



Climate change - what is it all about?

An introduction for young people



EUROPEAN
COMMISSION



environment

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Climate change – what is it all about?

Climate change is happening, and its impact on all of us is growing.

Have you noticed the weather becoming more extreme in your country, or on television? Does it seem to be warmer in the winter, with less snow and more rain? Do you feel that spring is coming a little earlier each year, with flowers blooming or birds arriving before you expect them?

These are all signs of accelerating climate change, or global warming as it is also known.

If we do not take action to stop it, during the course of this century global warming is almost certainly going to change the world we live in dramatically and alter our way of life. Millions of people's lives could be put in danger.

What causes climate change?

The climate is changing because of the way people live these days, especially in richer, economically developed countries – and that includes the European Union. The power plants that generate energy to provide us with electricity and to heat our homes, the cars and planes that we travel in, the factories that produce the goods we buy, the farms that grow our food – all these play a part in changing the climate by giving off what are known as 'greenhouse gases'.

The greenhouse effect

Our atmosphere acts as a transparent, protective covering around the Earth. It lets in sunlight and retains heat. Without the atmosphere, the sun's heat would immediately rebound off the Earth's surface back into space. If that happened, it would be some 30° Celsius colder on Earth – everything would freeze. The atmosphere therefore acts like the glass walls of a greenhouse. This is why people talk about the 'greenhouse effect'. The greenhouse gases in the atmosphere, which trap heat, are responsible for this effect.

How climate scientists work

Modern climate science involves studying the past, observing and interpreting what is happening now and using this information to help predict what will happen in the future.

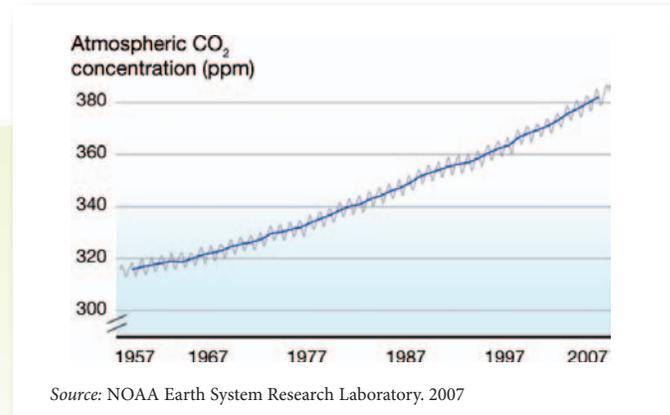
Scientists use a surprising array of sources to find out about past conditions. For example, they drill through the top of the ice caps at the Poles down to the bedrock and extract cylinders of ice known as ice cores. In the Antarctic, a team of European researchers has removed ice cores from a depth of more than 3 km which have not been touched by light or air in more than 900,000 years! The physical properties of the ice and the air contained in small bubbles tell the researchers what the climate and atmosphere were like at that time.

Other sources that provide clues about the past are the rings in trees and corals from ancient times, stalagmites and old pollen, seeds and leaves.

Based on these studies, we know that ice ages have alternated with warmer periods, and that average temperatures on Earth have varied between about 9° and 22° Celsius (the current average global temperature is 15° Celsius). These fluctuations were due to natural causes, such as variations in the Earth's orbit around the sun and in the Earth's axis, changes in the sun's activity and volcanic eruptions (which can push dust high into the atmosphere, temporarily blocking out some of the sun's heat).

For the past 8,000 years, the climate has been fairly stable, with small changes of less than 1° Celsius per century. These stable conditions have enabled society and ecosystems, as we know

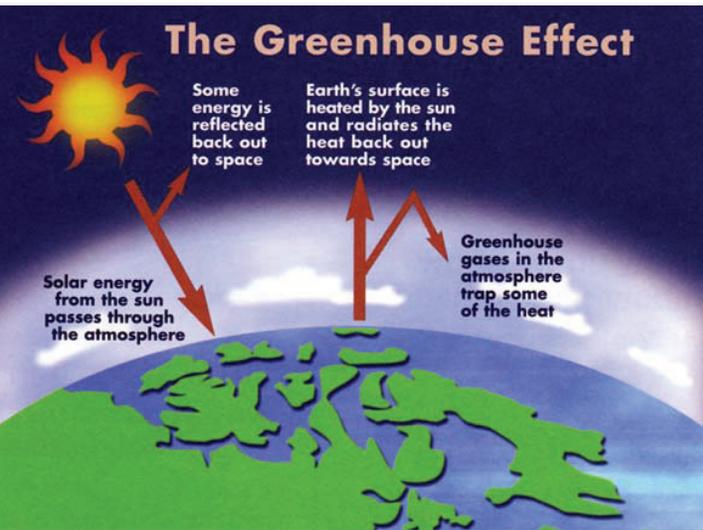
Atmospheric concentrations of carbon dioxide (CO₂) - Mauna Loa or Keeling curve



