

Global Issues

Global Warming

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ISSUES

To read the second part of each issue, click on the page number at the bottom of the page.

Glossary words

When a word is written in **bold**, click on it to find its meaning.



Facing global issues



Hi there! This is Earth speaking. Will you spare a moment to listen to me? I have some very important things to discuss.

We must face up to some urgent environmental problems! All living things depend on my environment, but the way you humans are living at the moment, I will not be able to keep looking after you.

The issues I am worried about are:

- the effects of **global warming**
- the health of natural environments
- the use of **non-renewable** energy supplies
- the environmental impact of unsustainable cities
- the build-up of toxic waste in the environment
- a reliable water supply for all.

My global challenge to you is to find a sustainable way of living. Read on to find out what people around the world are doing to try to help.

Fast fact

Sustainable development is a form of growth that lets us meet our present needs while leaving resources for future generations to meet their needs too.

What's the issue? Global warming

Today we know that Earth is warming rapidly due to the impact of human activities. This process is known as global warming.

Changes to climate

Global warming causes changes to climate. These changes can already be seen in every environment on Earth. In 2007 the United Nations Intergovernmental Panel on Climate Change (IPCC) agreed that Earth is an average of 0.6 degrees Celsius warmer than it was before 1970. It is predicted that Earth will continue to warm in the future.

Effects of global warming

Every region will experience different effects of global warming. These effects include more heatwaves and droughts, less ice cover, more extreme floods and changing seasons.

Fast fact

During Earth's 4.6-billion-year history, there have been many geological periods with cooler climates, called ice ages, but few periods when the climate was warmer than it is today.

Global warming may cause more extreme weather events, such as storms and hurricanes.



Global warming issues around the globe

Some of the issues linked to global warming across the globe include:

- longer, warmer summers and shorter winters (see issue 1)
- melting sea ice in Arctic glaciers (see issue 2)
- changes to seasons and crop cycles (see issue 3)
- changes to rainfall patterns and river flows (see issue 4)
- damage to homes as a result of weather extremes (see issue 5).

Fast fact
 Today the average surface temperature on Earth is 14.6 degrees Celsius, which is at least 0.5 degrees Celsius warmer than in 1950.



ISSUE 3
United States
 Changes to the time of year when spring flowers bloom. See pages 16–19.

ISSUE 2
The Arctic
 Frozen sea ice is melting and affecting the Nenets people. See pages 12–15.

ISSUE 4
Africa
 Drought caused by changed rainfall patterns. See pages 20–23.

ISSUE 1
France
 Worst summer heatwave ever recorded. See pages 8–11.

ISSUE 5
Bangladesh
 Thousands of people have been left homeless due to flooding. See pages 24–27.

A warmer world

Global warming is increasing temperatures in every region on Earth. While the average temperature has increased across the globe, some areas have had larger temperature rises than others.

