



Climate change, fisheries and aquaculture

Fisheries and aquaculture are threatened by climate change: higher water temperatures, rising sea levels, melting glaciers, changes in ocean salinity and acidity, more cyclones in some areas, less rain in others, shifting patterns and abundance of fish stocks. Climate change compromises the sustainability and productivity of a key economic and environmental resource, but it also presents opportunities, especially in aquaculture. Developing countries that depend on fish for food and exports will have a real challenge adjusting to the changes.

Impacts of climate change

Oceans, especially at mid-latitudes and the tropics, are warming and parts are becoming more saline. But in the subarctic Atlantic, the Southern Ocean and parts of the Pacific, oceans are becoming fresher. Increasing acidification threatens coral reefs, which are also endangered by rising temperatures that cause bleaching. Climate change affects the intensity and frequency of sea currents, which flush and clean continental shelf areas in 75 percent of the world's major fishing grounds.

Eighty percent of the world's freshwater fisheries are in Africa and Asia. Parts of both continents will experience greater warming than the global annual average, resulting in less rainfall and lower lake levels. Already lake levels are dropping, mainly because people are using more water.

The oceans in the tropics and mid-latitudes will be less productive but, by contrast, cold water oceans will see greater productivity. Many fish cannot tolerate swift rises in temperature. Fish distribution patterns will change, with the strongest and most rapid change to fish stocks at the edges of their species' range.

Species, particularly those with shorter life spans, will change the timing of their life cycle. Some plankton species will bloom earlier, resulting in mismatches between the early life stages of fish and their prey, and therefore declines in abundance.

Coral reefs are habitat for many of the world's marine species. Climate change threatens them in two ways: it causes coral reef bleaching and destruction while increased ocean acidity interrupts calcification. Corals cannot easily move into higher latitudes because there are no suitable surfaces where they can develop.

Risks to diet and food security

Fisheries and aquaculture play a crucial role for food supply, food security and income generation. Some 42 million people work directly as fishers and fish farmers, with hundreds of millions more engaged in associated activities – the great majority in developing countries. Fish exports boost foreign currency earnings – particularly important in developing economies. In fact, aquatic foods are the most widely traded foodstuffs, outpacing agricultural products.

Fish is a major source of protein in many poor people's diets, which are often dominated by starchy staples. Fish comprises about 20 percent of animal protein in the diets of over 2.8 billion people – and can reach 50 percent in the world's poorest regions, notably Africa and South Asia, and up to 90 percent in small island developing states and coastal areas.

Impacts of climate change will affect fisheries- and aquaculture-dependent people as production and marketing costs increase, buying power and exports decrease and dangers from harsher weather conditions rise. Small fishing communities in some areas will face greater uncertainty as availability, access, stability and use of aquatic food and supplies diminish and as work opportunities dwindle.

Developing countries are at greatest risk. In sub-Saharan Africa, Angola, Congo, Mali, Mauritania, Niger, Senegal and Sierra Leone are the most vulnerable countries. Semi-arid and with significant coastal or inland fisheries, they export large quantities of fish. Earnings from fish exports can be equivalent to 50 percent of the cost of their food imports.

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Key facts

- Fisheries employ more than 200 million people worldwide – 98 percent from developing countries.
- Small-scale fisheries support 99 percent of fishers but produce less than 50 percent of all fish.
- Aquatic products provide at least 50 percent of animal protein and minerals to 400 million people from the poorest African and South Asian countries.
- Countries most vulnerable to fisheries- and aquaculture-related climate change include those in West and Central Africa, northwest South America, and Southeast Asia.

Most of the people who work in small-scale fisheries are from developing countries. If fish distribution changes due to global warming, fishers with their small boats will be unable easily to follow the fish to new fishing grounds. These coastal populations also are threatened by more frequent storms and sea level rise.

River-dependent Asian fisheries, such as in Bangladesh, Cambodia and Pakistan, are also vulnerable to climate change as the abundance and diversity of riverine species are particularly sensitive to climatic disturbances.

Aquaculture: new opportunities

Now accounting for 45 percent of global seafood consumption, aquaculture production will continue rising to meet future demand. Here, climate change offers new opportunities. Production in warmer regions will likely increase because of better growth rates, a long growing season and the availability of new fish farming areas where it was once too cold. Aquaculture development opportunities will increase in some areas. This is particularly significant in tropical and sub-tropical regions, such as in Africa and Latin America.

At the same time, extreme weather events such as floods and cyclones could damage fish farms. In cool and temperate regions mollusc and salmon farms will be adversely affected by warming as the fish will not be able to survive algal blooms and new pathogens caused by higher temperatures.

Adaptation and mitigation strategies

Adaptation strategies should be based on an “ecosystem approach”, defined as a comprehensive and holistic approach to understanding and anticipating ecological change, assessing the full range of consequences, and developing appropriate management responses. In support of such an approach, ongoing study of the climate change phenomenon and its impact on the fisheries ecosystem will be crucial.

Although a relatively small contributor of greenhouse gas emissions, there are certainly areas in which fisheries and aquaculture have a responsibility to limit such emissions as much as possible. Decreasing carbon dioxide emissions will also improve the aquatic ecosystems’ ability to respond to external shocks. For example, eliminating inefficient global fleets and fishing practices would reduce fuel needs; increasing efficiency of aquatic farms would decrease water and energy use; and reducing post harvest losses as well as increasing waste recycling will shrink the sector’s carbon footprint.

Providing the best possible conditions to assure food security – quantity, access, use and timing of supply – calls for responsible management and governance. The FAO Code of Conduct for Responsible Fisheries and relevant international plans of action can be used as a basis for action.

Nigeria: variable access rights in a variable climate

As global warming dries out fresh water fisheries, communities may have to adapt simply by sharing the dwindling resource. Lessons in how to do it equitably could be learned from the fishers of the Nguru-Gashua wetlands in northern Nigeria. During the flood season, fishers have open access to the wetlands. But when the floods recede the deep sections of the river are managed by village water management councils. Fishers either pay for the right to use the deep sections or give up part of their catch to the council; outsiders must seek permission. Parts of the river are fished one at a time. Individuals or families own floodplain pools; they must give up part of their catch to the village, the proceeds of which are used in community development projects.

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