them today, to develop. But now things are hotting up fast. Natural causes alone cannot account for such rapid warming, which is unprecedented for at least 1,000 – some studies say 2,000 – years. And the concentrations of CO₂ and methane in the atmosphere today are the highest for at least 650,000 years.

Much of the information that scientists have discovered is used to predict future climate and the effects of climate change. This is done through computer modelling and simulations. We are not talking about simple PCs – the computers that are used to look 100, 200 or 300 years into the future are complex systems which take in many variables.

Scientists still do not know exactly how sensitive our climate is to the rising greenhouse gas concentrations – that is, which concentrations trigger which temperature changes. This also depends on other factors like air pollution and cloud formation. So, the scientists run simulations based on different presumptions. They must also make many other presumptions, for example about how much fossil fuel we will burn in the future, how many people will live on Earth and how economies will develop. This is why all projections of future climate developments operate within ranges.



Source: Government of Canada Climate Change Website

Most of the greenhouse gases occur naturally. However, since the Industrial Revolution in the 18th century, human society too has been producing greenhouse gases in ever-increasing amounts. As a result, their concentrations in the atmosphere are now higher than at any time in the past 650,000 years. They make the greenhouse effect stronger.

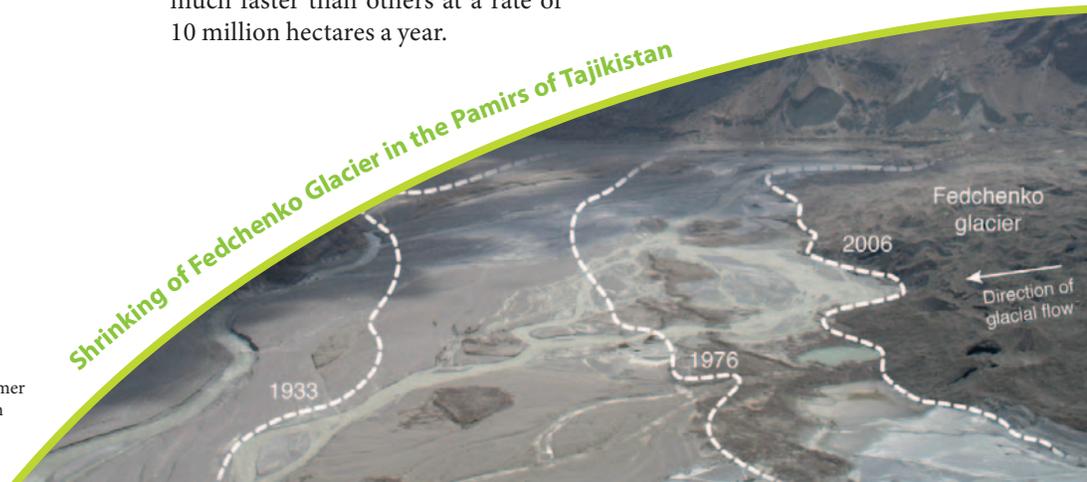
This means rising temperatures on Earth, which are causing the climate to change.

The greenhouse gases we produce

The principal greenhouse gas generated by human activities is carbon dioxide (CO₂). It makes up 82% of all the emissions of greenhouse gases from the 27 member countries of the European Union. Carbon dioxide is released when fossil fuels – coal, oil and natural gas – are burnt. And fossil fuels are still the most common energy source. We burn them to produce electricity and heat, and we use them to fuel our cars, ships and planes.

Most of us know carbon dioxide from soft drinks – the bubbles in carbonated drinks and beer are actually CO₂ bubbles. It is also vital to the breathing process: we take in oxygen and breathe out carbon dioxide, while trees and plants absorb CO₂ to produce oxygen. This is why the world's forests are so important. They help soak up some of the excess CO₂ that we generate. Yet deforestation – the logging, clearing and burning of forests – is taking place across much of the world, with tropical forests disappearing much faster than others at a rate of 10 million hectares a year.