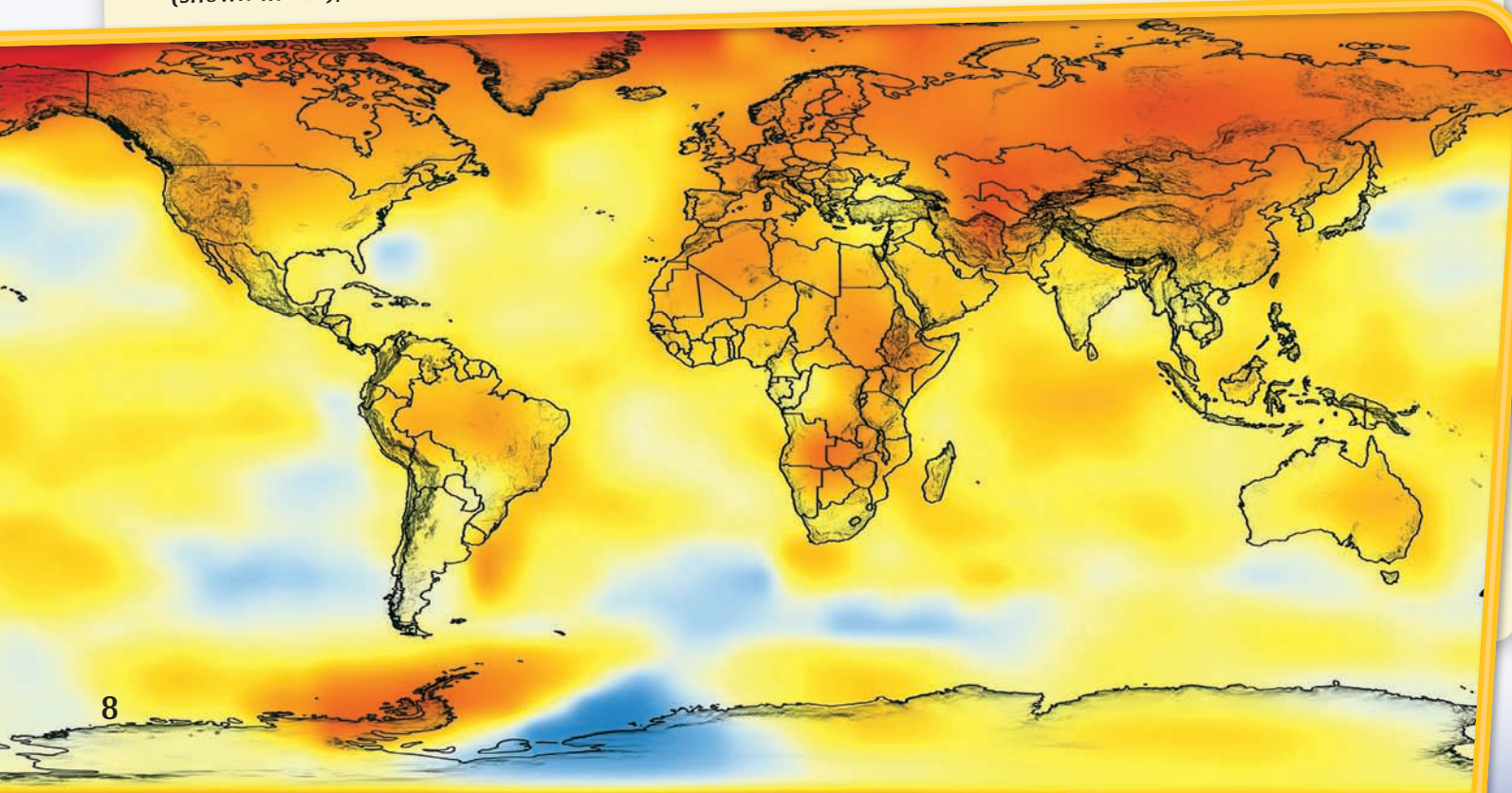
Warmer summers and winters

One impact of global warming in **temperate zones** is warmer summers and winters. As a result, some regions are experiencing more heatwaves. Rainfall patterns have also changed, so that many areas in temperate zones are experiencing drought for the first time.

A warmer Northern Hemisphere

Temperature has been rising in the Northern Hemisphere faster than it has in the Southern Hemisphere. This is because the Northern Hemisphere has larger land masses, and land absorbs more heat than oceans do.

Between 2002 and 2006, many areas on Earth were warmer than average (shown in red), but few areas were colder than average (shown in blue).



In Paris, local people bathed to get cool during the European heatwave.

CASE STUDY

France during the European heatwave

In 2003, a heatwave affected countries across Europe. In France, temperatures topped 40 degrees Celsius throughout much of August 2003.

Warmer for longer

The European heatwave lasted for a long time, and this was what made it so devastating for France. For a whole month, temperatures during the heatwave were much higher than usual.

Impacts of the European heatwave

The European heatwave had many impacts across France.

- Thousands of people died due to **heat stroke** and dehydration. French funeral parlours recorded a 37 per cent increase in deaths, compared to the same period in 2001.
- Doctors struggled to cope with the number of heat stroke victims in hospitals.
- Some offices had to shut down due to a lack of air conditioning.
- Some homes became too hot to live in. Many buildings in France are built to hold heat in during cold weather, not to keep cool during hot weather.

