Climate Impact Profile Template

# Brief Intro to the region:

Potential Sources to draw from:

## For system-level changes:

* ***IPCC Regional Climate Impacts report****:* [*https://www.ipcc.ch/report/ar5/wg2/*](https://www.ipcc.ch/report/ar5/wg2/)
* ***FAO report on Impacts of climate change on fisheries and aquaculture****:* [*http://www.fao.org/documents/card/en/c/I9705EN*](http://www.fao.org/documents/card/en/c/I9705EN)

### Climate vulnerability assessments:

* **Comprehensive Assessment of Risks to Ecosystems (CARE):** <http://fishe.edf.org/data-center/ecosystem-assessment>
* **Climate Adaptation Toolkit for Marine and Coastal Protected Areas (CAKEX)**: <https://www.cakex.org/MPAToolkit>

*Clarify the spatial boundaries of the system being assessed. Describe the physical and oceanographic features that define the region, and briefly discuss dominant ecosystem types and key fisheries of interest.*

## Climate/ latitude zone:

*E.G.:*

* *Polar*
* *Temperate*
* *Sub-Tropical*
* *Tropical*

## Relevant bio-physical features that may be impacted by, or affect the systemic impacts of, climate change:

*E.G.:*

* *Biogenic habitats (list) and their connectivity*
* *Semi-enclosed or enclosed body*
* *Other dominant system features:*
  + *Freshwater input system*
  + *Ice-dominated system*
  + *ENSO or PDO dominated system*
* *Open ocean*

# Likely climate-driven marine ecosystem changes:

*Drawing on the sources listed above and others as available, summarize the key climate impacts expected in this region in the physical and lower biological (i.e., primary production) components of the ecosystem, filling in any available details in the applicable categories below.*

* *Temperature changes*
* *Chemical changes, including changes to: pH; dissolved oxygen; salinity; nutrients; UV radiation.*
* *Weather/ climate pattern changes, including long-term climate patterns (ENSO; PDO)*
* *Changes to wave and current patterns, water mixing, and/ or upwelling/ downwelling*
* *Sea level rise and sea ice changes (cover and thickness)*
* *Erosion, turbidity, and ocean color changes*
* *Biogenic habitat loss (e.g., mangroves, coral reefs, seagrasses, etc.)*

# Likely fishery-relevant impacts of those changes:

Potential Sources to draw from:

## For species-specific changes:

* **FishCast** – Shiny App that predicts climate-driven species range shifts at the individual country level: <https://emlab-ucsb.shinyapps.io/fishcast2/>
* **Aquamaps** – Global distribution maps for over 33,500 species of fishes, marine mammals and invertebrates: <https://www.aquamaps.org/search.php>
* **OceanAdapt** – Shiny App for exploring changes already detected in species ranges and depths in North America: <https://oceanadapt.rutgers.edu/>

### Existing assessments of climate vulnerability for select species:

* **NOAA Climate Vulnerability Assessments**: <https://www.fisheries.noaa.gov/national/climate/climate-vulnerability-assessments>
* **Hare et al. (2016)** “A Vulnerability Assessment of Fish and Invertebrates to Climate Change on the Northeast U.S. Continental Shelf.” <https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0146756>

## Species featured:

* *List focal (economically, culturally, or ecologically valuable) species in region.*
* *If new species of interest are expected to move* in *to the region (based on maps linked at right or other information), list these “emerging stocks” here as well.*

## Brief Intro to the fisheries:

*Briefly summarize fishing practices, gears, seasons, etc. for each focal species. Discuss cultural, social, economic value of the fisheries in question. If possible, discuss dependence on the fisheries, adaptive capacity, and vulnerability of all potentially impacted stakeholder groups.*

## Climate-driven impacts on fisheries:

*Referring to the sources at right and others as available, and/ or to the questions in the* ***Appendix*** *below, summarize expected climate-driven changes to focal species ranges and/ or productivities in the region. If range shifts across jurisdictional boundaries are expected, briefly discuss what other agencies/ governments might need to be included in management discussions.*

*If emerging stocks are expected to move into the region, discuss these patterns here as well.*

*Also discuss how system-level climate drivers may impact species habitats (e.g., increased algal blooms, coral bleaching, etc.) as well as fishing operations (e.g., increased storms may reduce fishing opportunities).*

# Potential metrics/ indicators of those changes and impacts:

*List some metrics/ indicators that can be measured in your system to reveal and track climate-driven system and species changes identified above. E.G.:*

* *Average water temperature*
* *Turbidity*
* *pH*

# Appendix: Questions to consider when trying to understand likely local climate-driven species range and productivity changes

1. Is the species “tolerant” of expected climate-driven changes (e.g., temperature changes, pH changes)?
   1. *If yes, species may be less likely to be impacted by climate change (but see below).*
   2. *If no, species may be likely to try to move away or productivity may decline (see below).*
2. Is the species mobile during any life stage (including as larvae)?
   1. *If yes, species that are intolerant of may shift their ranges poleward (either through juvenile/ adult movement, or through larval drift) to track their preferred temperature and pH gradients (but see below).*
      1. Does the species have a limited depth range, or are they able to survive in deeper waters?
         1. *If yes, species may shift ranges deeper rather than, or in addition to, poleward, potentially moving outside the range of existing fishing gear.*
   2. *If no, species that are intolerant of expected changes may see declines in productivity.*
3. Is the species dependent on an immobile and non-ubiquitous habitat type during any life stage?
   1. *If yes, even mobile species may not be able to find suitable habitat in new areas that conform to their preferred temperature and/or pH tolerances, and thus may see declines in productivity.*
   2. *If no, species that are intolerant of expected changes, and that are mobile, may be likely to move away (but see below).*
4. Is the species a “prey specialist,” feeding only on one or a limited range of foods/ species?
   1. *If yes, even tolerant and/ or mobile species that are not habitat dependent may not be able to find suitable prey in areas that conform to their preferred temperature and/or pH tolerances, and thus may see declines in productivity.*
   2. *If no, species that are intolerant of changes, mobile, and not habitat dependent may be likely to move away.*