

Climate-Resilient Fisheries Planning Tool Workbook

Paper format edition of the Excel workbook

Overview

What does the Climate-Resilient Fisheries (CRF) Planning Tool do?

The Climate-Resilient Fisheries Planning Tool guides users through a six-step process to assess their fishery's climate resilience and identify approaches and priority actions to help build resilience in their fishery.

Who should use it?

The tool is designed for fishery participants, community leaders, managers, NGO partners, scientists, and others seeking to enhance the resilience of marine fisheries to climate change. The tool can be used by individuals and by groups, such as stakeholders in workshops. The tool was developed by the SNAPP working group on Climate-Resilient Fisheries.

Why use the CRF Planning Tool?

Any initiative intended to increase the climate resilience of a fishery will be a complex, long-term, and multifaceted process. To facilitate successful outcomes, the Climate-Resilient Fisheries Planning Tool helps users identify and focus their efforts on attributes of the fishery system that have the greatest potential to strengthen climate resilience. The tool is based on rigorous scientific research, analysis of case studies exploring climate resilience in various fisheries, and expert consensus regarding key actions for climate resilience. The tool can be used even when detailed data on current and projected climate impacts are not available. However, when that information is available, the tool's value increases even further.

How is the CRF Planning Tool used?

The tool facilitates an assessment of ecological, socio-economic, and governance dimensions of a fishery system that enables users to prioritize interventions across these dimensions based on the planning goals, expected climate impacts, and resilience attributes present in the fishery. Through a six-step process, the tool supports users in developing a set of actionable interventions and priorities to operationalize climate resilience in the fishery. The steps are presented on a series of web pages with a downloadable workbook (in Excel and PDF formats) that provides a worksheet for each step. After completing Steps 1-6, tool users come away with a prioritized list of potential actions aimed at building climate resilience that can be used to create a fishery climate resilience plan. In many cases, it may be valuable to use the tool iteratively, such as by repeating Steps 1-6 annually, to help refine and adjust climate resilience actions over time.

How to use the Workbook?

This workbook contains sheets for each step of the tool for users to record the relevant information about their fishery system, drawing on previous content where relevant. Each step contains instructions, yet most steps can be approached however users are inclined to process and apply the information to their system.

Step 1: Specify the Fishery System

Instructions:

1. List the key types of ecosystem features and fishery actors in your system loosely as a brainstorm. We suggest considering the ecological, socio-economic, and governance dimensions of the fishery system, but you can create different or additional categories as you see fit for characterizing the system.
2. Consider the boundaries of the system as defined above. Are there ecosystem features or actors you won't consider in this assessment and planning process? If so, you may want to note what they are and why you are opting to not include them for this purpose.
3. Organize the features and actors from the brainstorming exercise into groups using lists, visuals, symbols, or other approaches you prefer, and then describe or visualize how these groups relate to each other.
4. List external stressors that can influence or impact the system.

A large, empty rectangular box with a black border, intended for the user to complete the instructions listed above. It occupies the lower two-thirds of the page.

Step 2: Set Long-Term Goals

Instructions:

1. Consider the system you defined in Step 1 and what you value and find important in the system.
Brainstorm your long-term goals for the system in the lower part of this sheet.
2. Select 5 or fewer goals that are your primary goals for this planning process by checking the box to the left of that goal.
3. For each goal (or at least the selected top goals), create a shorthand or nickname for ease of referring to them throughout the rest of the tool.

Top Goal	Goal

Step 3: Identify Climate Impacts

Instructions:

1. List the climate-related stressors and impacts occurring in the fishery system now. Consider impacts to the ecosystem and stock, fishery operations, and livelihoods and community.
2. List the climate-related stressors and impacts you expect will occur in the system in the future.
3. Consider how these current and potential future impacts may affect your ability to achieve goals set for the fishery system. Note these and other considerations in the Other Notes section.