Towards a sustainable future: Adapting to changing temperatures

As global warming continues, the number of heatwaves in temperate zones may rise. People can learn from extreme weather events and plan for the future.

Learning from extreme weather events

If people learn from extreme weather events, this knowledge can help them to plan for the future. Research predicts that society will face more extreme weather events including heatwaves, forest fires, hurricanes and droughts as global warming increases. Scientists can monitor problems caused by these weather events, such as health risks, transport problems and decreasing water supplies.

Fast fact

Most climate models predict that temperatures will increase by an average of between 1.4 and 6 degrees Celsius by 2100.

Planning for future heatwaves

People can plan and prepare for heatwaves that may occur in the future. Many buildings, transport systems and agriculture systems were designed for climate conditions of the past, and they may not function effectively as climates change. Researching ways to adapt these systems for future climate conditions will help to reduce the impacts of global warming on people and ecosystems.



People in Europe need to be ready to fight more forest fires, such as the ones that occurred in Portugal during the European heatwave.



Train rails can buckle in hot weather, so trains need to go more slowly in hot climates.

CASE STUDY

Planning for heatwaves in the European Union

Following the European heatwave, countries in the European Union (EU) put measures in place to prepare for future heatwaves.

Reducing the impacts of heatwaves

The EU has adopted many measures to help reduce the impacts of future heatwaves.

- In the United Kingdom, a program called Heat-Health Watch operates every summer to warn people of dangerously hot weather.
- In Britain, Network Rail is imposing speed restrictions on trains when temperatures reach above 30 degrees Celsius. This helps to stop trains from derailing if railway lines buckle in the heat.
- In France, the government is setting up an alert system to protect vulnerable people, such as elderly people living alone.
- In some European countries, the use of garden hoses is limited or banned during times when water supplies are running low.
- In many countries, news services tell people how to stay hydrated and cool during a heatwave.

Learning from others

Many of the measures put in place in the European Union are already common practice in warmer countries, such as Australia and the United States. Sharing knowledge of how to survive in different conditions will help make adapting to changing weather patterns easier.

Fast fact

Some climate models predict that extreme weather events that result in severe damage could occur every second year by 2050.

Declining ice cover

The Arctic has changed more than any other region on Earth as a result of global warming. Arctic sea ice is melting rapidly, and this is affecting local wildlife.

