Preparing East Coast Fishing Communities for an Era of Climate Change

Scenario Planning Toolkit

July 2023
Scenario planning is a tool used by organizations to prepare for a future of uncertainty.

From 2021-2023, several East Coast fishery management organizations collaborated in a scenario planning process involving several hundred stakeholders. The objective was to explore how fisheries and governance would have to change to prepare for an era of climate change. The results of that exercise are highlighted on the East Coast Climate Change Scenario Planning webpage, and are described in more detail in the East Coast Climate Change Scenario Planning Summit Report and Potential Action Menu linked on that page.

The process was valuable for fishery managers – and it can be replicated by and for other other stakeholder groups who want to explore how climate change (and other factors) might affect their future. It doesn’t need to take 2 years! You can hold a helpful scenario conversation in a 1 or 2 day session, or even a meeting lasting a couple of hours.

This toolkit is designed to be used by any East Coast fishery stakeholder. It briefly summarizes the ECSP scenario work and offers suggestions for how other groups can use the material to have valuable conversations about the challenges of climate change.
The following sections of slides can be used depending on the goal of the scenario conversation, and the time available

Slides 4-7: Definition of scenarios and explanation of why it can be a valuable process

Slide 8: Identifying the specific reason why to use scenarios

Slides 9-19: Exploring trends and drivers of change to create a scenario framework

Slides 20-26: Describing the ECSP scenario framework and main elements of each story

Slides 27-36: How to use scenarios to generate ideas to prepare for the future

Slide 37: Wrap up slide

Slide 38: Links to additional toolkit resources for conducting a scenario planning effort
The reason why we need scenarios: we’re not good at thinking about the future
What is scenario planning? A way of asking better questions about the future

What **will** happen?

What **should** happen?

What **might** happen?

“Scenarios are stories about the ways that the world might turn out tomorrow...”

“Scenario planning uses provocative stories about the future to help change the minds and actions of a group of people”
Benefits of scenarios

1. Quicker reactions to a changing world
2. Early and broad risk identification
3. Innovative ideas
4. More considered decisions and flexible plans
5. Trust-building and alignment towards a preferred future
Steps in a Scenario Process

1. Identify Issues to Address
2. Look Ahead: Driving Forces
3. Building Blocks
4. Scenario Frameworks
5. Build Out Scenarios/Identify Implications
6. Generate & Prioritize Options
7. Communicate & Continue
Step 1: Identify Issues to address

Scenario planning should always be used for a reason (not just for the sake of “doing scenarios”).

Any organization or group should ask the question: what’s the problem to solve?

For the ECSP process, fishery managers wanted to look in detail at how governance and management issues will be affected by climate driven change in fisheries, particularly changing stock availability and distributions. The scenarios focused on exploring how climate change might affect east coast fisheries over the next 20 years.

In using these scenarios with other stakeholders, be sure to consider “why” the scenarios can be valuable. What are the issues to address – or the challenges / problems that need to be solved?
Step 2: Looking Ahead - Outside-In Thinking
Physical Drivers of Change

Rapid warming across much of the East Coast

Acidification in upper ocean, but impact on shell formers more connected to water saturation

Climate change affects net primary production, varies with latitude

Warming and stratification lead to widespread oxygen declines

Oceanographic Drivers of Change Webinar Briefing February 2022

Slide extracts from Charlie Stock’s webinar presentation
Most species have shifted their distribution, often driven by temperature. We’ve also seen changes in migration timing.

Warming has influenced stock productivity, with larger influences on overfished populations. More significant responses in populations with faster life histories. Negative influences of species at the southern end of their range.

Many species body sizes getting smaller. Disease becoming more prevalent. Combined effects of warming, acidification and hypoxia can be synergistic.
Social & Economic Drivers of Change

Demand / market conditions are shaped by: changing consumer preferences; new technologies creating alternatives to wild-caught / local seafood; international trade / supply chain issues

Fisheries might also be affected by: commercial ocean activity (e.g. offshore wind); population growth in coastal towns; demand for scarce waterfront space; various regulations

Fuel costs, crew wages, distances to port, availability of support services likely to affect business viability and ability to adapt to changing conditions

Social & Economic Drivers of Change Webinar Briefing March 2022

Slide extracts from Doug Lipton’s webinar presentation
Step 3: Scenario Building Blocks

**Pre-determined Elements**
Factors or forces that are ‘locked-in’ and confidently predictable over the time horizon

**Critical Uncertainties**
Important forces that have the potential to move in alternative directions over the time horizon

**Wildcards**
Low probability events and developments that could impact the future in significant ways in the time horizon
1. Ocean temperatures continue to warm, affecting marine species biology & distribution
2. Regions exhibit differences in seasonal temperature changes
3. Primary production changes differently in different regions
4. Sea levels rise
5. Changing ocean uses create more competition for fisheries
6. Coastal population grows
Wildcards

