4.8

# Global warming—the end of coral reefs?

**Global warming could bring an end to coral reefs. It is causing the temperature of the oceans to increase and the sea level to rise. It does not take much of a temperature change to upset the delicate balance that exists on coral reefs. When corals die, it is called coral bleaching.**

4.31 Bleached coral is white and lifeless.

## EVIDENCE AND EFFECT OF GLOBAL WARMING ON REEFS

The line graphs in 4.32 show that increases in carbon dioxide and methane gases in the atmosphere follow the same shape as the temperature of Antarctica and sea level change. It is not just the increase in temperature that is causing the problem for coral reefs, it is the speed at which the temperature change will occur.

Coral reefs growth relies on the symbiotic relationship between the zooxanthellae and the coral polyp. This in turn relies on sunlight, clear oceans and warm water. When the water gets too hot, the coral polyp spurts out the zooxanthellae and this essential relationship is broken. Other plants and animals start to die because of the break in the food chain, and the reef dies.

Bleached coral reefs are like white graveyards—all that is left is the coral skeleton. It takes years for reefs to recover. Some reefs may never recover. If the sea temperature continues to rise, corals around the world will be threatened.

### GEOGRAPHY FOCUS

Mass coral bleaching in 1998 and 2002 was caused by a change in sea temperature of less than 1°C. Scientists are predicting sea temperature changes of 2 to 6°C in the future.

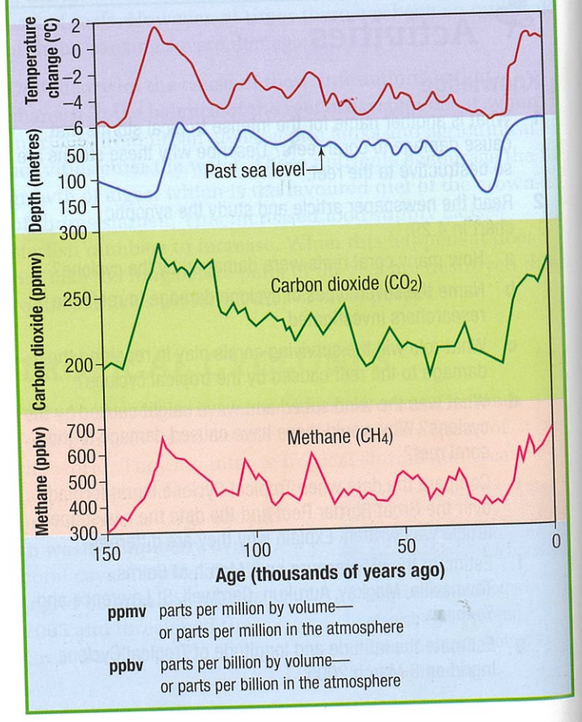
### When did this threat occur?

Widespread coral bleaching was first noticed in 1998. High sea surface water temperatures caused the bleaching of reefs around the world. The second worst year on record was 2002.

### Effects of climate change

Many scientists suggest that some reefs could disappear completely by 2020 due to coral bleaching and that the entire global environment of coral reefs could be destroyed over the next 100 years due to sea temperature rises.