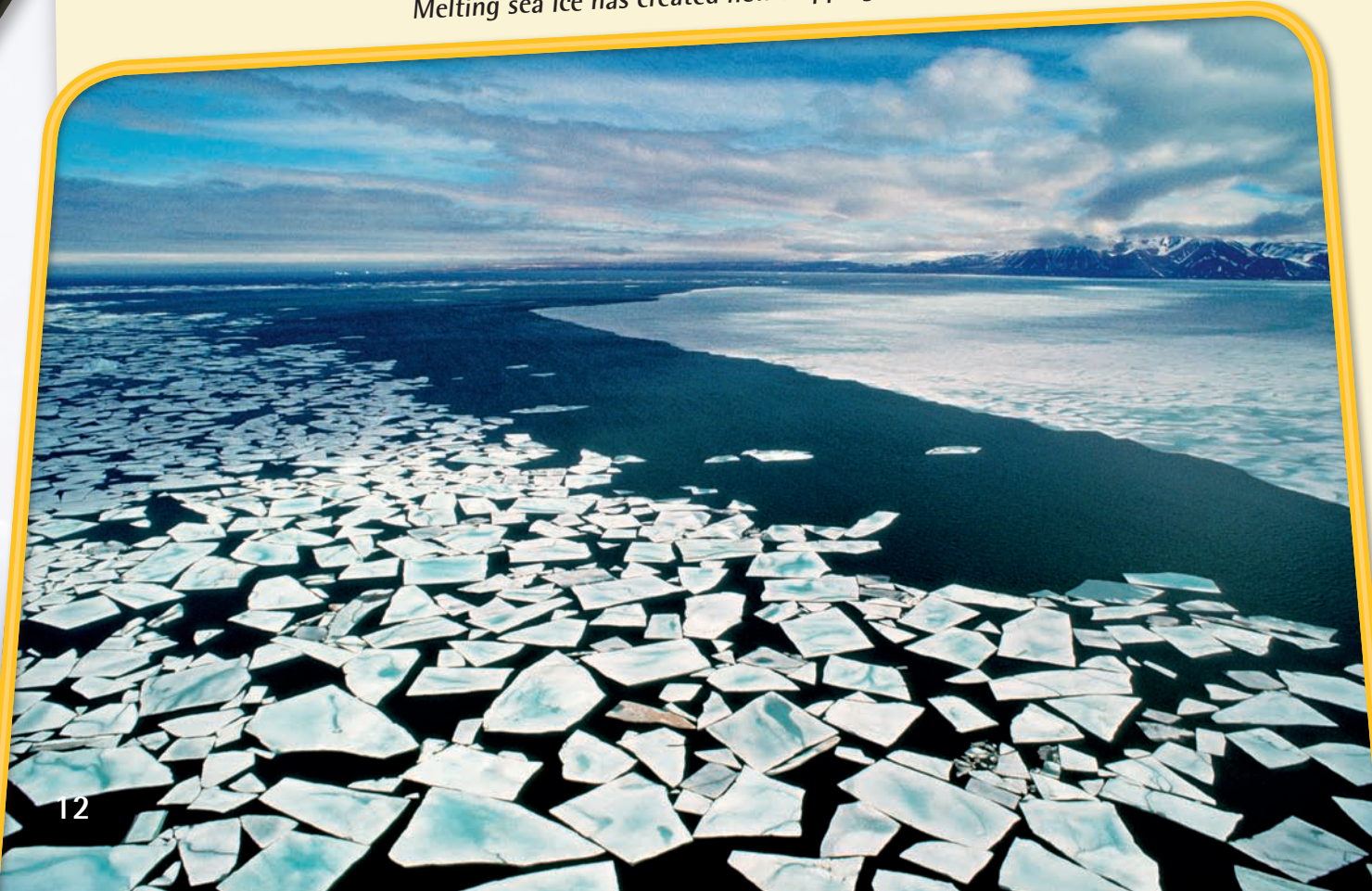
Melting sea ice

A large amount of sea ice at Earth's northern pole has melted due to rising temperatures. For the first time in human history, shipping channels are opening up through the Arctic Ocean. This benefits shipping and trading companies, but it is having a devastating effect on wildlife.

Impacts on wildlife

Melting sea ice is impacting on wildlife in the Arctic. The loss of ice cover means that migratory birds, seals and polar bears can no longer travel safely in their habitats, as they risk drowning.

Melting sea ice has created new shipping channels in the Arctic Ocean.



The Nenet people may have to stop using sleds to hunt reindeer as sea ice melts.

CASE STUDY

The Nenet people

The Nenet people of Siberia, in Russia, have lived in the Arctic for generations. Today their traditional food supplies are being threatened due to melting sea ice.

Travelling across permafrost

Ground that is frozen all year around is known as permafrost. The Nenet people travel across permafrost to hunt caribou and reindeer. Caribou and reindeer herds once travelled south during winter and then returned north across the permafrost in summer.

Melting rivers, lakes and seas

Today, Arctic rivers, lakes and seas are melting, so reindeer often have difficulty returning from the north in summer. The Nenet people can no longer depend on this important source of food. They also cannot travel safely over the permafrost to hunt reindeer.

Fast fact

The West Antarctic ice sheet is now breaking up. It is one of the largest expanses of ice, and it holds enough water to raise sea levels by up to 7 metres.

Towards a sustainable future: Protecting polar life

As the Arctic climate changes, life in the Arctic will change too. Arctic wildlife can be protected, and Arctic peoples can find ways to adapt to changing climates.

Protecting Arctic species

As the **Arctic icecap** melts, there is less habitat available to polar bears, seals, reindeer and other Arctic species. Researchers fear that if the icecap disappears, polar bears and other Arctic species will disappear as well. Unlike animals in temperate zones, animals in the Arctic cannot migrate to other areas if their habitats change. It is important that governments work to protect threatened species in the Arctic.

