



Impact of Climate Change on Marine and Inland Fisheries

Resources: The Rising Tide

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Climate change is no longer a distant threat—it's a present-day crisis affecting ecosystems, economies, and communities worldwide. Among the most vulnerable sectors is fisheries, which provide food, employment, and cultural value for billions of people. Both marine and inland fisheries are facing unprecedented challenges due to rising temperatures, ocean acidification, shifting water cycles, and extreme weather events. These changes are disrupting aquatic ecosystems, altering fish population dynamics, and threatening the livelihoods of millions who depend on fish as a staple protein and economic resource.

Climate Change and Marine Fisheries

Marine ecosystems, which cover over 70% of the Earth's surface, are undergoing rapid transformations:

1. Ocean Warming and Species Migration: As ocean temperatures rise, many marine species are migrating toward the poles in search of cooler waters. This geographical shift disrupts traditional fishing grounds, affects spawning patterns, and reduces the predictability of fish stocks. For instance, Atlantic cod, once abundant in the North Sea, have shifted further north, impacting European fisheries.

2. Ocean Acidification: The ocean absorbs about 30% of global CO₂ emissions. This leads to acidification, which weakens the calcium carbonate shells of marine organisms like corals, mollusks, and some plankton species. These organisms are foundational to marine food webs; their decline cascades up the food chain, affecting larger fish and commercial species.

3. Deoxygenation and Dead Zones: Warmer waters hold less oxygen, leading to hypoxic zones—areas with dangerously low oxygen levels. These "dead zones" are inhospitable for most marine life and are expanding in size and frequency, particularly in coastal areas affected by agricultural runoff.

4. Extreme Weather and Coastal Disasters: More intense storms and rising sea levels can destroy coastal fisheries infrastructure such as ports, fish markets, and aquaculture farms. Coral reefs—nurseries for many fish species—are also highly susceptible to bleaching events triggered by heatwaves.

Climate Change and Inland Fisheries

Inland fisheries, primarily in rivers, lakes, and wetlands, are equally affected, particularly in tropical and subtropical regions where communities heavily rely on freshwater resources.

1. Hydrological Changes: Shifts in rainfall patterns, glacial melt, and droughts are altering river flows and water levels. Reduced river discharge affects fish breeding and migration, especially for species like salmon and sturgeon that rely on seasonal flow changes for spawning.

2. Temperature Stress: Elevated water temperatures reduce dissolved oxygen in lakes and rivers, stressing fish and leading to mass die-offs. Cold-water species such as trout and whitefish are particularly vulnerable.

3. Wetland Degradation: Many inland fish species rely on floodplains and wetlands for spawning and feeding. Climate-induced changes, combined with human activities like dam construction and land conversion, are degrading these critical habitats.

4. Invasive Species and Diseases: Warming waters facilitate the spread of invasive species and fish diseases, which outcompete or infect native populations. In the Great Lakes, for example, climate change has been linked to increased prevalence of harmful algal blooms, affecting both fish health and human water use.

Socio-Economic Impacts

1. Food Security: Fish contribute over 17% of the global population's animal protein intake. In many developing countries, particularly in Asia and Africa, inland and marine fisheries are the primary source of protein. Climate-related declines in fish stocks threaten nutritional security.

2. Livelihoods and Economy: Over 120 million people are employed in fisheries and aquaculture, the vast majority in small-scale operations. Climate impacts reduce fish availability, increase costs of operation, and push marginal fishers into poverty.

3. Conflict and Migration: Resource scarcity due to climate change can exacerbate territorial disputes over fishing grounds and contribute to climate-induced migration, especially in regions where communities are already vulnerable.

Mitigation and Adaptation Strategies

Addressing the impact of climate change on fisheries requires both local adaptation and global mitigation efforts:

Sustainable Fisheries Management:

- Implementing ecosystem-based approaches to fisheries
- Reducing overfishing to build resilient fish populations
- Protecting critical habitats like mangroves, coral reefs, and wetlands

Climate-Smart Aquaculture:

- Promoting low-carbon aquaculture practices
- Breeding climate-resilient fish species
- Enhancing early-warning systems for disease outbreaks and extreme weather

Policy and Governance:

- Integrating fisheries into national climate adaptation plans
- Supporting transboundary cooperation for shared marine resources

Scientific Research and Monitoring:

- Improving climate and oceanographic data collection
- Investing in climate impact models to guide policy
- Engaging traditional knowledge systems in monitoring and adaptation

Conclusion

Climate change presents an existential threat to marine and inland fisheries—ecosystems that sustain both global biodiversity and human well-being. The path forward lies in embracing science-based management, community resilience, and bold climate action. Without immediate and sustained efforts to reduce emissions and adapt fisheries to a changing climate, the impacts could be irreversible for both aquatic life and the people who depend on it.