Already occurring stressors	Fishery system impacts	Notes/Sources

Expected stressors	Fishery system impacts	Notes/Sources

Other Notes

Step 4: Evaluate Climate-Resilience Attributes

Instructions:

1. Become familiar with the definition, mechanisms, and examples from case studies of each climate resilience attribute using the links on the tool website.
2. Score the strength of each climate resilience attribute based on its presence and strength in the fishery system (Score). If you are not sure, select Not Sure as the score. The Example Questions to Consider (located after the scoring table) are not exhaustive but may help you determine appropriate scores for the attributes.
2. Rate the Importance of each resilience attribute in terms of the unique capacities of your system, your values and goals, and the attribute's ability to help address climate impacts expected in the system.
3. Be sure to capture your sources and reasoning as Notes.

	Climate Resilience Attribute Component Attributes	Brief Description	Score <i>Weak</i> <i>Moderate</i> <i>Strong</i> <i>Not Sure</i>	Importance <i>Important</i> <i>Not Imp.</i> <i>Not Sure</i>	Notes
Ecological	Habitat diversity and quality	The availability, variety, and caliber of suitable habitats.			
	Dietary diversity	The range of prey items a species can exploit.			
	Spatial flexibility: <i>(1) Adult mobility</i> <i>(2) Environmental niche breadth</i>	The ability of a population to tolerate changing conditions or move to new locations to find suitable conditions.			

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Ecological	Evolutionary flexibility: <i>(1) Genetic diversity</i> <i>(2) Plasticity</i> <i>(3) Evolutionary potential</i>	A species' ability to adapt to environmental conditions by maintaining high genetic diversity, which allows species to adapt to future environmental changes and avoid inbreeding, or through short-term morphological, physiological, or behavioral traits (i.e., phenotype) or multi-generational evolutionary mechanisms that affect a species' genotype to better fit a particular environment that they encounter.			
	Stock Status: <i>(1) Population abundance</i> <i>(2) Age structure</i>	The size and age distribution of the population.			
	Species diversity	The number of different species present in an ecosystem and relative abundance of each of those species.			
	Ecosystem Connectivity: <i>(1) Ecosystem connectivity</i> <i>(2) Larval dispersal</i>	The environmental and larval capacity to distribute among suitable, adjacent and/or available locations.			

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Socio-Economic	Wealth and reserves	The aggregate value of capital assets that contribute to human well-being, such as financial, human, manufactured, and natural capital.			
	Economic flexibility: <i>(1) Economic diversity</i> <i>(2) Access to economic opportunity</i>	The current and future ability to access a range of income-earning or subsistence activities.			
	Community flexibility: <i>(1) Mobility</i> <i>(2) Flexible and agile infrastructure</i>	The ability of a community to move or adapt to changes, both temporarily and permanently.			
	Technology	The ability of actors in a fishery system to develop and acquire new technologies and methods for improving fisheries management, economic outputs, and human well-being.			
	Social capital	The networks of relationships among people and organizations who live and work in a particular community.			
	Knowledge and learning capacities: <i>(1) Learning capacity</i> <i>(2) Access to knowledge</i> <i>(3) Diversity of knowledge sources</i>	The number of different information and data types available in a system, as well as the ability to acquire and the capacity to synthesize that information and knowledge.			

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Socio-Economic	Agency	The capacity of individuals to independently and collectively make and act on their own free choices.			
	Psychological and cultural capacities: <i>(1) Resilience mindset</i> <i>(2) Place attachment</i>	The ability to accept the inevitability of change, even with strong ties to a particular geographical location and/or historical context, and to also account for it in planning, decision-making, and management.			
Governance	Efficient and effective	The ability to produce results that meet constituent needs and achieve desired results while using available resources wisely.			
	Responsive	The sensitivity, readiness, speed, and accuracy with which a governance system handles, resolves, and follows up on a management-relevant change.			
	Adaptive	The capacity for a structured, iterative process of continual innovation, testing, learning, and adjustment for flexible decision-making and action.			

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Governance	Inclusive: <i>(1) Participatory</i> <i>(2) Equitable and inclusive</i>	The capacity for citizens to influence and share control in decision-making that affects their lives, as well as the degree to which decisions recognize and improve the well-being of all individuals.			
	Accountable: <i>(1) Accountable</i> <i>(2) Transparent</i>	The degree to which decisions and decision makers are held accountable to their constituents and management priorities; objectives and progress are made explicit and clear.			
	Leadership and initiative	The ability of institutions and leaders to motivate, provide direction, and assume responsibility.			
	Connected: <i>(1) Polycentric</i> <i>(2) Integrated across scales and sectors</i>	The degree to which multiple governing bodies overlap, interact, and collaborate at appropriate scales for the resource.			