Adapting to new conditions

Some Arctic peoples may have to change their traditional practices to adapt to new climate conditions. Governments and organisations can provide Arctic peoples with support to change their hunting and fishing practices. Some farmers in Greenland may be able to grow more crops in the warmer conditions.

Alaskan eskimoes may no longer be able to hunt for crabs if sea ice continues to melt.



Fast fact

Approximately 125 000 years ago, the Greenland icecap melted and raised sea levels up to six metres.



Polar bears rest on ice sheets in between hunting seals in the Arctic Ocean.

CASE STUDY

Protecting polar bears

In May 2006, polar bears were listed on the International Union for Conservation of Nature (IUCN) Red List of Threatened Species.

Threats to polar bears

Polar bears are threatened by declining food supplies. The number of seals in the Arctic is declining as fewer large **ice sheets** are available for seals to breed on. Melting permafrost means that polar bears cannot travel across the **polar zone** in search of seals.

Many polar bears are now trying to catch seals in the water instead. In northern Alaska, polar bears have drowned while trying to swim long distances between ice sheets. In 2004, four polar bears drowned after trying to swim a 257-kilometre gap.

Protection of polar bears

Listing polar bears as a threatened species is the first step towards protecting them. Countries that are members of the IUCN will now have to consult with each other on how to manage and protect polar bear populations.

Fast fact

In 2004, there were only 20 000 to 25 000 polar bears worldwide.

Changing seasons

Warmer climates have led to changing patterns in the seasons. In many temperate zones, local **ecosystems** are being affected as plants flower earlier each year.

Changing weather patterns

Even slight changes in weather patterns can have huge impacts on local ecosystems. While some species of plants may grow better due to warmer conditions, others may suffer. If some crops do not grow as well as they once did, food supplies may decline.

Changing patterns of flowering

Some plants are flowering earlier in temperate zones. Earlier spring flowering is occurring in regions such as southern Europe and the southwest United States. In colder regions, spring flowering is occurring later. Plants that have adapted to cold weather may not flower at all as winters shorten and become warmer.

In temperate zones, spring flowering is occurring even before the winter ice melts.

Fast fact
In the United Kingdom, many **fungi** have been observed reproducing twice a year instead of once, due to longer spring seasons.



Trees in forests such as this are dying at an increased rate in the United States.

CASE STUDY

Changing ecosystems in the United States

In the United States, many ecosystems seem to be altering due to changing seasons. Some forests are dying, while others are spreading into new areas.

Dying forests

Researchers have observed that many forests in the United States are dying. In 2002 and 2003, many pinion pines in the southwest of the country died due to rising temperatures and decreased rainfall. Studies of 21 000 fir and spruce trees in the Sierra Nevada mountains of California have shown that more trees are dying at higher **altitudes** than in the past due to lack of water.

Moving maple forests

Maple tree forests in eastern United States are starting to grow in areas further north. It has been estimated that these forests could move more than 80 kilometres northwards. Maple forests in New England are predicted to move into northern Maine and southern Canada. Maple forests will not be able to shift northwards in areas where forests are only found in isolated patches, because the forest habitat is broken up.

Fast fact
A study observing 36 species of plants in central United States reported that dates of flowering advanced by an average of 7.3 days from 1936 to 1998.

Towards a sustainable future: Learning about changing ecosystems

Research is being carried out to find out more about the factors that affect plant growth as the seasons change. Learning about these changes means that people will be able to plant suitable crops and protect native plants in the future.

Choosing the right plants

Changes in plant growth are occurring in Africa, Australia, North America, Asia and Europe. Studies are being carried out to investigate whether some plants will grow better with warmer temperatures and less rainfall. This could help ensure that crops will grow successfully and native plants will survive if temperatures on Earth continue to rise.

Researching crop growth

Research is being conducted into crop growth in temperate zones across the globe. The Potsdam Institute for Climate Impact Research published a study about crop growth in Europe. It showed that 2005 crop yields were approximately 30 per cent lower than average 2003 yields. This result suggests that as temperatures rise in Europe, crop yields may reduce. If farmers know that this is likely, they can prepare for the future.

