

Commonwealth Marine Economies Programme



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Climate Change Adaptation for Caribbean Fisheries

Taking action together

With negative climate change impacts already obvious in the Caribbean, everyone involved in fisheries and aquaculture – from fisherfolk and managers to ministers – needs to act now and build on the work already underway to secure people’s livelihoods. Adapting to climate change in the Caribbean needs to be as widespread as its effects. This report card suggests a to-do list to cooperate and take action.

Continue what works: Action has already started, such as safety at sea training, mangrove restoration, diversifying fisheries, protecting habitats and new aquaculture projects. They are making a real difference to lives and livelihoods. These provide a springboard for more local action which must be expanded and accelerated.

Collaborate and engage: A sustainable future can only be achieved by working and learning together

Get involved: Individuals and communities need to drive the development of climate-smart fisheries through no-regret actions that save money, increase income and improve safety, regardless of future climate change

Study and act: Targeted research can help managers facilitate on-the-ground change, through detailed fish stock, vulnerability and economic assessments and using new fishing platforms and gear



The Big Picture: climate change impacts

Caribbean fisheries

The impacts of climate change on Caribbean fisheries are described in the [2017 Caribbean Marine Climate Change Impacts Report Card and reviews](#).

In summary, Caribbean fisheries are under threat from changes in ocean currents, sea temperatures, salinity, pH and storms. Fish distributions are changing, and important habitats, such as coral reefs, are being lost, causing declines in fish numbers. Hurricanes and storms are compromising safety at sea, and increasing the risk to fishing gear, boats, fishing infrastructure and markets, with some fishers taking a long time to return to fishing after the most damaging hurricanes.

These impacts could reduce the fish available for local consumption and for export. Fewer fish would increase conflicts between fishers (including recreational and industrial fishers), fishing communities, and States.

Caribbean aquaculture

For the growing aquaculture industry, changes in temperature, rainfall patterns, salinity, acidification and storms will directly impact aquaculture facilities and production. Supply chains, including fishmeal and fish oil, may also be affected.

In the short-term, rising temperatures could increase yields, although this benefit may be offset by increased feed costs. In the longer-term, as farmed species reach temperature limits, sites may become unsuitable for some species, especially if fish diseases become more prevalent.

This card explores what can be done to adapt to climate change and build resilience in Caribbean fisheries and aquaculture.



The cost of doing nothing

The economic costs of climate change inaction in the Caribbean are projected to total **US\$10.7 billion per year by 2025**, including from hurricane damages, loss of tourism revenue and infrastructure damage.

Hurricanes are a major risk, causing loss and damage of boats, gear and facilities. In Dominica, Hurricane Maria damaged or destroyed hundreds of vessels, gear, and vendor equipment, with costs of **US\$2.9 million in loss and damages**. Additionally, 40% of vessels and up to half of all fishers were left unable to fish, losing income and food.

Climate change is predicted to cause a potential annual loss in landed fish values across the Caribbean and Latin America of between **US\$1.21 and US\$2.72 billion**.

Fisheries account for up to 15% of protein intake in the Caribbean, and the fisheries sector is more vulnerable to climate change than in other regions. Some of the poorest communities are fisherfolk, who would see significant and immediate benefits from disaster risk reduction and cost-effective adaptation solutions.

The costs of adaptation are thought to be far lower than the damage caused by climate change, if left unchecked.

What's making the problem worse?

As well as climate change and overexploitation, Caribbean fish stocks are being affected by a wide range of other pressures from human beings and the environment. These place additional stress on marine ecosystems, making them less resilient to the effects of climate change.

Marine litter and microplastics

Marine litter is a major threat to marine ecosystems, as plastics and microplastics are ingested by seabirds, marine mammals, fish, and invertebrates. One study in Belize showed plastic items were present in 41% of the Queen conch samples and 36% of the riverine fish samples investigated.

To tackle plastic pollution, many Caribbean countries have banned plastic bags and/or polystyrene/Styrofoam or banned the single use of plastics to minimise pollution.



Sargassum

Sargassum mats can provide unique habitats for a variety of marine animals. They provide food, shelter, shade and nurseries for crabs, shrimp, and sea turtles, and act as naturally occurring fish aggregation devices (FADs) for several fish species.