Shrinking of Fedchenko Glacier in the Pamirs of Tajikistan



Source: Photo: V. Novikov (taken in summer 2006); data from the Tajik Agency on Hydrometeorology



When forests are cut or burned, they release CO₂ into the atmosphere. It is estimated that deforestation causes around 20% of global emissions of greenhouse gases, so stopping this process is an important priority.

Other greenhouse gases released by human activities are methane and nitrous oxide. They are among the invisible fumes from 'landfill' sites for dumping waste and from cattle breeding, rice cultivation and certain methods of fertilising farmland. We also artificially manufacture some greenhouse gases, the so-called fluorinated gases. They are used in refrigeration, air-conditioning systems and even training shoes. They can find their way into the atmosphere due to leakages and if the appliances are not properly dealt with when they become waste.

The climate is changing

Climate change has already begun. Since 1850, the average global temperature has increased by 0.76° Celsius. The average temperature in Europe has gone up even more, by almost 1° Celsius, with the fastest rises being recorded over the last 30 years.

Globally, 12 of the last 14 years have been the hottest 'on record' (in other words since 1850, when instruments able to measure temperatures fairly accurately were first developed). The 'top three' hottest years have been, in descending order, 1998, 2005 and 2003.



Satellite observations of the polar ice cap

Observed sea ice September 1979



Observed sea ice September 2003



Source:
Arctic Climate Impact Assessment (ACIA), 2004.
Impacts of a Warming Arctic.

Vital Arctic Graphics

People and global heritage on our last wild shores

The warming trend is due to the growing quantities of greenhouse gases released by human activities, and it is accelerating: the rate of temperature increase has risen from 0.1° Celsius per decade over the past 100 years to 0.2° Celsius in the past decade. Climate experts predict that the average global temperature is most likely to increase further by between 1.8° and 4.0° Celsius over the course of this century, but could rise by as much as 6.4°C in the worst case. And these are just cautious estimates.

Temperature increases of this size may not seem much until one remembers that during the last Ice Age, which ended 11,500 years ago, the average global temperature was just 5° Celsius lower than today, yet polar ice covered much of Europe. A few degrees make a lot of difference for our climate!

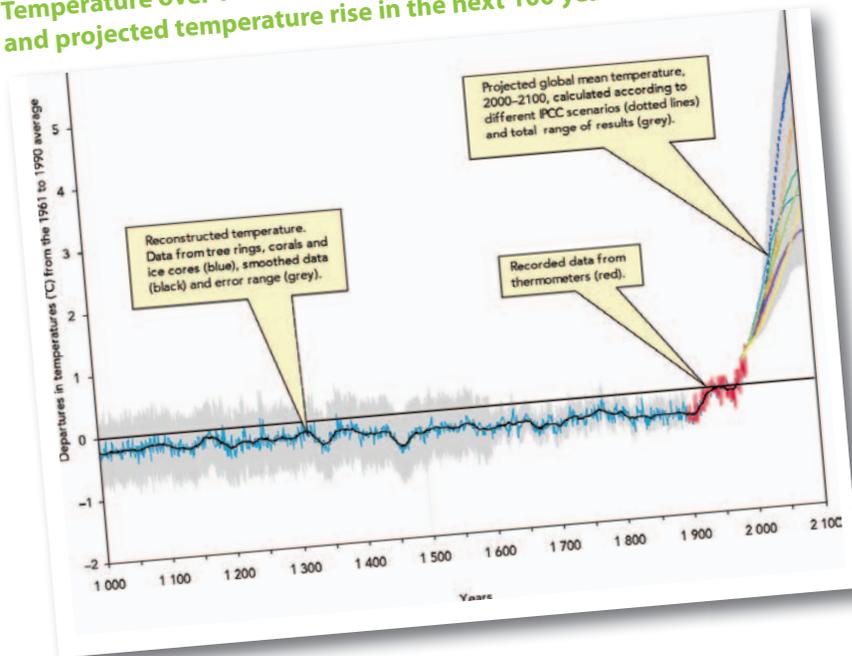
Climate change is already having an impact in Europe and around the globe. Unless we bring it under control, it could trigger catastrophic events, such as rapidly rising sea levels, and food and water shortages in some parts of the world. Climate change will affect all countries, but developing countries are the most vulnerable. They often depend on climate-sensitive activities such as agriculture, and do not have much money to adapt to the consequences of climate change.

