

# Five Effects of Climate Change on the Ocean

## Our Mission

Conservation International believes that the Earth's natural heritage must be maintained if future generations are to thrive spiritually, culturally, and economically. Our mission is to conserve the Earth's living heritage — our global biodiversity — and to demonstrate that human societies are able to live harmoniously with nature.



PAPUA NEW GUINEA, MARINE RAR  
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## 1. A Warmer Ocean

**Cause:** The ocean has absorbed 80 percent of the heat added to the Earth's system by climate change.

### How it affects biological diversity on Earth:

- Warmer waters cause coral bleaching, which in turn negatively impacts the entire coral ecosystem.
- Many species will be forced to migrate so they can maintain the temperature conditions they need for feeding and reproduction.
- Alteration to water temperature can directly impact development, age of sexual maturity, timing of spawning, growth, and survival of most fish and cephalopods.
- Decreased upwelling due to warmer waters means that fewer important nutrients from lower in the water column will make it to the surface of the water. Many important marine ecosystems almost completely depend on nutrients from such upwelling areas—for example, marine habitats around the Galapagos Islands and along the U.S. coast of California.

**How it impacts human welfare:** As in all instances, people are directly linked to life around them. People and many industries around the world rely on the ocean for food and other natural resources. For instance, upwelling areas provide some of the richest fishing grounds in the world. Likewise, coral reefs provide habitat for fish and other protein food sources for people, as well as important tourism economies in many areas. As warming ocean waters impact life within the ocean, humans and the industries dependent on them are likewise impacted.

## 2. Melting of the Poles

**Cause:** Rising greenhouse gases causing increased atmospheric warming cause polar ice to melt.

### How it affects biological diversity on Earth:

- Production of algae in polar marine environments depends on the presence of sea ice. Algae are the foundation of most of the Arctic food web and support numerous important species, such as Arctic cod. Many other Arctic species, such as seals, beluga whales, narwhals, and polar bears, depend directly or indirectly on the cod. As sea ice diminishes, algae diminish, then cod diminish, creating a ripple effect throughout the food web.
- Diminished sea ice results in the loss of vital habitat for seals, walrus, polar bears, penguin, orcas, minke whales, and other megafauna in the Arctic and Antarctic.
- Sea ice is a critical habitat for Antarctic krill, which are the food source for many seabirds and mammals in the Southern Ocean. In recent years, as sea ice has diminished, Antarctic krill populations have declined, resulting in declines in the species dependent on the krill.



POLAR BEARS (*URSUS MARITIMUS*), ARCTIC NATIONAL  
WILDLIFE REFUGE, ALASKA. ©CI/RUSSELL A. MITTERMEIER

**How it impacts human welfare:** The Arctic cod fishery is already impacted by diminished sea ice, affecting the fishers' livelihoods and availability of cod to consumers. Also closely corresponding to the decrease in Arctic ice coverage, there has been a dramatic increase in polar bears foraging for food in coastal communities and hunting camps—a nuisance and danger to the people living there.

### 3. Rising Sea Levels

**Causes:** As sea water warms, it expands. Likewise, as glaciers and polar ice melt, sea levels rise.

**How it affects biological diversity on Earth:**

- The survival of coral reefs, mangroves, sea grasses, and other critical habitat-forming species hinges on their ability to move into shallower waters. Slow-growing species are most unlikely to be able to keep pace with the rising sea level.
- Critical coastal habitats—for instance, sea turtle nesting beaches—are lost as the sea level rises. Natural and manmade barriers such as cliffs, sea walls, and coastal developments stand in the way of migrating further inland.

**How it impacts human welfare:** Although only 2 percent of the world's land lies at or below 10 meters of elevation, these areas contain 10 percent of the world's human population—634 million people that are directly threatened



SEA TURTLES CAN LOSE THEIR NESTING BEACHES TO SEA LEVEL RISE, AND THEIR MIGRATORY PATTERNS MAY BE AFFECTED AS OCEAN CURRENTS CHANGE.  
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by sea level rise. The small island nations of the Pacific Ocean are the most immediately vulnerable to the impacts of climate change and particularly to sea level rise. For example, nearly 50,000 of the 100,000 people in Kiribati live within 3 meters above sea

level. Some Kiribati citizens already are among the world's first refugees of sea level rise, and two of the nation's islands have disappeared into the ocean. Up to 30 percent of the country's mangroves are estimated to be lost to sea level rise by 2100.

### 4. Changes to the Ocean's Major Current Systems

**Causes:** Changes in ocean temperatures and wind patterns—results of overall climate change—will affect and alter oceanic currents.

**How it affects biological diversity on Earth:**

- Many animals' migratory patterns can change as the currents they follow are altered.
- Many species that depend on ocean currents for reproduction and nutrients will be affected. For example, many reef-building coral and reef fish species rely on dispersal of their larvae by currents.

**How it impacts human welfare:** Ocean currents play a major role in maintaining Earth's climate. For example, Europe's relatively mild climate is maintained in part by the large Atlantic current called the Gulf Stream. Changing these currents will have major implications for the climate across



PARADISE HARBOR, ANTARCTICA. © CI/RODERIC B. MAST

the globe, including changes in rainfall—with more rain in some areas and much less in others—and to the air temperatures. These changes have drastic implications for countless species, including humans.

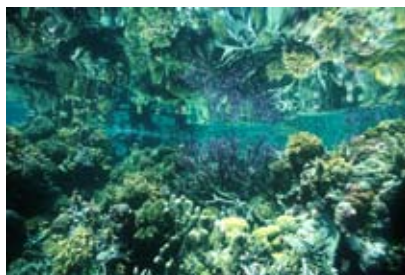
Temperatures on land change as currents take on cooler or warmer waters, affecting large areas of human habitation. Europe, for one, is already affected by changes of this sort.

### 5. Ocean Acidification

**Causes:** The same burning of fossil fuels that is increasing greenhouse gas levels in the atmosphere, is also altering the chemical composition of seawater, making it more acidic.

**How it affects biological diversity on Earth:**

- Acidification directly harms the many ocean plants and animals that build shells of calcium carbonate—including many tropical reef-building corals, cold-water corals, mollusks and other scallops, crustaceans such as lobsters and crabs, and some microscopic plankton that make up the foundation of the food web throughout most of the ocean.



REEF-BUILDING CORALS THAT PROVIDE HABITAT FOR HUNDREDS OF SPECIES WILL BE DAMAGED BY OCEAN ACIDIFICATION. © ROGER STEENE

- Many of those same shell-forming organisms provide critical habitat and food sources for other organisms.

**How it impacts human welfare:** Many of the shell-forming organisms provide critical habitat and food sources for other organisms—directly and indirectly impacting the availability of marine food sources for humans.