

Rising sea levels and climate change

READING SKILLS

Classifying information Recognizing trends Skimming for key data

EXAM PRACTICE

Labelling a map Completing a table Short answer questions







Identifying the topic

- Look at these images and answer the questions.
 - a How are these images connected?
 - **b** Could you organize these pictures in a different order? Explain how you would decide.
 - **c** Do you think global warming is the result of human activity? Give reasons for your opinion.

Skills

Classifying information

Before you read a text you can ask yourself a few questions:

- 1 Does the title give me a clear idea of the content?
 - The title of a text about factual events may give you important clues about the topic, focus, date and location of the information.
- 2 Do I know anything about this topic?
 - If you know something about the topic, think of the key vocabulary you might expect to find in the text. Try to remember alternative words (synonyms) associated with these key words.
- 3 What kind of information can I expect to find in the passage?
 - The title might refer to some or several of the following: dates, percentages, figures, currency, geographical locations, volumes, ratios and measurements.
- 4 Can I predict the structure of the text from the title?
 - The time frame and the tense of the verb in the title will indicate whether the text will describe past events or the current situation or predict future developments.
- **2** Read the following titles of articles about rising sea levels and answer questions 1–4 above.
 - a Sea level change 100 years of annual tide-gauge records
 - **b** Rate of acceleration of global mean sea-level rise since 2000
 - c US east coast cities affected by two-metre rise in ocean levels
 - d Nineteenth and twentieth century rises in sea level

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3 Scan the passage below and complete the table with the type of information found in the text.

Dates/Periods of time	Measurements	Geographical locations

Sea level rising

Global average sea level has increased over 8 inches since 1880, and global warming has caused the great majority, if not all, of that rise. Warming has acted in two main ways: by heating up and thus expanding the global ocean; and by attacking glaciers and polar ice sheets, pouring meltwater and icebergs into the sea. The planet has heated by more than one degree Fahrenheit over the last century, rising faster as we have burnt coal, oil and gas faster, and so sent ever more heat-trapping gases into the air. Scientists overwhelmingly agree that these building gases are responsible for most of the warming observed thus far.

Warming and sea-level rise are both accelerating, as is the rate of decay of ice sheets on Greenland and Antarctica. Loss of ice from these sources has the potential to raise sea level by many tens of feet over centuries. In the warm period before the last Ice Age – when the planet was as warm as we expect it to become by 2100 or sooner, at least without deep and immediate cuts to pollution – global sea level very likely reached over 20 feet higher than it is today, an eventual sea level we could be committing to within decades if not already. That rise would be enough to drown many major coastal metropolises.

This century, scientists expect about 20 to 80 more inches of global sea-level rise, depending significantly on how much more heat-trapping pollution humankind puts into the sky. The amount also depends on just how strongly pollution translates into warming, and just how strongly warming translates into sea rise.

4 Complete the following sentences with the correct tense of the verbs in brackets.

- **a** Over the last 130 years the sea level ______ (rise) nearly 10 inches.
- **b** Even now the volume of the ocean ______ (expand) as the planet gets warmer and polar ice melts.
- c Experts calculate that over the next century human activity ______ (cause) sea levels to match those of the Ice Age.

Skills

Recognizing trends in charts, diagrams, tables and maps

Texts that give factual information often include statistics and figures that can also be represented in charts, diagrams, tables and maps. In the text, the writer will usually:

- a describe the data or information.
- **b** compare figures over a period of time, or at different points in time.
- **c** highlight the most significant aspects of the data; for example, exceptionally high and low figures, percentages and ratios in a chart, unusual data patterns, exceptions to the norm and trends.
- d explain the possible causes of and reasons for the figures and changes in the chart.

Unit 9

Exam skills

Labelling a map

In some questions you will be asked to complete labels on a map using words or numbers from the reading passage. You can write numbers in figures or words, but remember that in the reading test spelling counts. If you write the numbers in words, you must take care to spell them correctly.

5 Read the following passage and complete the map with the predicted rise in sea level that will completely submerge each city. Write a NUMBER from the text.

Rising sea levels threaten coastal cities

Since 1880, sea levels have risen an average of 8 inches globally. Calculations vary, but there is common consensus that, as a result of global warming, oceans will heat up and expand at an increasing pace and sea levels will consequently rise more rapidly. Some scientists calculate that the sea will rise between 6 and 15 inches by 2050 and between 12 and 48 inches by 2100. Experts predict that if this trend continues, many coastal settlements will be susceptible to flooding within the next century, and that some will be in danger of disappearing altogether.

Unusually high tides and storm surges in recent years, have already caused serious flooding in cities worldwide, including New York, New Orleans and Venice. Although, this in itself does not pose an immediate threat to their survival, there is evidence that rising sea levels could lead to the inundation of major cities by the end of the 21st century.