However, the good news is that there is still time to put the brakes on climate change if we act fast – and we are finding out more and more about how everyone can help to do that.

Climate change and its effects

- The polar ice caps are melting. The area of sea covered by the Arctic ice at the North Pole has shrunk by 10% in recent decades, and the thickness of the ice above the water has decreased by about 40%. On the other side of the world, the ice sheet above the Antarctic continent has become unstable.
- Glaciers are retreating all around the world. Since 1850, glaciers in the European Alps have lost about two-thirds of their volume, and the loss rate has clearly accelerated since the 1980s. Managers of the Andermatt ski resort in Switzerland have covered the Gurschen glacier, a popular skiing area, with a huge insulating plastic sheet during the summer to stop it from melting and sliding.

Temperature over the last 1 000 years (northern hemisphere) and projected temperature rise in the next 100 years



Source: European Environment Agency

- As the ice caps melt, sea levels are rising twice as fast as they were 50 years ago. By 2003, scientists found the sea rising by 31 centimetres per century, and this could double again over the next 100 years, with the global sea level rising by up to 88 centimetres by 2100. This would flood low-lying islands and coastal areas, such as the Maldives, the Nile Delta in Egypt, and Bangladesh. In Europe, the rise could be 50% higher again, putting up to 1.6 million more coastal dwellers at risk of flooding by 2080. Around 20% of coastal wetlands could disappear by the same time, and erosion of the Atlantic coastline, currently retreating by up to 1 metre per year, would increase. Further away from the coast, sea water would penetrate and contaminate agricultural soil and freshwater supplies.

- The huge Greenland ice sheet has started to melt.

It is losing at least 100 billion tonnes of ice a year and this is pushing up sea levels. If the ice sheet melted completely, which would probably take many hundreds of years, sea levels could rise by as much as 7 metres.

- Climate change is expected to increase the intensity and/or frequency of extreme weather events, such as storms, floods, droughts and heat waves. About 90% of all natural disasters in Europe since 1980 have been directly or indirectly caused by weather and climate. The average number of weather and climate-related disasters per year in Europe increased by about 65% between 1998 and 2007 compared with the average for the 1980s. These disasters not only create a lot of damage, they also drive up the costs of insuring homes and other property.

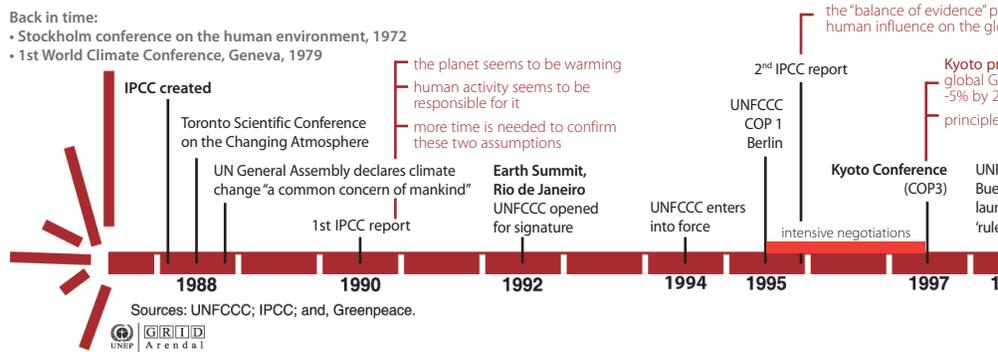
- Since 1990, Europe has been hit by almost 260 major river floods, including the catastrophic summer floods of the Danube and Elbe rivers in 2002. Since 1998, flooding has killed more than 700 people in Europe, displaced half a million others and cost at least €25 billion. Although there is no proof yet that these floods were directly caused by climate change, as global warming advances the frequency and intensity of floods is expected to increase in large parts of Europe.