Crop yields may reduce as temperatures rise.



The European Space Agency's Envisat satellite collects data on natural environments across Earth.

CASE STUDY

The GLOBCARBON project

The GLOBCARBON project mapped the state of natural environments. It used data collected from European satellites between 1998 and 2007.

Mapping natural environments

The GLOBCARBON project measured many elements to map natural environments across Earth. It used about 25 computers to analyse data from five European Space Agency (ESA) satellites. The satellites collected data on:

- levels of plant cover
- areas of fire-affected land
- areas of green, leafy forests.

In 2007, the first stage of the project was made available to the public. It showed estimates based on data collected between 1998 and 2003. The second stage will include data collected between 2004 and 2007.

Planning for the future

Information from the GLOBCARBON project will help people to understand how ecosystems are changing as the seasons change. It will help people to predict what will happen to ecosystems in the future, so that they can plan ahead.

Fast fact

The five ESA satellites that collected data for the GLOBCARBON project were SPOT-4, SPOT-5, ERS-2, AATSR and Envisat.

Changing rainfall patterns

Rainfall patterns in many areas have changed due to global warming. These changes are impacting on people, animals and crops all over Earth.

Changing amounts of rain

Rainfall patterns changed significantly throughout the twentieth century, and they may continue to change in the future. Today, some areas are receiving more rain than in the past, while other areas are receiving less rain. It is also estimated that more heavy downfalls will occur as temperatures on Earth rise.

Increasing rainfall in tropical zones

As temperatures rise, oceans get warmer and more water evaporates into the air. Large amounts of warm, moist air build up in clouds. When these clouds become too heavy, extreme weather events such as storms and hurricanes may occur. As these weather events occur more often, more torrential rain may be dumped on coastal areas and lost as flood waters.

Rainfall is increasing in many areas of the world (shown in red).



A lack of monsoon rains has left land in the Sahel region dry and dusty, with little vegetation.



CASE STUDY

Drought in Africa

A series of severe droughts has affected the Sahel region in Africa. While overgrazing and overpopulation were once blamed for the droughts, it is now believed that the droughts are an effect of changing rainfall patterns.

Disappearing monsoon rains

Farmers in the Sahel region have always relied on yearly **monsoon rains** to sustain their crops. In the 1960s, these monsoon rains failed to come. Plants died and **nomadic** camel herders began to graze their animals on farmland instead. This caused widespread conflict between the camel herders and the farmers, who were already suffering from the drought conditions. As the region became drier and produced less food, famine began to occur in local communities.

Rising ocean temperatures

Today, it is believed that the Sahel region experienced a sudden decline in rainfall due to rising ocean temperatures. A study published by the National Centre for Atmospheric Research in 2003 showed that changes in rainfall patterns were due to rising surface temperatures in the Indian Ocean. Water was evaporating into clouds, but it was not falling as rain. The monsoon rains have not returned.

Fast fact

Rainfall in the southern area of Western Australia is declining rapidly, as it did in the Sahel region. Winter rains are decreasing by about 15 per cent.

Towards a sustainable future: Planning for extreme weather events

As rainfall patterns change, a greater number of extreme weather events may occur. People can prepare for these new weather conditions in order to minimise the effects.

Rise in extreme weather events

As rainfall patterns change, it is predicted there will be a significant increase in extreme weather events, such as storms, floods and droughts. Snow-covered mountains may also receive more rainfall as Earth warms.

Planning for disasters

People can prepare for extreme weather events across the globe. Governments can develop emergency systems to deal with damage from disasters caused by floods or hurricanes. People who live near rivers can prepare to deal with **flash floods** or declining water supplies, due to rivers running dry during hot months.

Local governments can set up flood walls to minimise the damage from some extreme weather events.

Fast fact

Over the past 50 years, snowfall on mountains in southwest USA has declined. This snow used to be a reliable source of water.



Rivers in California are now running low in summer as snow melts more quickly in spring.