If scientific calculations are accurate, Venice would be completely submerged if sea levels rose by 42 inches. The Hague in Holland, another low-lying European city, would also be affected by rising sea levels. Like Venice, it is only 39 inches above today's sea level, and would be totally submerged if sea levels rose by 45 inches. On the other hand, central New York, at an elevation of 79 inches above sea level, would not be submerged until the level of the ocean rose by 80 inches, while the greater part of San Francisco would disappear under the sea with a rise in sea level of only 42 inches.



Rise in sea levels (in inches) needed to submerge major cities

6 Scan the text again and identify the organizational words and phrases that express relationships of:

a cause

- **b** effect
- c comparison

Rising sea levels and climate change

Skills

Skimming for key data

Skimming is an effective technique for identifying the overall message and structure of a reading passage (see Unit 1). Key words from the topic sentence are repeated and extended throughout the passage, indicating points in the text where sub-topics and themes are developed. Words and phrases that express opinions and logical arguments outline the structure of the text.

- **7** Skim the following text for:
 - a key vocabulary in the topic sentence.
 - **b** repetitions of key and associated vocabulary in the text.
 - c sub-topics or themes.
 - d words that indicate the logical argument and structure of the text.

Traditional knowledge and past experience

Adaptive capacity and resilience can also be strengthened through the application of traditional knowledge and past experience of environmental changes. In the TAR*, Nurse et al (2001) noted that some traditional island assets, including subsistence and traditional technologies, skills and knowledge, and community structures, and coastal areas containing spiritual, cultural and

⁵ heritage sites, appeared to be at risk from climate change, and particularly sea-level rise. They argued that some of these values and traditions are compatible with modern conservation and environmental practices.

Since then, several examples of such practices have been described. For instance, Hoffmann (2002) has shown that the implementation of traditional marine social institutions, as exemplified

in the Ra'ui in Rarotonga, Cook Islands, is an effective conservation management tool, and is improving coral reef health; while Aswani and Hamilton (2004) show how indigenous* ecological knowledge and customary sea tenure* may be integrated with modern marine and social science to conserve the bumphead parrotfish in Roviana Lagoon, Solomon Islands. Changes in sea tenure, back to more traditional roles, have also occurred in Kiribati (Thomas, 2001).

- 15 The utility of traditional knowledge and practices can also be expanded to link not only with biodiversity* conservation but also with tourism. For instance, in a coastal village on Vanua Levu, Fiji, the philosophy of *vanua* (which refers to the connection of people with the land through their ancestors and guardian spirits) has served as a guiding principle for the villagers in the management and sustainable use of the rainforest, mangrove forest, coral reefs and village
- gardens. Sinha and Bushell (2002) have shown that the same traditional concept can be the basis for biodiversity conservation, because the ecological systems upon which the villagers depend for subsistence are the very same resources that support tourism. These examples indicate that local knowledge, management frameworks and skills could be important components of adaptive capacity in those small islands that still have some traditional foundations.
 - * TAR Third Assessment Report of the Intergovernmental Panel on Climate Change
 - * indigenous characteristic of a specific region
 - * tenure possessing or looking after something (usually property)
 - * biodiversity a variety of plant or animal life

Unit 9

Exam skills

Table completion

One type of question asks you to complete a table which summarizes information from one section of the text. The answers may not be in the same order as the information in the reading passage. You should write the words exactly as they appear in the reading passage. Check the spelling and make sure you do not exceed the number of words you are asked to write.

8 Complete the table with information from the passage on page 73. Write NO MORE THAN THREE WORDS in your answer.

Location	Traditional practice	Beneficial to
Cook Islands	using ancient a societies	b
Solomon Islands and c	application of local d information	bumphead parrot fish
Fiji	consulting with forefathers and e	forests, coral formations and f

Exam skills

Short answer questions

In this type of exercise you are required to answer questions about factual details in a reading passage using words from the text. The answers to the questions are in the same order as the information in the text. You must write the number of words indicated in the instructions.

- Read the passage on page 73 and answer the questions (a–e) with words from the text. Write NO MORE THAN TWO WORDS.
 - **a** Where exactly are the cultural and religious places that Nurse et al (2001) consider to be endangered by a rise in sea level? ______
 - **b** According to Nurse et al (2001), how do time-honoured community wisdom and current environmental and conservation methods relate?
 - c Which features of managing the sea have been reintroduced in Kiribati?
 - d What role does vanua play in the ecological practices of the population of Vanua Levu?

e What determines both the islanders' survival and the tourist industry?

Reading Passage 9

You should spend 20 minutes on questions 1-13, which are based on Reading Passage 9.