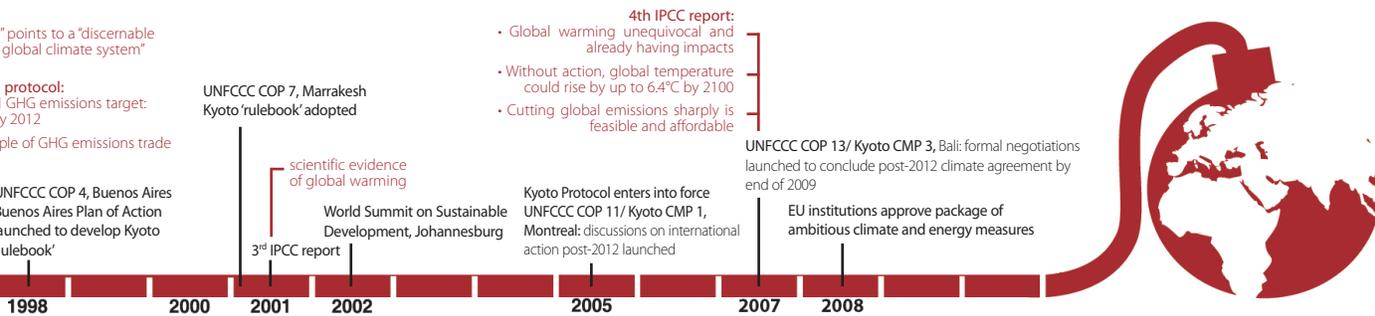
Kyoto protocol, timeline and history

Acronyms glossary for time line

GHG: greenhouse gas
 UNFCCC: United Nations Framework Convention on Climate Change
 IPCC: Intergovernmental Panel on Climate Change
 COP: Conference of the Parties (= countries that have ratified a convention)
 CMP: Meeting of the Parties that have ratified the Kyoto Protocol



- Water is already scarce in many regions of the world. Almost one-fifth of the world population, 1.2 billion people, does not have access to clean drinking water. If global temperatures increase by 2.5° Celsius above pre-industrial levels (that is, around 1.7°C above today's levels), an additional 2.4 to 3.1 billion people worldwide are likely to suffer from water scarcity.
- Global warming is forecast to increase world food production as long as it stays within the range of 1.5-3.5° Celsius above the pre-industrial temperature (0.7°-2.7°C above the average global temperature today), but above that food production will decrease. The growing season has lengthened in northern Europe but the earlier flowering and maturity of some crops and plants increase the risk of damage from delayed spring frosts. In some places in southern Europe the growing season is getting shorter.
- Tropical diseases like malaria and dengue might spread because the area where the climate conditions are suitable for the mosquitoes, ticks and sandflies that carry them will expand. The tiger mosquito, which can transmit a variety of diseases, has extended its area in Europe considerably over the past 15 years and is now present in 12 countries. One study has estimated that 5-6 billion people would be at risk from dengue by 2080 due to climate change and population growth.
- A heatwave in several parts of Europe in the summer of 2003 contributed to the premature deaths of more than 70,000 people, set off large-scale forest fires in southern Europe and caused agricultural and forestry losses of €10 billion. From around 2070 onwards, Europe could experience heatwaves like that every second year.



- Climate change is starting to reduce the attractiveness of many of the Mediterranean's major tourist resorts but improving those in other regions. Future projections of climate change suggest that the Mediterranean will become less suitable for tourism in summer, leading to a shift in summer tourism towards other parts of Europe.
- As Europe gets warmer, birds, insects, animals and plants are moving northwards and to higher ground. But there is a strong risk that many will not be able to keep up with the speed of climate change or that roads, towns and other types of human construction that break up the countryside will prevent them from moving far enough. One alarming study finds that climate change could lead to the extinction of a third of the Earth's species by 2050. Polar mammals and birds, such as polar bears, seals, walruses and penguins, are especially vulnerable.
- In the long term, widespread climate change could trigger regional conflicts, famines and movements of refugees as food, water and energy resources become scarce. Worldwide, up to 1 billion 'climate change refugees' could be driven from their homes, and will need help, especially from the richer nations.
- Another worst-case scenario is that changes in ocean temperature cause the shutdown of the Gulf Stream that carries warm water northwards in the Atlantic. While this is unlikely to happen during this century, scientists agree that in northern Europe it would reverse the warming trend and make the weather much colder¹.

¹ Many of these facts and figures are taken from two major reports: the Intergovernmental Panel on Climate Change (IPCC) Fourth Assessment Report, at: <http://www.ipcc.ch/ipccreports/ar4-syr.htm>, and the report 'Impacts of Europe's changing climate - 2008 indicator-based assessment' jointly produced by the European Environment Agency, Joint Research Centre of the European Commission and the World Health Organization's Regional Office for Europe, at: http://reports.eea.europa.eu/eea_report_2008_4/en

What needs to be done to curb climate change?