In the past decade, unusually large influxes have appeared in the Caribbean with the potential to harm Caribbean fisheries. They can prevent light from reaching the seabed due to the sheer size of the *Sargassum* mats, they can reduce oxygen levels in the water and smother seagrasses and coral reefs.

Some Caribbean nations have been catching much younger dolphin fish because they associate with the *Sargassum*. Flyingfish landings are much lower when there is high abundance of *Sargassum*, as fish congregate around the large *Sargassum* mats, making them harder to catch.

Pollution and water quality

Most marine pollution is from untreated wastewater, agricultural run-off, and solid waste from land. This is expected to get worse as populations grow and farming practices become more intensive.

Excessive nutrient and sediment run-off enhances algal growth on coral reefs, which blocks out the sunlight needed for corals to grow. Sediment reduces water clarity, which stunts the growth of seagrasses, and can also bury and kill the shoots.

Coastal water quality around Caribbean islands can be improved through treating sewage, restoring vegetation along rivers and environmentally friendly treatment systems that use the recycled water to grow trees and plants or feed aquaculture ponds.

Habitat damage

Marine and coastal habitats, such as coral reefs, mangroves and seagrass beds, are being damaged by a combination of sand mining, dredging, anchoring, sea defences, coastal development and damaging fishing practices.

Fish and shellfish rely on these habitats for food, shelter, spawning and nursery areas, and any degradation reduces the biodiversity and biomass they can support as well as the coastal protection they provide by reducing wave energy. Reducing or eliminating current damage is imperative. Planting coral, seagrass and mangroves, or installing artificial reefs can improve and restore habitats, biodiversity and fish populations.

Ghost gear

In the Caribbean, lost pots, traps, nets, lines and recreational fishing gear all contribute to ghost fishing, causing economic damage through loss of gear, and reducing fish availability. Some Caribbean States have joined the Global Ghost Gear Initiative (GGGI), pledging to reduce the loss of gear and remove gear already in the ocean.

Interactions with the COVID-19 pandemic

The Caribbean and some Central American countries have adopted broadly successful measures to contain the coronavirus, but unemployment and poverty levels among fisherfolk have risen. National lockdowns have limited fishing activity, and fewer tourists have contributed to reducing demand. Fish and seafood production is thought to have shrunk by up to 60% during the pandemic in some areas.

Government actions to support fisheries during the pandemic include waiving some licence requirements, providing some social assistance and stopping illegal practices. Unemployment support and food assistance programmes are also being implemented in many States.

The pandemic has re-emphasised the need for economic diversification. Some States are exploring new products considering expanding to new markets and new partnerships.



How vulnerable are Caribbean fisheries and aquaculture?

Climate change is having substantial impacts on Caribbean fisheries, resulting in high to very high climate vulnerability. Identifying what drives vulnerability is the first step in developing community, country and regional adaptation responses.

Climate vulnerability is a function of:

1. Climate exposure or hazard

This includes risks from sea level rise, sea temperature change, ocean acidification, storms and waves, and varies between and within islands. Eastern coasts are typically more exposed to climate hazards.

2. Ecological sensitivity

The ability of different habitats and species to recover from disturbance determines ecological sensitivity. Some countries are more reliant on climate-sensitive fish stocks, such as reef fish, while others are more reliant on less affected oceanic pelagic fish.