Step 4 Example Questions to Consider

Climate Resilience Attribute Component Attributes	Example Questions to Consider
Habitat diversity and quality	Are diverse habitat types available? Are the habitats ecologically healthy?
Dietary diversity	Is the species a generalist feeder, or does it eat only a few types of prey?
Spatial flexibility: (1) <i>Adult mobility</i> (2) <i>Environmental niche breadth</i>	Can the species tolerate a range of environmental conditions and/or habitat types in one location? Can it easily move to track its preferred environmental conditions?
Evolutionary flexibility: (1) <i>Genetic diversity</i> (2) <i>Plasticity</i> (3) <i>Evolutionary potential</i>	Does the species have a high genetic diversity to enable it to evolve in response to changing conditions? Can the species change its morphology, physiology, and/or behavioral patterns to adjust to changing conditions? Have studies documented the ability of the species to change its DNA over time (i.e., genotypic changes)?
Stock Status: (1) <i>Population abundance</i> (2) <i>Age structure</i>	Is there a stock assessment and/or survey available that estimates population abundance and/or status of the population? If so, what is the population abundance of the fished species relative to other observed abundance levels? Are there size frequency data available that illustrate that the fish population has an intact and well-distributed age structure (i.e., abundant juvenile and mature individuals)?
Species diversity	How many different species are present in surveys and/or fisheries catch data and how abundant are those species? Are the types and numbers of species similar to levels that would be expected for this ecosystem? Are any expected types of species noticeably missing in the ecosystem?

Ecosystem Connectivity: <i>(1) Ecosystem connectivity</i> <i>(2) Larval dispersal</i>	Are there multiple areas of habitat needed by the species, and if so, can the species move between the habitat patches? Are larvae motile or stationary?
Wealth and reserves	Do fishery participants have access to financial resources or other assets to cover costs associated with adapting to change?
Economic flexibility: <i>(1) Economic diversity</i> <i>(2) Access to economic opportunity</i>	Are there multiple income-earning activities in the fishery? Are there income-earning activities outside of the fishery? Are there economic opportunities for underrepresented groups?
Community flexibility: <i>(1) Mobility</i> <i>(2) Flexible and agile infrastructure</i>	Do individuals or groups in the fishery system have the flexibility to adjust their fishing operations, fishing locations, occupations, infrastructure, or other choices to buffer impacts and create opportunities?
Technology	Is new technology integrated into the fishery, fishery management system, or market systems? Is new technology--or the benefits of it--available to all types of participants in the fishery system?
Social capital	Do strong networks exist between individuals and organizations in the fishery system?
Knowledge and learning capacities: <i>(1) Learning capacity</i> <i>(2) Access to knowledge</i> <i>(3) Diversity of knowledge sources</i>	Do individuals, communities, and the governance system have access to multiple forms of knowledge, such as local or traditional knowledge, or scientific information? Do individuals and groups have networks to obtain new knowledge and learn from one another? Is knowledge transferred equitably across the fishery system, providing access to all participants?
Agency	Can all individuals or groups freely negotiate, make decisions, and act?

Psychological and cultural capacities: <i>(1) Resilience mindset</i> <i>(2) Place attachment</i>	Do participants in the fishery expect changes to occur? Do they have plans for how they will weather or adjust to changes?
Efficient and effective	Do management actions achieve societal and fishery objectives? Do leaders use resources efficiently?
Responsive	Does the governance system quickly address disturbances? Does the governance system follow up in a timely manner on newly implemented actions?
Adaptive	Is the effectiveness of decisions routinely re-evaluated? Are management directions modified if their performance is not achieving expectations? Does the management system consider emerging risks and opportunities and how they may affect the ability to achieve objectives?
Inclusive: <i>(1) Participatory</i> <i>(2) Equitable and inclusive</i>	Does the management system encourage ongoing citizen involvement? Does the management system engage and include underrepresented and disadvantaged groups in its processes?
Accountable: <i>(1) Accountable</i> <i>(2) Transparent</i>	Are there established rules and objectives for the governance system? Is information regarding decision-making procedures and deliberations available to the public? Can constituents hold the government responsible for their needs?
Leadership and initiative	Does the fishery system have strong leaders working to achieve shared goals for the fishery?
Connected: <i>(1) Polycentric</i> <i>(2) Integrated across scales and sectors</i>	Do multiple governing bodies work together to make and enforce policy? Are multiple governing bodies able to work together well to facilitate smooth processes and outcomes to achieve system goals?