Quite simply: we need to reduce emissions of greenhouse gases into the atmosphere. Some greenhouse gases are long-lived, which means that they stick around in the atmosphere for decades or even longer. Even if we take firm action now, temperatures will continue to rise for a while. However, if we do not take any action, temperatures will increase even more, and at some point the climate could spiral out of control.

Reducing our greenhouse gas emissions will require investments and changes to how we produce and use energy. But recent studies find that the price of doing nothing would be much higher because of the damage and suffering that unconstrained climate change would cause.

Climate change will not disappear immediately, but the sooner we all become aware of it and take action against it, the better we will be able to take control of our destiny, live comfortably, and protect all the beauty and diversity of our planet for the future.

What governments are doing together

In the 1980s, evidence of climate change was mounting and a number of international conferences raised worldwide concern about the issue. Governments realised how big a threat climate change was and that they had to do something about it. They also realised that they had to work together to have any chance of success. Climate change is a global issue because all countries will be affected by it and all contribute, in varying degrees, to greenhouse gas emissions. So, no country can solve the problem on its own.

The UN Intergovernmental Panel on Climate Change

In 1988, the United Nations set up the Intergovernmental Panel on Climate Change (IPCC) which brings together thousands of scientists from around the world. Their task is to assess existing research and knowledge about climate change and its effects and to provide comprehensive reports at regular intervals. Several years of work go into preparing each report. The most recent report, known as the Fourth Assessment Report, was published in 2007. It concluded





beyond all reasonable doubt that greenhouse gas concentrations in the atmosphere have increased mainly as a result of human activities, and gave a grave warning of the consequences if nothing is done.

The IPCC, together with former US Vice-President Al Gore, won the Nobel Peace Prize in 2007 for their work in increasing public knowledge about climate change. The award of the Peace Prize underlines how climate change is coming to be seen as a threat to the security of mankind.

The UN Framework Convention on Climate Change

In 1992, governments agreed the United Nations Framework Convention on Climate Change (UNFCCC). This international agreement has been formally accepted by 191 countries plus the European Union – almost all the countries in the world. The objective of the Convention is to stabilise greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous, man-made interference with the climate system.

Under the Convention, governments monitor and report the greenhouse gases they produce, develop climate change strategies, and help the poorer among them address climate change. They meet once a year to review progress and decide what to do next. The Convention was designed as an umbrella under which more action would be agreed in the future.

The Kyoto Protocol

In 1997, in the Japanese city of Kyoto, governments took the next step and agreed the important Kyoto Protocol. This treaty commits industrialised countries to reduce or limit their greenhouse gas emissions and reach certain emission targets by 2012.

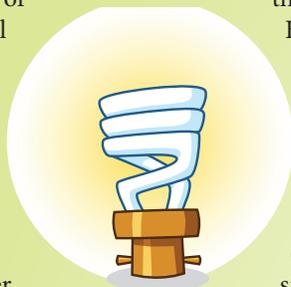
The Kyoto Protocol focuses on industrialised countries because they are responsible for most of the past and current greenhouse gas emissions and have the knowledge and money to reduce them. For example, the amount of greenhouse gases produced in the EU is around 11 tonnes per citizen every year, while developing countries produce only around 1 tonne per citizen each year.



What you can do

Climate change is a global problem, and yet each of us has the power to make a difference. Even small changes in our behaviour can save energy and resources and help prevent greenhouse emissions, without affecting our quality of life. In fact, they can save us money.

- Recycle things. Recycling an aluminium can to produce a new one requires one-tenth of the energy needed to produce one from scratch. Paper factories use far less energy to make paper from old newspapers than from wood pulp.
- Avoid foods that take a lot of water and energy to produce or transport, such as meat and processed meals.
- Use bottled water sparingly. For one thing, it's thousands of times more expensive than water from the tap! In Europe, tap water is safe to drink, and you can fit a filter to purify it further if you want. Bottled water consumes energy in production and marketing, and in some countries many of the plastic bottles end up as litter and don't get recycled.
- When you make a hot drink, boil just the amount of water you need. Don't fill the kettle to the top if it's not necessary!
- Save hot water by taking a shower rather than a bath – it requires four times less energy.



the ceiling – they use a lot of energy. Households are responsible for 30% of electricity consumption in the EU, so if we all save electricity, it will make a big difference.