3. Fisheries sensitivity

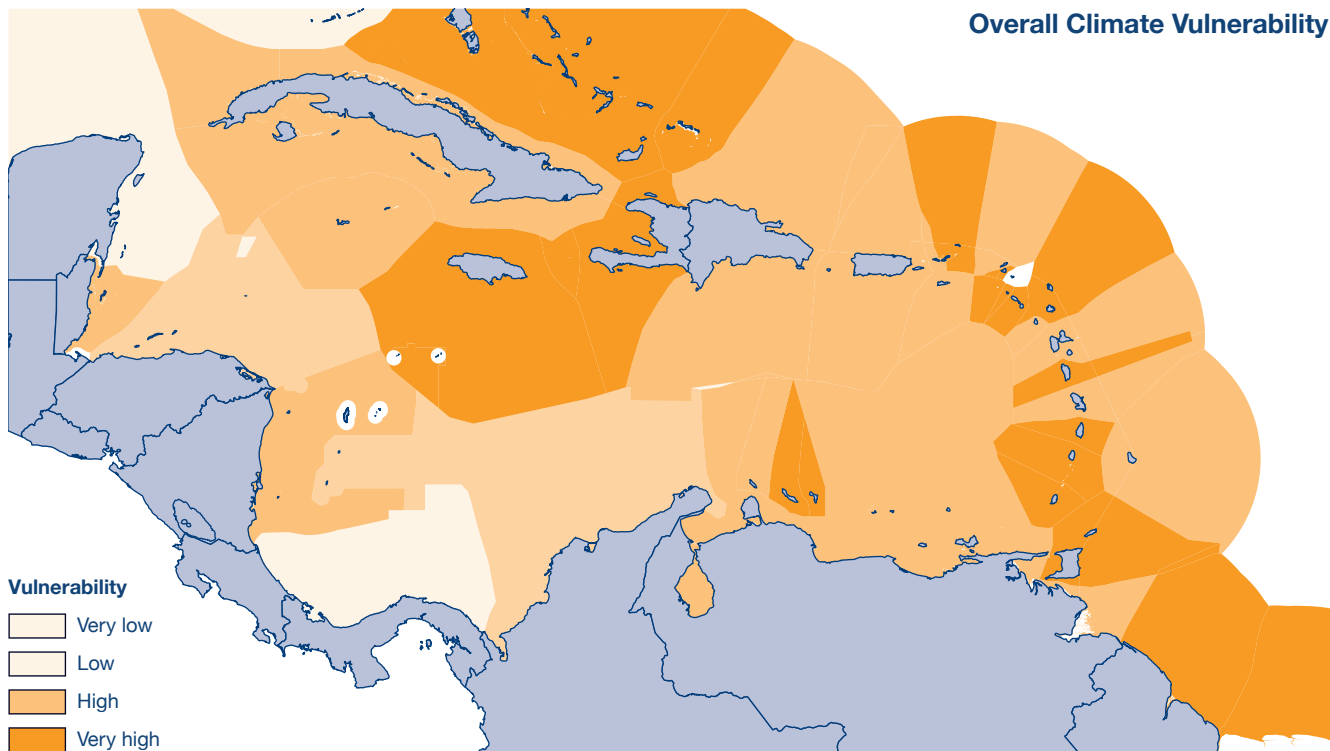
The number of jobs related to the industry, and diversity of catch determines fisheries sensitivity. Countries less able to swap between species, and with a greater reliance on the sector, are most at risk.

4. Adaptive capacity

Health, education, income, governance and size of economy all affect adaptive capacity. Fishers in countries with low adaptive capacity are less able to adapt to changes, or recover from severe storms.

A recent study that assessed the Overall Climate Vulnerability produced the following vulnerability scores, based on these four factors.

Overall Climate Vulnerability



Overall Climate Vulnerability of the fisheries sectors in 33 Caribbean countries or territories. Each country is delimited by its EEZ boundary. Redrawn from Monnereau et al. (2015). NB These boundaries are subject to some objections which have been submitted to the UN.

Almost all Eastern Caribbean States have fisheries with 'very high' overall vulnerability. These countries are exposed to climate hazards such as hurricanes, have small population sizes and their economies are highly dependent on marine resources. Institutional capacity and access to finance limit their ability to adapt. A single extreme event can cause country-wide damage that may take a very long time to recover, reducing adaptive capacity further.

Taking action

A framework for adaptation

To increase the speed, coverage and effectiveness of adaptation, these five steps will help educate, facilitate and legislate for climate change action.



Five steps for sustainable adaptation (Source: US Aid, Adapting to Coastal Climate Change, 2009)

This process provides a mechanism to identify and implement autonomous or planned adaptation. Autonomous adaptation is instigated and developed by fisherfolk or communities themselves in response to changes in the environment, whereas planned adaptation is more likely to be put in place or made possible by institutions or governments.

Some adaptation measures take longer to implement and to take effect than others, and some require fewer human or financial resources than others. There are also 'no regrets' measures, which tend to focus on building resilience, and benefit society and the environment as a whole. The paper supporting this card contains a full list of adaptation actions, the speed of response and scale of resource required.

Overcoming barriers

Around the world, climate adaptation efforts are hampered by a combination of factors, including limited resources, institutional and governance systems, technical knowledge, social perceptions and distrust. These barriers need overcoming so that fisheries can adapt quickly and continue to support livelihoods.