CASE STUDY

California's water management systems

In California, dams help to keep water supplies reliable and prevent floods. Water action plans are helping to keep water supplies reliable.

River flows in California

Rivers in California are fed mainly by water from melted snow that runs off the Sierra Nevada mountains. Today, snow is melting more quickly due to rising temperatures and increased rainfall. A study of the Sierra Nevada mountains showed that runoff from melting water peaked three weeks earlier in 2003 than it did in 1948. This means that water has been evaporating more quickly as the weather warms. River flows are declining rapidly in summer as a result.

Water action plans

In 2008, Governor Schwarzenegger announced plans to rebuild California's water systems. The plans include building more dams to keep water supplies reliable as the population grows and temperatures rise. They also include using runoff from melted snow to supply cities, farmers and business with water during drought conditions.

Fast fact

Over time, temperatures in the Sierra Nevada mountains have increased, and the amount of snow has decreased by 20 per cent.

Environmental refugees

Global warming has caused such significant changes in some areas on Earth that people can no longer live in those areas. These people are called environmental refugees.

Who are environmental refugees?

Environmental refugees are people forced from their homes by changes to their environment. They may have to move somewhere else in their own country, or into another country. Many environmental refugees live on small islands, near coastal areas or in low-lying areas.

Numbers of environmental refugees

Today about 25 million people can be described as environmental refugees. That is more than half of the world's total refugee population. Oxford University professor Norman Myers predicts that the number of environmental refugees will increase to 150 million over the next 50 years. People who live on small islands or near the coast will be among the most affected as sea levels rise.

Fast fact

In China, the number of people displaced by the effects of global warming could one day be as great as 75 million.



The small Pacific island of Tuvalu is shrinking further each year as sea levels rise.



Floods in low-lying areas of Bangladesh have increased in recent years due to rising sea levels.

CASE STUDY

Flooding in Bangladesh

The country of Bangladesh has many low-lying areas that are prone to flooding. As sea levels rise, the country is at threat from more flooding.

Rising sea levels

Rising sea levels are caused by water expanding, and by melting glaciers. As temperatures increase, water in oceans expands and sea levels rise. Today, approximately 15 per cent of the total rise in sea levels is due to melting glaciers. As more glaciers melt, sea levels will continue to rise.

Flooding river deltas

Bangladesh has many low-lying river deltas that could flood if sea levels continue to rise. The Bangladeshi Environment Minister has warned that Bangladesh could have millions of environmental refugees within the next few decades.

Fast fact

If sea levels across Earth rose by one metre, they would flood the city of Shanghai, in China. Shanghai is home to over 12 million people, and by 2030 it is expected to house 27 million people.

Towards a sustainable future: Helping environmental refugees

Many environmental refugees need help to deal with the effects of global warming, such as rising sea levels. Measures are being put in place to help people prepare for the future.

Fast fact

Developed countries are looking for technologies to adapt to changing climates. These technologies could be shared with developing countries that do not have access to the same resources.

Aid and accommodation

Governments and non-government organisations can help to provide environmental refugees with emergency aid and accommodation. People at risk of becoming environmental refugees can also be taught ways to adapt to their changing environments. Many organisations are providing local people with information about global warming and strategies to minimise its effects.

Planning for the future

In many regions, measures are being put in place to deal with rising sea levels. These measures include:

- building walls to hold back flood water
- establishing flood prevention schemes
- providing uncontaminated water supplies to low-lying areas.

Providing farmers in developing countries with water-efficient crops may help them to adapt to new climate conditions.



Fast fact

The Carteret Islands are part of Papua New Guinea. They are located in the Pacific Ocean, 120 kilometres northeast of Bougainville.



Many homes in the Carteret Islands are now close to the shoreline as sea levels rise.

CASE STUDY

Carteret Islanders telling their story

The Carteret Islanders are the world's first cultural group to become environmental refugees as a result of current climate changes. Telling their story to others can help people to realise how much some people's lives have been affected by global warming.