The Antarctic Peninsula is a rugged mountain chain generally more than 2000 metres high, differing from most of Antarctica by having a summer melting season. Summer melt produces many isolated snow-free areas, which are habitats for simple biological communities of primitive plants, microbes and invertebrates*, and breeding grounds for marine mammals and birds. The Antarctic Peninsula has experienced dramatic warming at rates several times the global mean (Vaughan et al, 2003; Trenberth et al, 2007). Since the TAR*, substantial progress has been made in understanding the causes and profound impacts of this warming.

Since records began, 50 years ago, mean annual temperatures on the Antarctic Peninsula have risen rapidly: >2.5°C at Vernadsky (formerly Faraday) Station (Turner et al, 2005). On the west coast, warming has been much slower in summer and spring than in winter or autumn, but has been sufficient to raise the number of positive-degree days by 74% (Vaughan et al, 2003), and the resulting increase in melt has caused dramatic impacts on the Antarctic Peninsula environment, and its ecology.

Around 14 000 km² of ice have been lost from 10 floating ice shelves (King, 2003), 87% of glacier termini* have retreated (Cook et al, 2005), and seasonal snow cover has decreased (Fox and Cooper, 1998). The loss of seasonal snow and floating ice do not have a direct impact on global sea level, but acceleration of inland glaciers due to the loss of ice shelves (De Angelis and Skvarca, 2003; Scambos et al, 2004; Rignot et al, 2005) and increased run-off of melt water (Vaughan, 2006) will cause an increase in this contribution. If summer warming continues, these effects will grow.

Marine sediment* cores show that ice shelves probably have not reached a similar minimum for at least 10 000 years (Domack et al, 2005), and certainly not for 1000 years (Pudsey and Evans, 2001; Domack et al, 2003). This suggests that the retreat is not simply due to cyclic variations in local climate, and that recent warming is unique in the past 10 000 years (Turner et al, 2007). The processes leading to warming are unclear, but appear to be correlated with atmospheric circulation (van den Broeke and van Lipzig, 2003) and particularly with changes in the Southern Annular Mode* caused by anthropogenic* influence (Marshall et al, 2004; Marshall et al, 2006). The winter warming on the west coast also appears to be related to persistent retreat of sea ice (Parkinson, 2002) and warming in the Bellingshausen Sea (Meredith and King, 2005). The spring depletion of ozone over Antarctica (the Antarctic Ozone Hole) has also been implicated in driving circulation change (Thompson and Solomon, 2002), but this has been disputed (Marshall et al, 2004). Current general circulation models (GCMs) do not, however, simulate this observed warming over the past 50 years (King, 2003) and we cannot predict with confidence whether rapid warming will continue in the future.

If warming does continue (especially in the summer) there will be significant impacts; retreat of coastal ice and loss of snow cover would result in newly exposed rock and permafrost* – providing new habitats for colonization by expanding and invading flora and fauna. However, the direct impacts of climate change on the flora and fauna are difficult to predict, since these ecosystems are subject to multiple stressors. For example, increased damage by ultraviolet exposure, because of reduced ozone levels and summer desiccation*, may oppose the direct responses to warming (Convey et al, 2002). In addition, there is a growing threat of alien species

Unit 9

invasion, as climatic barriers to their establishment are eroded by climate amelioration*, and increasing human activity increases the opportunity for introduction. Such invasions have already occurred on many sub-Antarctic islands, with detrimental consequences for native species (Frenot et al, 2005). Furthermore, slow reproduction rates during rapid climate change may limit the possible relocation of native species.

- * invertebrates animals without a backbone
- * TAR Third Assessment Report of the Intergovernmental Panel on Climate Change
- * termini the end of something
- * sediment mineral or organic matter that sits at the bottom of the sea
- * Southern Annular Mode climactic patterns occurring in the southern hemisphere
- * anthropogenic caused by human activity
- * permafrost frozen soil
- * desiccation drying
- * amelioration improvement

Questions 1-4

Label the diagram below with information from the text. Write NO MORE THAN TWO WORDS OR A NUMBER.



Questions 5–9

Complete the table with information from the reading passage. Write NO MORE THAN TWO WORDS OR A NUMBER.

Year of research publication	Effects on Antarctic	Causes
5	ice shelves smallest in 10 000 years	
6	exceptional levels of warming in last 10 000 years	
2003	higher temperatures	7
2004 and 8	changes in Southern Annular Mode	human activity
2002	west coast 9	reduction in sea ice

Questions 10–13

Answer questions 10–13 with words from the text. Write NO MORE THAN THREE WORDS.

10 What would be uncovered if ice and snow levels decreased?.....

11 What would populate the newly formed environment?

- 12 How does human behaviour encourage foreign species to migrate to new environments?
- 13 What may reduce the speed of reproduction of local animals and plants?