br[illegible]den - help!]			
10	Changes to sea ice					
11	Changes to cold pool	Catchability for yellowfin sole	Ste[illegible]n[illegible]s of the isotherm	Model estimates	Indicates herding of yellowfin sole	
12	Changes to sea ice	Changes in forage rates on bivalves (in open water areas)	Spectacled eider abundance and southern distribution	Fish and wildlife survey	Indicator of bivalve forage predation impacts	
13	Multiple climate drivers	Changes in fish distribution and fishery access	Proportion of catch by reporting area/ EBS grid	VMS - Upward facing acoustics, shared data collaborations, mean distribution of fishing activities; CP (hook and line), residence time by lat	Indicator of fraction of the stock that has left FMP area/ EEZ	
14	Multiple climate drivers	Changes in fish distribution and fishery access	Residence time by lat/lon (northern location	VMS - Upward facing acoustics, shared data collaborations, mean distribution of fishing activities; CP (hook and line), residence time by lat	Indicator of fraction of the stock that has left FMP area/ EEZ	
15			Coastal erosion rates			
16	Changes to sea ice		Changes in cold pool			

DRAFT

ACT Meeting template

An example…..

Arctic Answers
Science briefs from the Study of Environmental Arctic Change
https://www.searcharcticscience.org/arctic-answers

How is diminishing Arctic sea ice influencing coastal communities?

THE ISSUE. Loss of sea ice, thawing permafrost, reduced snow cover, and rising sea level are reducing hunting and fishing opportunities and degrading infrastructure for rural Arctic communities. Most Alaska Native communities are affected by erosion and flooding, with 31 communities imminently threatened and 12 planning to relocate. Local responses to these stresses are hampered by the nation's highest prices for food and fuel and widespread poverty across rural Alaska.

WHY IT MATTERS. Climate change amplifies challenges confronting Arctic communities, where 60-80% of households depend on wild game and fish for food, harvesting several hundred pounds per person annually. Already faced with economic, social, and cultural changes, traditional ways of life in rural Alaska are further threatened by climate change impacts on diminishing food security, deteriorating water and sewage systems, increasing risk of accidents, and greater expenditures to construct and maintain infrastructure. Government agencies and other institutions need to promote policies that reduce stresses on Arctic communities and foster responses consistent with local economies and cultures.

STATE OF KNOWLEDGE. Arctic communities and scientists have worked together to document local observations of climate change; the associated impacts on hunting, fishing, safety, and food security; and the potential impacts of projected changes into the future. More recently, researchers have been assessing the efficacy of local responses. For example, subsistence whalers on St. Lawrence Island in the Bering Sea have initiated a fall harvest to help make up for spring whaling seasons made shorter by changing ice conditions. At Kivalina—a village that is also facing relocation due to erosion—changing spring ice conditions have prevented the harvest of bowhead whales for over 20 years. In other cases, changes can amplify one another. Limited time off from jobs means that whalers from Nuiqsut now have much shorter time available for whaling in fall. In Alaska's Arctic region, 78% of Native Iñupiat households combine jobs and subsistence to meet their economic, cultural, and nutritional needs. The benefits of employment are lessened, however, by the reduction in time devoted to harvesting wild foods. Less time to hunt means less chance to wait out fall storms or to adapt to other changes in weather or animal migration patterns. Those migration patterns may be further altered as diminishing sea ice opens opportunities for industrial activities (for example, shipping and offshore petroleum development). The cumulative effects of stresses and changes are broadly recognized but difficult to measure.

Map of the 11 Alaska traditional whaling communities, with the 2015 and 1981-2010 median September ice extents shown.

June 2017

WHERE THE SCIENCE IS HEADED. More work is needed to understand how local responses can be effective (such as the St. Lawrence Island fall whaling season) as well as how they fall short of what is needed (such as Kivalina's inability to hunt in spring). In addition, future research must address ways that policies exacerbate or mitigate such impacts, for example by imposing additional constraints on what communities can do, or by supporting flexibility and local initiative to solve problems. Actions made without adequate knowledge of local conditions, no matter how well intentioned, may undermine local well-being by promoting ineffective responses or fostering dependence on outside intervention rather than on local talent, capacity, and creativity. Ultimately, communities need support to identify local solutions.