To overcome social and cultural barriers, fishing communities must be included in planning, monitoring and managing any climate adaptation projects, using their knowledge, and to get community buy-in. Fishers can also learn from other Caribbean countries who are already adapting. Training and financial assistance for fisheries departments is needed so that they can support fisherfolk, cooperatives and coastal communities. Social research and training are needed on alternative fishing methods or livelihoods that still meet Caribbean cultural needs.

Political leaders need more knowledge on what they can do to make a difference about the negative impacts of climate change on fisheries. There needs to be sustained public awareness on the issues of climate change in Caribbean fisheries to drive policy makers to prioritise adaptation and support change.

To overcome legislative barriers, it is important that policies are flexible enough to adapt to rapid changes in fisheries, such as in target species distributions, fish migrations, and in fishery yield and productivity.

Financial barriers are difficult to overcome in the short term. National budgets, conservation funds and grant funding are likely to continue to be the main sources of adaptation funding. Country and region-wide policies and plans, such as National Adaptation Plans and Nationally Determined Contributions, provide the links with policy that are used to leverage climate financing. Some of the financial barriers for individual fishers can be overcome by reform in the banking sector to allow loans available on terms that fit with fishers' irregular income, and having straightforward access to insurance for their livelihoods and assets.

Adaptation action is already underway in the Caribbean

Here are some examples of adaptation projects already underway.

Climate Change Adaptation of the Eastern Caribbean Fisheries Sector (CC4FISH)

The overall aim is to introduce adaptation measures in fisheries management and empower fisherfolk and aquaculturists to adapt to climate change in Antigua and Barbuda, Dominica, Grenada, St Kitts and Nevis, Saint Lucia, St Vincent and the Grenadines and Trinidad and Tobago.

The project has 3 key goals:

1. Build awareness of climate change, including carrying out vulnerability assessments, prioritising adaptation measures, and researching *Sargassum* impacts and its uses.
2. Increase resilience to climate change, including training in safety at sea, fish handling and processing, as well as other capacity building activities, aquaponics demonstration facilities, fisherfolk exchanges to share knowledge, and developing aquaculture strategies.
3. Mainstream climate change in fisheries governance, such as fisheries management plans, *Sargassum* management plans, and training of trainers.

The project is making an important contribution to sustainability at both the regional and national level.



Marine protected areas

Marine protected areas can increase the health of coastal and marine habitats, making them more resilient to climate change pressures, and better able to support healthy fisheries into the future. The Caribbean Fish Sanctuary Partnership Initiative (C-FISH) provided boats, training and equipment to strengthen community-managed sanctuaries in five countries. This resulted in increased fish biomass inside and outside the sanctuaries.

The Soufriere Marine Management Area (SMMA) on the west coast of Saint Lucia is another example. There are distinct zones in the SMMA, including marine reserves, fishing priority areas, multiple use areas, recreational areas and yacht mooring sites. Fish stocks in and around the reserve have increased showing that the habitats and fish stocks are healthy and should have increased resilience to climate change.

In Belize they operate a rights-based managed access approach to fisheries. Fishers who historically fish an area retain those rights, and engage in co-management of the fisheries. Sustainable catch rates have improved, and the decline in habitat health has stopped, building resilience to climate change.



Moored FAD fishing

Moored fish aggregating devices (FADs) can be used to divert fishing pressure from reef species to pelagic fish, which are considered less vulnerable to climate change impacts. Several countries in the Caribbean have developed, or are developing, a moored FAD fishery for pelagic fish. This reduces pressure on their overfished coral reef and inshore fisheries, and provides a more consistent, and in some cases higher, income.

The JICA-funded CARIFICO programme developed FAD fisheries in a number of Caribbean countries, with best practice followed, and community involvement from the start. These were vital to ensure that pelagic stocks are not overfished, and that fishers have a say in management.



Coastal resilience in Grenada

The Nature Conservancy's At the Water's Edge project has encouraged government and communities to work together to improve resilience to climate change by:

1. Creating community action plans, linking physical and social vulnerabilities.
2. Testing hybrid reef technology by designing artificial reef structures to reduce wave energy and coastal erosion and support coral growth and biodiversity.
3. Restoring coastal vegetation by training locals to plant and care for mangroves to form a natural coastal defence.