Manual Results (optional):

When working in the Excel version, this table auto-populates. However, when using this PDF version, that automatic process does not occur. If you would like to develop a deeper understanding of the attributes interacting in your system, please use the quadrat below to populate your own score responses. In the blank spaces, please place each attribute where it should be based on the first table in Step 4 (i.e., an attribute that was listed as having a weak score and is not important should be placed in the bottom left-hand box).

**When you indicate that you are "Not sure" about any of the attribute scores/importance levels, those attributes should be listed in the box below titled "Information Needed".*

STRONG, NOT IMPORTANT	STRONG, IMPORTANT
WEAK, NOT IMPORTANT	WEAK, IMPORTANT

Information Needed

Step 5: Brainstorm Climate-Resilience Actions

Instructions:

1. Revisit your goals from Step 2. If you would like to modify them or add new goals based on insights you have gained from earlier steps in this assessment and planning process, do so now.
2. Consider your goals, climate-related impacts, resilience attributes, values, and resources and brainstorm potential actions you might want to take. Examples are available on subsequent pages.
3. For each action, identify which goals it will support, climate-related impacts it will address, and/or resilience attributes it will enhance.

Modified Goals	

#	Brainstormed Action	Goal(s) supported, Impact(s) addressed, Resilience Attribute(s) enhanced
1	<i>Example: Set up volunteer mangrove seeding program</i>	<i>Mangrove health; Helps reduce erosion; Habitat diversity and ecosystem connectivity</i>
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Example Actions to Address Climate Impacts

Example impacts	Example action to address impact
Decreased catch due to stocks changing location	Increase flexible access rights to fisheries resources
Lower yield	Develop data collection plan to understand source of lowered yield
Seasonality shift in resource distribution	Shift away from time-dependent effort control measures
Increasing uncertainty of catch	Decentralize management to local entities that can respond more rapidly to changing stocks
Habitat degradation	Develop management and protection plans to support critical habitats for fish stocks and marine biodiversity.
Safety at sea	Create early warning communication and response systems about approaching storms
Loss of fishing-related assets (e.g., vessels and land infrastructure) in storms	Protect harbors and landing sites
Increasing uncertainty of extreme weather events	Monitor, record, and forecast extreme weather patterns
Loss of household monetary wealth and assets	Facilitate access to alternative livelihood opportunities
Conflict, displacement, competition	Create effective arrangements for dispute settlement
Reduced profitability for fishers	Identify exit strategies for fishers to leave fishing and feasible alternative livelihood opportunities
Reduced alternative livelihoods options	Support value-added products and access to higher-value markets
Loss of culture	Incorporate traditional knowledge in management planning

Sources:

- Badjeck, M. C., Allison, E. H., Halls, A. S., & Dulvy, N. K. (2010). Impacts of climate variability and change on fishery-based livelihoods. *Marine Policy*, 34(3), 375-383.
- Bahri, T., Vasconcellos, M., Welch, D. J., Johnson, J., Perry, R. I., Ma, X., & Sharma, R. (Eds.). (2021). *Adaptive management of fisheries in response to climate change: FAO Fisheries and Aquaculture Technical Paper No. 667 (Vol. 667)*. FAO
- Barange, M., Bahri, T., Beveridge, M. C., Cochrane, K. L., Funge-Smith, S., & Poulain, F. (2018). *Impacts of climate change on fisheries and aquaculture: synthesis of current knowledge, adaptation and mitigation options*. FAO

