

## RISING TIDES



The coastal nation of Bangladesh is particularly vulnerable to rising sea levels.

Photo: J. Desloîtres/MODIS RRT/NASA GSFC

**S**pare a thought for the people of the Carteret Islands, a scattering of atolls off Papua New Guinea in the South Pacific. They are losing their homeland to the ocean.

For the last 20 years they have been desperately trying, in vain, to stop the sea that surrounds them washing their islands off the map. They have built walls to try to keep the water out, but every year the waves have washed over their land, sweeping away homes, destroying crops and making their drinking water salty. Now the ocean threatens to drown them out altogether. And within two years they will all have gone – to the nearby, mountainous island of Bougainville.

The 2,000 people of the islands are the first trickle in what will become a flood of people around the world. For as global warming takes hold and raises temperatures, sea levels are rising worldwide.

So far this has mainly been caused by the vast bulk of the ocean expanding as it warms – as railway tracks do on a hot day. But increasingly, water from melting glaciers and ice caps is accelerating the process.

Scientists' best guess is that sea levels will rise 30 to 40 centimetres this century, but it could be a metre. It doesn't sound like much, but it would be enough to make many nations – like Maldives and Tuvalu – uninhabitable, and to inundate vast areas of low-lying countries like Bangladesh, making millions of people homeless.

And if the polar ice caps melt as global warming continues, the rise will be still more catastrophic. The melting of the Greenland ice sheet would raise sea levels by nearly 7 metres, the loss of the West Antarctic one by another 5 metres. That would swamp coastal cities and lowlands worldwide, changing the world's maps for ever, and causing unimaginable devastation.

## FAILING HEALTH



Coral suffering from moderate bleaching can recover if temperatures return to normal before too long, enabling the algae on which the coral depends to recolonize its tissues.

Photo: P. Kobeh/Still Pictures



If temperatures remain high, fatal bleaching occurs. The algae that the coral needs to survive die off, and the coral itself dies. Mat-forming algae then begin to grow over the dead 'skeleton' of the coral.

Photo: Secret Sea Visions/Still Pictures

**A**lready, global warming is causing catastrophic crashes in sea and bird life. In the summer of 2005, the tiny plankton that form the base of the food chain of the Pacific off the northwest American coast failed to appear, causing populations of fish and seabirds to fall to record lows.

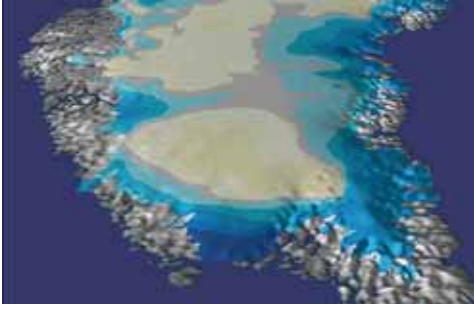
Much the same has happened around the northern coast of Britain over recent years, as warmer waters have driven plankton hundreds of kilometres further north.

Some scientists fear that these are signs that climate change is beginning to damage the health of the oceans irreparably. New research at the University of Amsterdam suggests that, as warming continues, plankton will be disrupted and destroyed worldwide.

Meanwhile, as the world's seas get warmer, coral reefs – the richest habitats of the oceans – are increasingly becoming bleached and dying.

# Heating UP

## GULF STREAM



A NASA image of Greenland's ice sheet shows that it is thinning around the coasts (blue areas). This could be partly due to increased melting, but is believed to be a result of glaciers carrying the ice more rapidly to the sea.

Photo: NASA GSFC SVS



Roads and railways in Labrador, Canada, are engineered to withstand extreme and prolonged low temperatures. Western European networks would quickly collapse under such conditions.

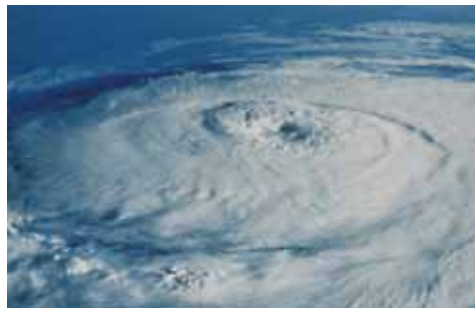
Photo: M. Lamarre/Still Pictures

Changes in the ocean currents could make some parts of the world very much colder, even as the planet heats up.

The Gulf Stream, which carries warm water across the Atlantic from the Caribbean, contributes as much heat to Western Europe in winter as the sun. Without it, one of the world's most heavily populated areas would have the same climate as frozen Labrador in Canada. Western European societies and economies could not survive.

This ocean system is driven by salty Arctic water sinking deep into the ocean, where it forms a vast current that flows south, to be replaced by the warmer surface waters flowing north. But increasing freshwater from melting northern ice is preventing the salty water from sinking, and so the current is faltering. Scientists reported in late 2005 that it had weakened by about 30 per cent.

## STORM WARNING



The eye of the storm: Hurricane Elena pictured from above. The storm forced almost a million people to evacuate coastal areas between Tampa, Florida and New Orleans, Louisiana. Winds were recorded up to 195 kilometres per hour.

Photo: NASA/Still Pictures

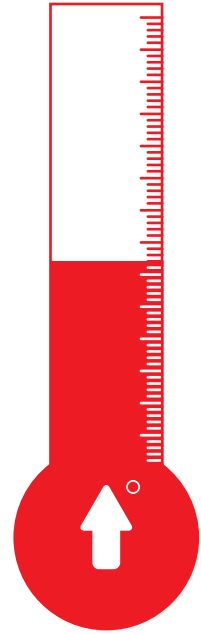


This fishing village in Honduras was destroyed by Hurricane Mitch in 1998. The Central American region is particularly prone to fierce storms.

Photo: N. Dickinson/Still Pictures

Hurricanes feed off warm seas, and as global warming has increased, both their size and number have grown. 2005 was the worst Atlantic season since records began more than 150 years ago. It started earlier, ended later and had more hurricanes and storms than ever, including three of the six fiercest ever to hit the United States. One, Katrina, flooded New Orleans, causing immense damage.

Scientists disagree on how much global warming is responsible. Recent studies suggest it has made hurricanes more intense, but it is unclear whether it has also made them more frequent. There is greater agreement that, as it continues, it will make the situation even worse.



## POISON GAS



A view of the Florida Keys from outer space exposes the architectural structures formed by the calcium deposits of corals.

Photo: NASA GSFC SVS/LANDSAT



Adding carbon dioxide to the oceans is like carbonating water to make a fizzy drink or soda.

Photo: B. Mims/UNEP/Topham

And, as if all this were not enough, carbon dioxide – the main cause of global warming – is threatening to alter the chemistry of the oceans in ways unprecedented in the last 20 million years.

The oceans have absorbed half of all the gas so far emitted by humanity, and will go on doing so. This process forms dilute carbonic acid, which hinders the ability of corals, crustaceans, molluscs and certain plankton to form their hard structures or shells. As the acidity continues to rise, it is feared, coral reefs, shellfish and plankton will die off, with huge knock-on effects on the life of the oceans.