4.32 Climate change variations in Antarctica over 150 000 years

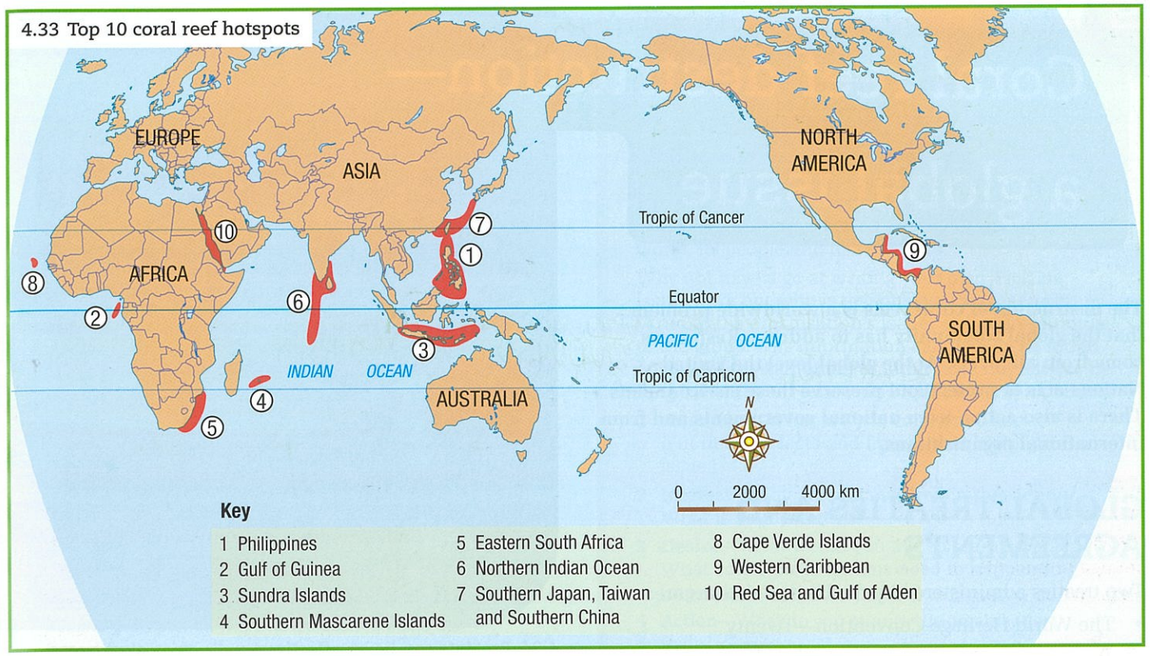



**ppmv** parts per million by volume—or parts per million in the atmosphere

**ppbv** parts per billion by volume—or parts per billion in the atmosphere



4.33 Top 10 coral reef hotspots




In addition, a rise in the sea level will cover some coral cays. This could mean that whole island communities in the Pacific Ocean will have to relocate. Some residents of Pacific atolls and cays have already had to move their homes to higher ground and are leaving the islands altogether, as in the case of Tuvalu.

Climatic change will also mean more frequent tropical cyclones which are very destructive to the coral reef. Cyclones are a natural threat that reefs are able to recover from but global warming will cause the number of tropical cyclones to increase, placing additional stress on reefs. Add to this the bleaching of reefs and their ability to recover from these events will be severely reduced.

Nature can cope with change over thousands of years but humans cause change in decades.

## SOLUTIONS TO CORAL BLEACHING

While the 10 reefs most at risk shown in 4.33 can be protected from local threats, it will take a global approach to solve the coral bleaching issue.

Electricity generation is the biggest source of greenhouse gases—the pollution that is causing global warming. Existing world energy consumption is predicted to increase by 50 per cent in the next 20 years and the future for coral reefs cannot be assured. Countries and individuals need to think about how energy is used and the sources that it comes from. (This concept is explored further in chapter 10.)

## Activities

### Knowledge

1 What two impacts of global warming threaten coral reefs?
2 Why is water temperature important to coral reefs? How does a change in it destroy the reef ecosystem?
3 What will be the end result of global warming on coral reef ecosystems?
4 How long is it predicted to take before global warming affects all coral reefs?
5 Describe the impact global warming will have on island communities of the Pacific Ocean.
6 In what way will global warming cause tropical cyclones to have a greater impact on coral reefs?
7 What activity creates the most greenhouse gases? What is likely to happen to this pollution source in the future?

### Skills

8 Refer to 4.32:
- **a** What is the relationship between the temperature change graph and the methane and carbon dioxide gas graphs?
- **b** Approximately how many thousands of years ago was the first rise in sea level?
- **c** What is the trend for the temperature graph over the past 100 years? Do you expect this trend to continue?
- **d** What relationship exists between sea level, temperature change and increases in methane and carbon dioxide?

**Skills** ICT CW