Example Actions to Build Resilience Attributes

Dimension	Resilience Attribute	Example action to enhance resilience attribute
Ecological	Habitat diversity and quality	Protect habitat quality by mitigating chronic stressors impacting the area.
	Dietary diversity	Use ecosystem-based management to incorporate prey stocks and/or food web dynamics into management plans.
	Spatial flexibility	Protect or restore habitats to meet the mobility needs of the population(s).
	Evolutionary flexibility	Connect small populations to other populations to promote gene flow.
	Stock status	Add minimum size limits based on size-at-maturity estimates to give fish the opportunity to spawn.
	Species diversity	Employ ecosystem-based management plans to manage species at or above their population targets.
	Ecosystem connectivity	Establish a network of protected areas that include a diversity of habitat types.
Socio-economic	Wealth and reserves	Share selling and buying prices along value chains to reduce knowledge asymmetry and imperfect price discrimination.
	Economic flexibility	Preserve access to competitive credit and investment opportunities and promote professional development training both within and outside of the fishery sector.
	Community flexibility	Create dynamic marine protected areas (e.g. moving seasonal closures) such that access to the fishery is not blocked for those living closest to protected areas.
	Technology	Partner with organizations that are looking for fisheries with whom to pilot new technologies, such as fisher-driven electronic traceability systems.
	Social capital	Host inclusive events that celebrate the fishery or the environment to encourage informal dialogue and relationship-building.
	Knowledge and learning capacities	Create knowledge sharing events welcoming to both younger and older fishers to promote informal exchange of knowledge across age ranges.
	Agency	Partner with labor organizations and departments to incentivize and enforce fair contracts that specify rights and terms of employment between employers and fishery workers.
	Psychological and cultural capacities	Partner with local cultural organizations to support and promote the exchange of traditional knowledge and values of the fishery.
Governance	Efficient and effective	Create plans and budgets based on community needs and climate resilience goals.
	Responsive	Use co-managed or decentralized governance arrangements to allow for more responsive decision-making processes in the face of disturbances.

	Adaptive	Design dynamic management goals that account for uncertainty and climate change processes.
	Inclusive:	Incorporate considerations for marginalized groups so that all stakeholders can participate in fisheries governance on fair terms.
	Accountable	Promote access to independent organizations so that fisherfolk can report fisheries management grievances.
	Leadership and initiative	Train young fisheries professionals to be prepared for future leadership roles by supporting early vocational development in skills such as public speaking, organizational management and effective leadership.
	Connected	Structure fishery management to consist of multiple, overlapping roles that act against corruption and enable contributions from many members.

Sources:

Bahri, T., Vasconcellos, M., Welch, D. J., Johnson, J., Perry, R. I., Ma, X., & Sharma, R. (Eds.). (2021).

Adaptive management of fisheries in response to climate change: FAO Fisheries and Aquaculture Technical Paper No. 667 (Vol. 667). FAO

Barange, M., Bahri, T., Beveridge, M. C., Cochrane, K. L., Funge-Smith, S., & Poulain, F. (2018). Impacts of climate change on fisheries and aquaculture: synthesis of current knowledge, adaptation and mitigation options. FAO

Conservation International. 2021 Social Responsibility Assessment Tool for the Seafood Sector: A Rapid Assessment Protocol. Available at: www.riseseafood.org

Step 6: Identify Priority Actions

Instructions:

1. In order to prioritize your list of actions from Step 5, consider the conditions that exist to support each action's implementation as well as conditions that must be improved or developed to advance implementation (Existing & Needed Support).
2. Consider an appropriate Timeframe for each action based on several factors like urgency and readiness.
3. As well as the above, many other factors can determine how to prioritize your actions. Using the example questions to help guide your thinking, note any Other Considerations for each action.
4. Indicate your prioritized actions using highlighting, a new sheet, or other approaches you prefer.

Act.	Existing & Needed Support	Timeframe	Other Considerations
1	<i>Already know of grants for mangrove projects, community is supportive and invested</i>	<i>Several years</i>	<i>General ecosystem benefits beyond improving nursery habitats</i>
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Step 6 Example questions

- Is funding available or accessible?
- Is this action compatible with the laws, regulations, and institutions of your system?
- Is there or will there be community support?
- What data are needed?
- Do other actions need to take place first?
- How urgently is this action needed?
- How quickly will resources be available?
- How much planning is needed?
- Who benefits from this action?
- Is this action inclusive? Are its outcomes equitable?
- Does this action have other benefits or adverse impacts?
- Have similar actions succeeded (or not) in this system in the past?