Rising sea levels in the Carteret Islands

It has been estimated that the Carteret Islands may be **uninhabitable** by 2015 due to rising sea levels. The local people have fought against rising sea levels for more than 20 years. Storm surges and high tides have washed away homes, destroyed vegetable gardens and contaminated fresh water supplies with salt water.

On 24 November 2005, the Papua New Guinean government authorised the evacuation of the Carteret Islands. The evacuation began in 2007, as ten families at a time were moved to the island of Bougainville.

Speaking out for climate justice

A group of Carteret Islanders went on a speaking tour in Australia. They described the problems they faced due to rising sea levels, and talked about others in similar situations. The tour aimed to raise awareness about the problems faced by environmental refugees. Speakers hoped to gain people's interest and support to help affected communities.

What can you do?

Record local changes

You can record information about changes to your local ecosystem. This could help your community plan to protect local plants and animals.

Keep records

Much of what we know about global warming comes from observing changes in local areas over time. You can keep records of events such as:

- rainfall
- temperatures
- the appearance of the first flowers, butterflies or birds in spring.

This information can help to show what is happening to the seasons in your area over the long term.

Community surveys

There are many community groups that run surveys of the natural environment. You could become involved in a survey such as the Great Backyard Bird Count. This is an annual four-day event in the United States. It asks people to observe the birds in their local area. Anyone can participate, even if they are not usually bird-watchers.

These people are looking for birds during the Great Backyard Bird Count.

Observing birds

Observe local birds in your area and record their movements. Any changes in the birds' behaviour could be a response to changes to their ecosystems. Your records could provide useful information to help protect bird species in the future.

How to recognise birds

Bird observers need to learn how to recognise different species of birds.

There are many ways to identify a bird, including:

- noting its shape, size and colour
- observing special features, such as markings on its wings, face and body
- looking in books or field guides to help you to identify birds in your area
- asking experts at local bird-watching clubs or societies.

Fast fact

There are just over 10 000 known bird species worldwide.

Use binoculars to observe birds in your local area, and record your observations in your notebook.



Towards a sustainable future



- Well,** I hope you now see that if you take up my challenge your world will be a better place. There are many ways to work towards a sustainable future. Imagine it... a world with:
- decreasing rates of global warming
 - protected ecosystems for all living things
 - renewable fuel for most forms of transport
 - sustainable city development
 - low risks of exposure to toxic substances
 - a safe and reliable water supply for all.

This is what you can achieve if you work together with my natural systems.

We must work together to live sustainably. That will mean a better environment and a better life for all living things on Earth, now and in the future.

Websites

For further information on global warming, visit these websites:

- United Nations climate change information kit
<http://unfccc.int/resource/iuckit/cckit2001en.pdf>
- World Bird Database <http://avibase.bsc-eoc.org/>
- The Great Backyard Bird Count www.birdsource.org/gbbc/kids/gbbc-is-for-kids

Glossary

altitudes

heights of objects

Arctic icecap

a layer of thick ice that covers the Arctic all year round

crop yields

amounts of food produced by crops

developed countries

countries with industrial development, a strong economy and a high standard of living

developing countries

countries with less developed industry, a poor economy and a lower standard of living

ecosystems

systems of natural connections between living and non-living things in an area

flash floods

floods that occur very suddenly

fungi

living things that are neither plants nor animals, commonly known as mushrooms and toadstools

geological periods

stretches of time in Earth's past, measured in millions of years

glacier

large moving rivers of ice

global warming

a rise in average temperatures on Earth

heat stroke

collapsing due to body overheating

heatwave

an extended period of time with higher than usual temperatures

ice sheets

large areas of frozen water that cover the North Pole

monsoon rains

heavy seasonal rains that come with the monsoon winds

nomadic

people who move from place to place as the weather changes

non-renewable

a resource that is limited in supply and cannot be replaced once it runs out

polar zone

the part of Earth's surface that forms a cap over the North and South poles

rainfall patterns

patterns of rain in a particular area over time

sea ice

ice that forms over seas and oceans, such as over the Arctic Ocean

temperate zones

areas of land and sea located between the tropics and the polar zones

uninhabitable

not fit to live in

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