

East Coast Climate Change Scenario Planning

Building Blocks for Scenario Creation

Scenarios are stories about the ways that the world might turn out tomorrow. Creating scenarios requires a broad understanding of the *drivers of change* that are poised to shape the future. This document outlines the drivers that we will use in the Scenario Creation exercise on June 21-23. Please review this material in advance. There will be time allocated at the workshop to discuss this with fellow participants, and to make any modifications or additions to the lists.

These drivers are categorized into three types:

- A. Pre-determined Elements:** these are drivers that are confidently predictable over the next 20 years. We can confidently assume that these trends will feature in any scenario that describes the future out to 2042.
- B. Wildcards:** these are surprising events and developments that could impact the future in significant ways over the next 20 years. A wildcard has the potential to reshape a system.
- C. Critical Uncertainties:** these are important drivers that have the potential to move in various, alternative directions over the next 20 years. For the purposes of this exercise, we have described the potential outcomes of the driver in two opposing directions. Your task is not to decide which outcome is more likely, but instead to imagine what would happen if specific outcomes were to occur in future. These have been categorized into three buckets: (i) oceanographic / physical / climate; (ii) biological, (iii) social & economic.

At the Scenario Creation workshop, you will be involved in exercises that combine these drivers of change to create scenarios.

- A. Pre-Determined Elements:** drivers that we can confidently assume will feature in any scenario that describes the next 20 years of East Coast fisheries, including:
 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

B. Wildcards: surprising events and developments that could impact the future of East Coast fisheries in surprising ways over the next 20 years, including:

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

C. Critical Uncertainties: important drivers that have the potential to move in alternative directions over the next 20 years. These are framed as 'either-or' directions. Critical uncertainties are listed in the tables below, grouped by physical/oceanographic, biological, and socioeconomic drivers.

*For example, the first critical uncertainty can be read as. What might happen to **rates of ocean warming** by 2042? Will there be rapid warming in the NW Atlantic, or will the AMOC (Atlantic Meridional Overturning Circulation) swing toward a cooler state, stalling the warming trend?*

Physical / Climate / Oceanographic Critical Uncertainties

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

Biological Critical Uncertainties

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

Social & Economic Critical Uncertainties

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