Iñupiat hunters establish a whaling camp on coastal sea ice near Utqiaġvik (formerly Barrow), Alaska, where thinning ice and warming temperatures in Spring are reducing hunting opportunities and increasing risks to personal safety. (Courtesy: M. Druckenmiller)

FURTHER READING

Chapin, F.S., III, S.F. Trainor, P. Cochran, H. Huntington, C. Markon, M. McCammon, A.D. McGuire, and M. Serreze, 2014. Ch. 22: Alaska. Climate Change Impacts in the United States: The Third National Climate Assessment, J. M. Melillo, Terese (T.C.) Richmond, and G. W. Yohe, Eds., U.S. Global Change Research Program, 514-536. doi:10.7930/J00Z7150. [Available online at: http://nca2014.globalchange.gov/report/regions/alaska]

Goldsmith, S., 2008. Understanding Alaska's Remote Rural Economy, UA Research Summary No. 10, Institute of Social and Economic Research, University of Alaska Anchorage. [Available online at: http://www.iser.uaa.alaska.edu/Publications/researchsumm/UA_ RS10.pdf]

SEARCH: *Advancing knowledge for action in a rapidly changing Arctic*
https://www.searcharcticscience.org/arctic-answers

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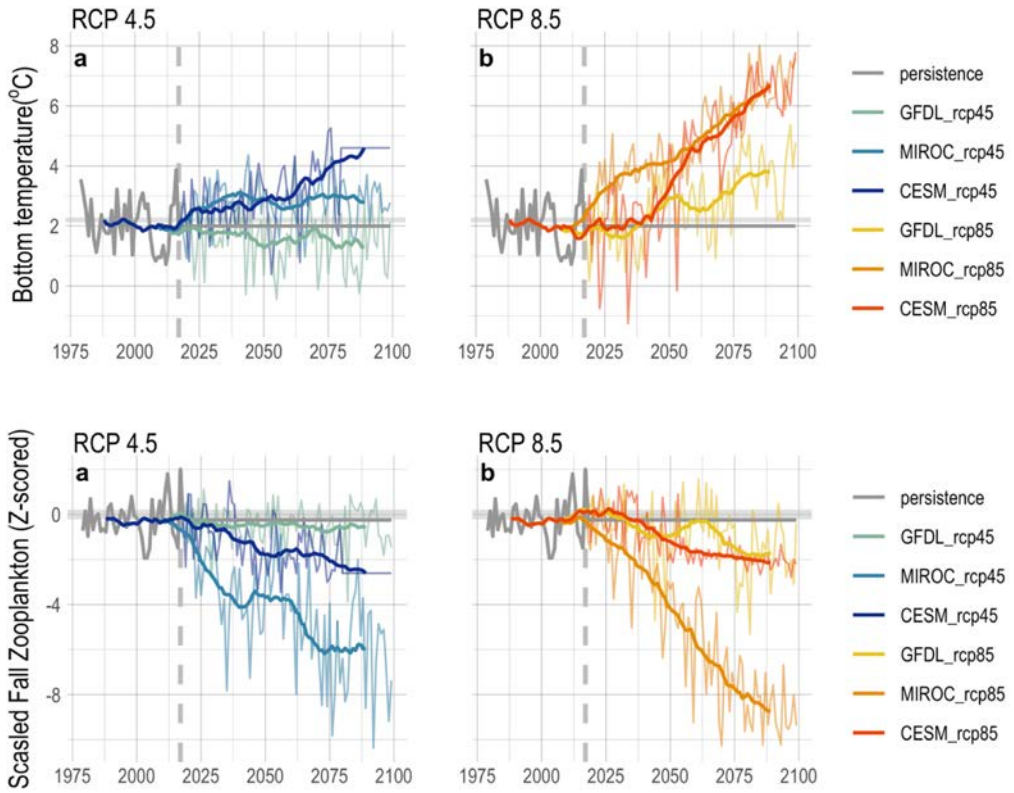
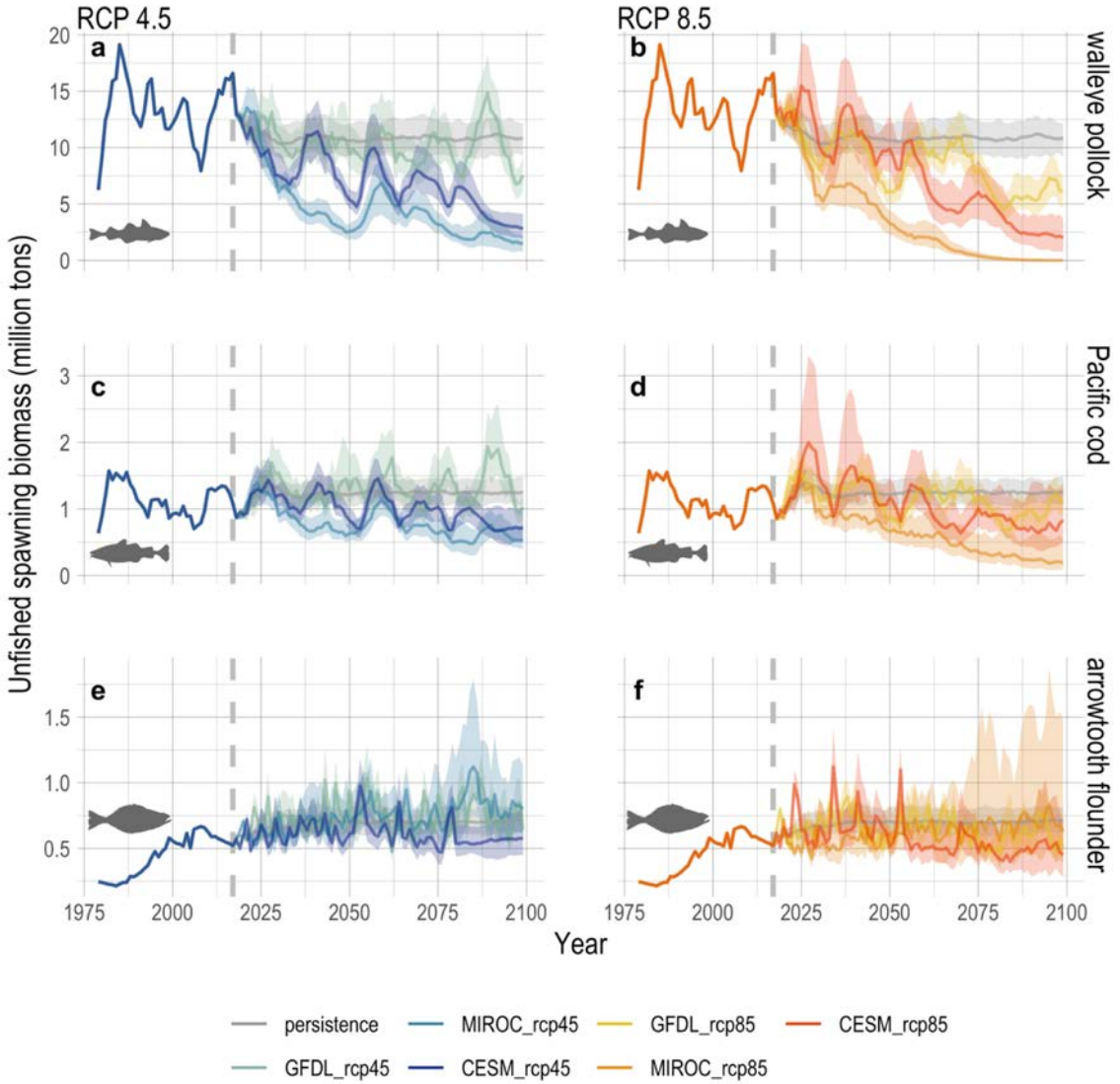
Unfished biomass (no harvest)





Holsman, K.K., Haynie, A.C., Hollowed, A.B. et al. Ecosystem-based fisheries management forestalls climate-driven collapse. Nat Commun 11, 4579 (2020). https://doi.org/10.1038/s41467-020-18300-3