1. Changes in ocean current systems
2. Series of extreme marine heatwaves
3. Series of Harmful Algal Blooms
4. Regime shifts caused by losses of critical food resource or changes in food web dynamics
5. Extreme market disruption (e.g. trade war, more pandemics)
6. Devastating hurricane
### Critical Uncertainties

**What might happen by 2042? Physical/Climate Uncertainties**

<table>
<thead>
<tr>
<th>Rapid warming in the NW Atlantic</th>
<th>1. Rates of ocean warming?</th>
<th>AMOC swings toward a cooler state, stalling warming trend</th>
</tr>
</thead>
<tbody>
<tr>
<td>Major effects</td>
<td>2. Impact of saturation of calcium carbonate on shell-formation?</td>
<td>Minor effects</td>
</tr>
<tr>
<td>Minor changes</td>
<td>3. Extent of changes in the Cold Pool?</td>
<td>Significant reduction in size and duration</td>
</tr>
<tr>
<td>Become stronger but less frequent</td>
<td>4. Storm frequency and intensity?</td>
<td>Become much stronger and more frequent</td>
</tr>
<tr>
<td>Impacts limited to specific locations / times &amp; some positive effects</td>
<td>5. Impacts of sea level rise?</td>
<td>Causes significant impacts to many facilities &amp; habitats</td>
</tr>
<tr>
<td>Low, decreasing impact</td>
<td>6. Pollution &amp; nutrient run-off in estuaries?</td>
<td>High, increasing impact</td>
</tr>
</tbody>
</table>
## Critical Uncertainties

### What might happen by 2042? Biological Uncertainties

<table>
<thead>
<tr>
<th>Varies by species &amp; region – hard to generalize and identify</th>
<th>7. Evidence of range expansion / contraction?</th>
<th>More evident, pronounced and consistent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Limited evidence of movement or unpredictable direction</td>
<td>8. Direction of species movements?</td>
<td>Mostly northwards / deeper waters</td>
</tr>
<tr>
<td>Limited, minor</td>
<td>9. Extent of range expansion / contraction?</td>
<td>Extensive, major</td>
</tr>
<tr>
<td>Low - species movement is not replaced by other emerging fisheries in the area</td>
<td>10. Replacement of moving species?</td>
<td>High - most species movement is replaced by other emerging fisheries in the area</td>
</tr>
<tr>
<td>Mostly maintained, worst effects on overfished populations</td>
<td>11. Stock production?</td>
<td>Declines markedly across many populations</td>
</tr>
<tr>
<td>Maintained / as now</td>
<td>12. Disease prevalence?</td>
<td>Much higher</td>
</tr>
<tr>
<td>Low</td>
<td>13. Extent of predation on key species?</td>
<td>High</td>
</tr>
<tr>
<td>Minor, occasional, generally manageable impacts</td>
<td>14. Impact of fishery interactions with protected resources or choke species?</td>
<td>Major, ongoing impacts</td>
</tr>
</tbody>
</table>
### Critical Uncertainties

#### What might happen by 2042? Social & Economic Uncertainties

<table>
<thead>
<tr>
<th>Moderate tech advances, used by few</th>
<th>15. Development and use of technology to support fisheries?</th>
<th>Widely available, used extensively (e.g. gear, tracking, vessels etc.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Declining market and lower prices as market is saturated / highly competitive (e.g. aquaculture, lab-grown fish)</td>
<td>16. Consumer preferences for wild caught and local seafood?</td>
<td>Growing market and higher prices as wild caught / local becomes a premium market</td>
</tr>
<tr>
<td>Marginal or positive effects on species distributions / research efforts etc.</td>
<td>17. Impact of offshore wind installations?</td>
<td>Mostly damaging effects on species distributions / research efforts etc.</td>
</tr>
<tr>
<td>Costs are contained creating profitable opportunities for most</td>
<td>18. Fishing &amp; related industry viability?</td>
<td>Costs rise more quickly than revenues for most operators</td>
</tr>
<tr>
<td>Limited coastal armoring as ‘living shoreline’ alternatives become popular</td>
<td>19. Extent and impact of coastal armoring?</td>
<td>Significant, with widespread effect on habitats</td>
</tr>
<tr>
<td>Leads to damaging competition and less prosperous fishing communities</td>
<td>20. Impact of alternative ocean uses, other coastal developments on fishing communities?</td>
<td>Leads to more prosperous coastal and fishing communities</td>
</tr>
</tbody>
</table>
Key Uncertainties

- **Stock production/Habitat/Replacement species**
  - Declining
  - Levels/health of stock productivity
  - Stock production/Habitat/Replacement species Maintained