The completed breakwater is designed to reduce 80-90% of wave energy for 30 years, and is one of the world's first examples of how communities and governments can work together to protect vulnerable coastal environments.

Fisheries Early Warning and Emergency Response (FEWER) app

To improve safety at sea, the FEWER mobile phone application is being rolled out to fisherfolk in the Caribbean. The app sends alerts of bad weather conditions or sea state to fishers, giving them early warning of any potentially dangerous conditions. Users can also share information on local conditions and missing persons.

The app was developed by the ICT4Fisheries Consortium.

Fisheries insurance

In 2019, a new insurance scheme for Caribbean fisheries was piloted in Saint Lucia and Grenada. The Caribbean Oceans and Aquaculture Sustainability Facility (COAST) is a parametric, or index-based, insurance, which aims to make fisheries resilient to climatic events, by releasing funds directly to those in the fishing industry in the event of bad weather, a storm or hurricane.

These pay-outs provide compensation for lost income and damaged fishing equipment, with immediate relief, so that fishers can return to fishing as soon as possible.

The region continues to invest in the installation of data capture instruments that will aid understanding of climate change impacts, including Coral Reef Early Warning Systems (CREWS), remote sensing, and other local monitoring of rainfall, waves, tides, temperature and pH, and generate appropriate responses.



Short term actions

Some adaptation options are already in place in some States, and can be replicated elsewhere without a lot of time or money. Many are local scale, on-the-ground actions, for fishers and aquaculturists to take, or aimed more at managers and cooperatives.

Local scale climate-smart actions

By adapting to climate change, and becoming more climate-smart, fisherfolk can ensure that their incomes are secure for the future, while also improving the state of the marine environment and fish stocks for future generations. There are actions that can be taken at the local-scale, without having to rely on government or large grants to make a change.

Individuals or communities can drive development of climate-smart fisheries themselves, by learning best practice approaches from other individuals and communities who have already made that change. Many actions are no-regret, which save money, increase income and improve safety, regardless of climate change. Fishing cooperatives can have a big part to play in coordinating, supporting, and providing training in these actions, particularly where groups of fishers can adapt together.

Climate-smart fisheries and aquaculture

We are climate-smart when we ensure safety of our assets and fisherfolk, and we have actions that are environmentally friendly and cost-effective. Climate-smart fisheries and aquaculture are sustainably managed to improve food security whilst preserving natural resources, increasing efficiency, reducing vulnerability and increasing resilience to climate change, whilst also reducing greenhouse gases.

Actions that can be prioritised at the local scale include:

- Developing local fisheries sector pre- and post-disaster plans
- Improving safety at sea, using radios and FEWER mobile app and improved training
- Stopping destructive fishing practices that catch juvenile fish or damage habitats
- Moving to sustainable pelagic fishing, to take pressure off overfished reefs
- Switching to more sustainable fish species or areas (and reverting to a different gear if necessary)
- Providing catch data to fisheries managers
- Marking gear, disposing of damaged gear correctly and removing lost gear to prevent ghost fishing
- Involving fisherfolk in data collection and real-time data collection
- Improving traceability throughout the fish chain
- Adding value to fish products by drying, salting, packaging, and improving shelf life
- Diversifying livelihoods, including aquaculture or eco-tourism
- Providing training in business skills and personal finance (e.g. via cooperatives)
- Minimising fuel consumption and replacing inefficient engines
- Reducing the carbon footprint of aquaculture facilities



Actions for managers and cooperatives

There are further short-term actions that could be implemented within one or two years with little or no investment. These can be implemented by managers or cooperatives, with support from individual fisherfolk or aquaculturists. These actions are the first steps to reducing the impacts from hurricanes on fishers, overcoming the reliance on overfished stocks, and improving the health of the marine environment which is vital for strong fish populations.

Disaster preparedness plans

The CRFM/FAO have produced a Protocol on Climate Change Adaptation and Disaster Risk Management in Fisheries and Aquaculture under the Caribbean Community Common Fisheries Policy and a Model Disaster Preparedness and Risk Management Plan for the Fisheries and Aquaculture Sector outlines plans for 2020-2030. These can be adapted for individual countries.

Developing national adaptation plans

Existing plans can be adapted and developed for individual countries. Some States have included fisheries and aquaculture in their national plans and National Adaptation Strategies, such as Saint Lucia's revised 10-year National Adaptation Plan. There are also climate-smart and adaptive fisheries management guidance documents available, which can be adapted.