- **Patterns of distribution**
  - Regional
    - Unpredictable
    - Coast-wide
    - Mostly predictable

- **Science ability to assess change**
  - Limited/unable to cope
  - Adequate/improving

- **Industry/Player Adaptability**
  - Mostly Low
  - Mostly High
Step 4: Scenario Framework

- Stocks maintained, but hard to assess / locate
- Stocks decline, and are hard to assess / locate
- Stocks maintained, mostly straightforward to assess / locate
- Stocks decline, straightforward to assess / locate
Step 5: Scenario Details - Criteria for Good Scenarios

**Plausible**
- Each scenario has the potential to occur (even if the assessed probability is low)

**Relevant**
- To the challenge outlined in the scoping phase

**Memorable**
- The main concept behind each scenario story is powerful and relatively easy to communicate

**Challenging**
- To most people’s current conventional wisdom

**Divergent**
- The scenarios are clearly different from each other, helping “stretch” thinking in different directions
Ocean Pioneers

- Crazy ocean conditions & weird weather: pendulum swings, boom & busts
- Ocean is resilient – stocks are maintained (in aggregate) with no damaging climate tipping points

- Seasons and locations of traditional fisheries change unpredictably, leading to (e.g.) changes in interactions with protected species
- Traditional stock assessments are less reliable; real-time data from vessels and other users is more valuable than traditional science
- New assessment approaches generate questions over data rights and data aggregation

- Extreme weather often creates dangerous fishing conditions
- Ocean activity (fishing, aquaculture and offshore wind) dominated by entrepreneurs, technology, pioneers
- Winners typically have deep pockets, sharp elbows, new technology and a willingness to take risks

- Uncertainty about how long “abundant” stocks can keep delivering
Unpredictable conditions create climate tipping points with negative impacts to diverse harvest, forage and marine wildlife species
- Storms and population growth create more pollution, reducing the quantity and quality of estuaries and other nearshore habitat
- Diseases are prevalent – several marine heatwaves lead to die-offs
- High stress on fishing operators: costs rise and harvest opportunities are reduced due to low abundance of traditional stocks and new area closures to protect endangered species
- Science appears unable to help the fishery management community adapt; stock assessments rely on insufficient data and constant lawsuits drain management capacity
- Stocks experiencing range shifts are incorrectly classified as overfished; these mistakes undermine the management process
- Low levels of trust between several different stakeholder groups

Conditions require operators to shift effort to lower trophic level species
- Government steps in to save some domestic fisheries, but only a few select fisheries get assistance
- Fishing no longer the dominant activity in the ocean, competing with other industries for space and attention
“Science is good, but the news is bad”
Declining productivity and abundance for many species including harvest mainstays, choke species, and diverse marine wildlife; maximum fish size is smaller
The cold pool continues to shrink in size and duration, negatively impacting diverse species that depend on this pelagic habitat
Range shifts as species move N and E, but not much range expansion

In some regions, management puts limits on newly arriving species, allowing establishment of new reproducing populations; marine wildlife interaction/bycatch challenges are addressed through improved forecasts and fishing community innovation
Successful small-scale fishermen adapt to reduced catch limits and new stocks, supplying limited but lucrative markets

Unsuccessful regions struggle to develop effective responses to challenges like shifting stocks and new marine mammal interactions, leading to fleet consolidation, loss of markets to artificially cheap seafood imports, and the permanent decline of historic fishing communities.

Aquaculture becomes prevalent as a mass source of seafood
Predictable changes and tolerable conditions; sea levels rise gradually
Range expansion as stocks move predictably north & east

Climate mitigation efforts reduce greenhouse gas emissions, with little effect on ocean conditions in the short-term; however, better pollution reduction, habitat protection and restoration reverse a great deal of habitat damage and loss

Science capacity booms, delivering effective ocean monitoring, real-time catch reporting, food web/population monitoring and bycatch avoidance
Species composition has changed, but widespread data means that management can provide for a full and flexible balanced use of available fish stocks
Investment in other ocean/coastal uses leads to competition (e.g. aquaculture) and collaboration (e.g. fisheries science is boosted by wind energy installations)

Recreational sector is healthy thanks to stable productivity and increased coastal wealth, but gentrification creates concerns over accessibility
Steps 5 & 6: Implications and Options

What might conditions be like in 2042?

What challenges and opportunities does this scenario create?

What changes / actions should happen now to prepare for future conditions like this?
Steps 5 & 6: Customized Implication Conversations

Implications conversations can be customized for specific audiences, for example:

• Commercial fishermen
• Recreational fishermen
• Coastal communities
• Fishery managers
• Alternative energy providers
• Aquaculture businesses

Or for specific roles, for example:
• harbormasters,
• charter businesses,
• tourism providers,
• local policy-makers

They can also be customized for specific regions or geographies

What are the main challenges facing [recreational fishermen] in this scenario?