Improving the health of the marine environment

Reducing existing pressures on the environment and rehabilitating degraded ecosystems is a top priority. There are many relevant conservation projects, legislation and fisheries policies in place to draw on, and the skills and knowledge exist to implement measures.

Livelihood diversification projects

Communities that have already benefitted from diversification projects could share knowledge with others. The FAO-CC4FISH project is an example where small projects have been implemented in multiple locations and could be adopted elsewhere. Knowledge on successful aquaculture businesses or FAD fisheries (e.g. CARIFCO project) could be shared with other States.

Mitigating the risk of climate hazards at sea

Reducing physical risk from climate change impacts is a key goal. The FEWER application can be used to receive alerts about bad weather. Under FAO-CC4FISH over a thousand fishers have been trained in SAS and over 1100 VHF radios distributed. There is a freely available manual on safe and sustainable fishing, produced as part of a training programme for Dominica fisherfolk.

Building adaptive capacity within fishing communities

Information on climate change is available, including the Caribbean Marine Climate Change Impacts Report Card and through the Pilot Program for Climate Resilience. Cooperatives can help to train fishers in new fishing techniques, business skills and personal finance.

Decision support tools and data

Decision support tools such as the Caribbean Climate Online Risk and Adaptation tool (CCORAL), contain a wealth of information on climate impacts on the sector, and how to use this to make decisions. Such data and tools can be used in conducting vulnerability assessments, in prioritising adaptation actions and informing resilience building.

High value markets

Access to higher-value markets can compensate for reduced yields due to climate change. Improving health and food safety standards, fisheries certification and eco-labelling schemes can increase market value. Value of fish products can be increased by producing packaged tuna steaks, or other high value goods.



Long term goals

There are other adaptation actions that require more funding to implement, or that first require supporting research, legislation or policy change. These will have a larger impact on the sector and its ability to cope with the impacts of climate change, but may take longer to implement. These larger scale actions may require funding programmes to support them, but will ultimately result in secure incomes, sustainable fisheries and food security.

Fisheries monitoring and ecosystem-based management

Ecosystem-based management of fisheries, including spatial management, is needed across the Caribbean, in line with the CCCFP, to improve the long-term sustainability of stocks. Fisheries must be monitored regularly, and data used in stock assessments, nationally and across boundaries for pelagic stocks. Management measures need implementing, with community involvement.

Adaptive capacity and social protection

Having adequate social protection in place is needed to enable fishers and communities to be proactive and develop adaptation, with extension and support services expanded. Gender equality, marginalised groups and youth inclusion need to be part of service design and implementation.

Adaptive and responsive legislation

Changing legislation can be a lengthy process, but flexibility is needed to enable fishers to respond to changes in spawning seasons, quotas, target species and fishing gear or techniques. This extends beyond direct fisheries legislation, for instance to planning and environmental legislation, to allow for facilities to be relocated if necessary, or to ensure that marine habitats are protected from other human pressures in the face of a changing climate.

Climate-proofing infrastructure

Restoring natural sea defences, such as healthy reefs, seagrass beds and mangroves, will increase coastal protection in areas where these habitats are currently degraded. Coastal inundation modelling can show where these natural habitats can have the most benefit. In many cases, additional engineering solutions will be required, with a view to 'building back better' to climate proof against more extreme events.

Network of marine protected areas

There are examples across the Caribbean of successful marine protected areas that benefit local communities as well as the environment. These could be developed into broader networks as part of integrated coastal zone and marine spatial planning, allowing for movement of organisms between sites, and genetic exchange. The 30 by 30 initiative aims to protect 30% of the ocean by 2030, with some Caribbean States having signed up.

Resilient ecosystems

Compounding pressures need to be addressed, including improving water quality through large-scale sewage treatment, and reducing damaging activities such as sand mining. Large scale restoration of seagrasses, mangroves and corals may also be necessary. This requires long-term monitoring and rehabilitation while they establish but could be done incrementally for large areas.

Developing and adapting the aquaculture sector

Aquaculture development in the Caribbean has been slow compared to other areas in the world. In terms of locating new aquaculture facilities, consideration must be given to availability of suitable space, taking into account water depth, wave exposure and vulnerability to flooding. Cultivating multiple species at once (integrated multitrophic aquaculture), using finfish or shrimp alongside species that feed on their waste, such as molluscs and macroalgae.

Re-tooling the fishing industry

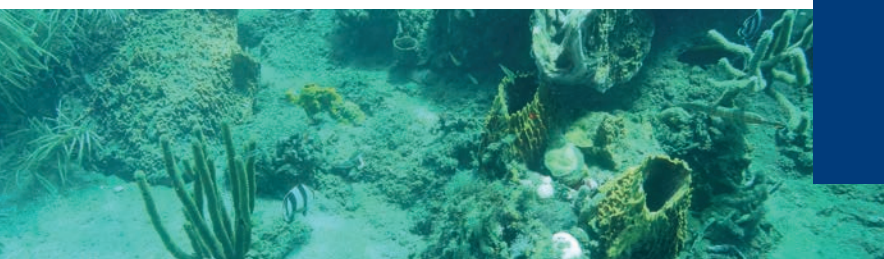
New fishing methods are needed which don't damage habitats, reduce catches of young fish, and biodegrade if they are lost at sea. Research and trials with different types of gear, different vessel types and targeting different species, can help to re-tool the industry to be as sustainable as possible, improving fish stocks for the future.

Finance for adaptation

Larger adaptation projects are often deemed 'development' by funders, and so are often not eligible for adaptation funding. Instead, donor funding often targets incremental adaptation, rather than the larger transformational projects that are needed.

Development concerns often detract from climate change adaptation while economic growth or poverty alleviation take priority, whereas these should all work together because successful adaptation should lead to economic growth and poverty reduction.

Country and region wide policies and plans, such as National Adaptation Plans and Nationally Determined Contributions, provide the links with policy that are used to leverage funding.



Research needed to support action

To support all stages in the adaptation process, identifying research priorities is critical. Climate change and fisheries research has evolved considerably in the past 20 years. Many States now have habitat maps, risk mapping and stock assessments, but not all States are covered and there are still many areas where more research is needed.

Key research needs include:

- Vulnerability and risk assessments for individual States and at the local level
- Improved data collection on key fish species and the fisheries they support
- Ecosystem and stock status assessments for key fisheries, and post-harvest sectors, evaluating the relative contribution of climate change and other stressors
- Downscaled modelling to assess climate change impacts on key fish species in the region
- Economic assessments of the costs of action and inaction in the Caribbean, particularly for the post-harvest value chain, to help determine 'quick wins' and long term economic savings
- Social data on the fisheries sector to understand consequences on communities
- Identifying new fishing gears and platforms to help fisherfolk adapt and diversify
- Research to support sustainable and equitable livelihood opportunities, in collaboration with relevant sector agencies
- Research to identify the most sustainable aquaculture for the region, that is resilient to climate change
- Further mapping and valuation of coastal habitats
- How *Sargassum* influxes impact the distribution and abundance of key fish species, and how to take advantage of opportunities presented by *Sargassum*, whilst not depleting fish stocks.

Monitoring progress and success

For the Caribbean, fish are essential, both for food and as part of the culture. It is imperative that the fisheries and aquaculture sectors are able to adapt to climate change, and that the benefits they bring to the region are not lost. Therefore monitoring, evaluation and learning should be embedded in the institutional mechanisms for tracking progress, identifying the roles and responsibilities of the range of stakeholder institutions, guided by Fisheries Departments.

Not all the adaptation actions listed here are the responsibility of Fisheries Departments or management institutions, and they cut across government ministries and agencies. Adaptation planning in the fishing and aquaculture industry should be included in national planning and development and recognised for its importance nationally and internationally.

Fishers and communities must be involved at every step. It is important that:

- Particular attention should be paid to gender equality, inclusion of youth and marginalised groups, and the role that adaptation plays in reducing poverty.
- Fisherfolk and coastal communities can engage meaningfully in policy development and planning, giving them the skills to be involved in ecosystem-based management and co-management.
- Channels are created through which local and traditional knowledge and culture is included in policy and used to inform action in fisheries and aquaculture.
- Gender equality, poverty and youth inclusion are integrated into adaptation and disaster risk management.
- Extension and support services for fisherfolk and aquaculturists are designed and expanded, to encourage and enable autonomous on-the-ground adaptation.





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