What types of fishery stakeholder struggles in this scenario? What are the prime causes of failure?

What are the main opportunities for [aquaculture] in this scenario?

What types of fishery stakeholder is successful in this scenario? What qualities and resources bring success?
Step 6: Some suggested prompt questions – for options

For each scenario, given the challenges and opportunities,…

- What new investments would you make?
- What new markets or customers would you serve?
- What new relationships would you build?
- What changes in policies or regulations would you want to see?
- What types of skills / experience would you need to develop or recruit for?
- What new information would you need to acquire?
- What new practices would you need to learn and apply?
- What existing practices should you stop doing?
Step 6: ‘Placing Bets’ Across A Scenario Matrix

**ROBUST**: Pursue those options that would work out well (or at least not hurt you too much) in any of the four scenarios

**HEDGE**: Make several distinct bets of relatively equal size, then wait and see what happens

**BET THE FARM/VISIONING**: Make one clear bet that a certain future will happen — and then do everything you can to help make that scenario a reality

**CORE/SATELLITE**: Place one major bet, with one or more small bets as a hedge against uncertainty (experiments)

**EXTREMES**: Prepare for, or prevent, a worst-case scenario
Fishery Managers were concerned with...

Ocean Pioneers

1. Cross-Jurisdictional Governance

2. Managing Under Increased Uncertainty

Unpredictable changes & conditions, low ability to assess

Compound Stress Fractures

3. Data sources and partnerships

Predictable changes & conditions, high ability to assess

Checks & Balance

Sweet & Sour
More detailed decisions follow from there

**Cross-jurisdictional Governance**
- Reevaluate Council committee structure, use, and decision making
- Re-evaluate and potentially revise Advisory Panel representation
- Develop joint management agreements with aim of clarifying roles and increasing efficiency
- Improve coordination across NOAA offices and regions

**Managing under Uncertainty**
- Identify ecosystem-level contextual information that can be considered within the management process to help incorporate climate information into decisions
- Streamline FMP documentation and rulemaking

**Data Sources and Partnerships**
- Expand study fleet, include recreational fisheries, and ensure data are used
- Use survey mitigation around offshore wind to transition to industry-based surveys or other survey platforms
- Improve the use of existing data.
Step 7: Communicating Scenarios
Step 7: Continuing Scenario Conversations

It is worth returning to the scenario framework at regular intervals following a scenario project. This can be done to address two separate goals.

First, periodically (e.g., annually) assessing the current state of conditions is useful for tracking change and determining if conditions are moving toward an identified scenario or in an unexpected direction.

Second, the scenarios can be used as a “wind tunnel” to assess how different management options being considered in a regulation could play out across the already identified plausible future scenarios.
On a regular basis, groups should discuss whether conditions have changed, and whether a different or new scenario should now be considered.

To do this, groups should track “indicators” - key developments and dynamics in the external environment that suggest that a particular scenario seems to be unfolding in the real world.

For the ECSP scenarios, this will mean looking closely at evidence for changing ocean and stock conditions. As new evidence emerges about changing conditions, groups should consider if new actions are needed, or if existing practices should be changed. Maybe actions that were not prioritized in 2023 become more relevant in later years?

Continuing such conversations ensures that a plan remains flexible against changing conditions.
When new regulations are being considered, groups should discuss how the alternatives being considered would play out in the existing scenarios.

Potential questions to ask are:

- Are there management alternatives that would be more successful in the existing scenarios than others? Re-look at the Step 6 slide on “placing bets” (see slide 30)
  - Do any management alternatives represent a robust opportunity?
  - Do any management alternatives represent a “bet the farm” option?
  - Do any management alternatives help us prepare for, or prevent, a worst case scenario?
- Do any of the management alternatives limit or increase future management adaptability?
- Do any of the management alternatives limit or increase the adaptability of the fishermen, fishing businesses, or fishing communities?
“Scenarios are stories. They are works of art rather than scientific analyses. The precision of [their content] is less important than the types of conversations and decisions they spark.”

Arie de Geus, The Living Company

De Geus is a former corporate planning director for Royal Dutch Shell. Shell pioneered the application of scenario planning to the business world.

For more information on the ECSP project, or for more resources on scenario planning, please visit https://www.mafmc.org/climate-change-scenario-planning
Links to Additional Toolkit Materials

1. Designed worksheets (scenario creation, idea generation)
2. Timed agendas for scenario discussions (various durations)
3. Guidelines for scenario small group facilitators
4. Language for scenario ground rules and session expectations
5. Description of alternative scenario creation approaches
6. Suggestions for ongoing ‘monitoring’ conversations