- When you need to replace a light bulb, buy an energy-saving one: though they are more expensive to buy, they last much longer and use about five times less electricity than conventional bulbs, so in the end they save you a lot of money.
- Don't leave your TV, stereo and computer on 'standby' – this is the mode when a little light remains on. On average, a TV set uses 45% of its energy in standby mode. If all Europeans avoided the standby mode, enough electricity would be saved to power a country the size of Belgium.
- Also, don't leave your mobile-phone charger plugged in when you have finished charging your phone – it continues to consume electricity even if the phone is not attached!
- There are now many companies supplying electricity from renewable energy or other 'green' sources. Ask your parents about changing to a green electricity supplier if they haven't already. And if you live in a sunny climate, ask them about installing solar panels.
- If you or your parents buy a new electrical appliance, for example a fridge or washing machine, make sure



- Don't forget to switch off the lights when you do not need them. This is particularly important with the powerful halogen standing lamps which bounce light off

that it is graded “A” – or “A++” for fridges – under the European energy-efficiency label, which every appliance must carry. These grades mean that it is very efficient in energy use.



- When clothes are not too dirty, use the economy cycle on the washing machine. And whenever the weather is warm and dry, hang the washing out to dry in the air instead of using an electric drier.
- About one-third of the water we use at home goes down the toilet, literally. So try flushing less often, using the short flush whenever possible, or reducing the capacity of your toilet cistern.
- Collect rainwater to use in the garden or for washing the car. This can save up to 50% of household water.
- Do not leave the tap running when brushing your teeth or cleaning dishes, and use spray taps to save up to 80% of water.
- Check your taps and pipes for drips and leaks and repair them if necessary.
- Look for goods with the European Eco-label, symbolised by a little flower, in shops and supermarkets. The label means such products meet strict environmental standards.
- Do not overheat your home. Reducing the temperature by just 1° Celsius can cut up to 7% off your family's energy bill.



• When you air your room, leave the window wide open for a few minutes and then close it again, rather than letting the heat escape over a long period.

• Private cars are responsible for 12% of the EU's CO₂ emissions. Taking public transport, cycling and walking are cheaper and healthier alternatives.

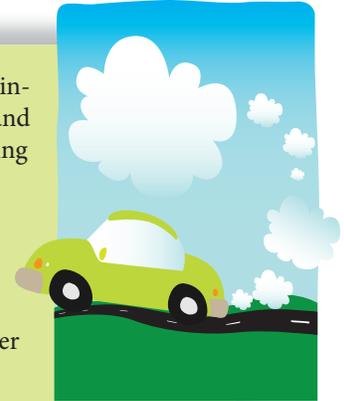
• If your parents are about to buy a new car, ask them to buy a small, fuel-efficient model! They can see how much CO₂ each car emits from the information displayed in the showroom.

• For journeys of a few hundred kilometres or less, take the bus or train instead of a plane. Flying is the world's fastest growing source of CO₂ emissions!

• Plant a tree at school or in your garden or neighbourhood! Five trees will soak up around 1 tonne of CO₂ throughout their lifetime.

• If you live in a country that doesn't get much rain, look for garden plants that suit the climate and need less watering.

• Choose holiday hotels and destinations that follow environmental goals, such as limiting water and energy consumption and reducing waste. Reuse towels and sheets to save on unnecessary washing.



The Kyoto Protocol came into force in 2005. To date, 183 governments plus the European Community have formally adopted it. The Protocol sets emissions targets for 37 industrialised countries. Most of these targets require greenhouse gas emissions reductions of 5-8% from 1990 levels by 2012. Among industrialised nations, only the US has decided not to participate in the Kyoto Protocol.

The Protocol also introduced various economic mechanisms under which countries cooperate in reducing emissions. These help to lower the cost of achieving such cuts. The Clean Development Mechanism allows industrialised countries to meet their emission targets partly by investing in emission-saving projects in developing countries. This, in turn, is helping to transfer new technologies to poorer countries, enabling them to develop in a cleaner way. It is the first global environmental investment and credit scheme of its kind. A parallel mechanism, known as Joint Implementation, enables industrialised countries to invest in such projects on each other's territory.

The need for a new global climate deal

The Kyoto Protocol is a crucial first step towards cutting greenhouse gas emissions. However, given scientists' projections that global warming will continue at an accelerated pace this century unless further action is taken, much more ambitious measures will be needed after 2012, when the Kyoto targets are due to have been met.

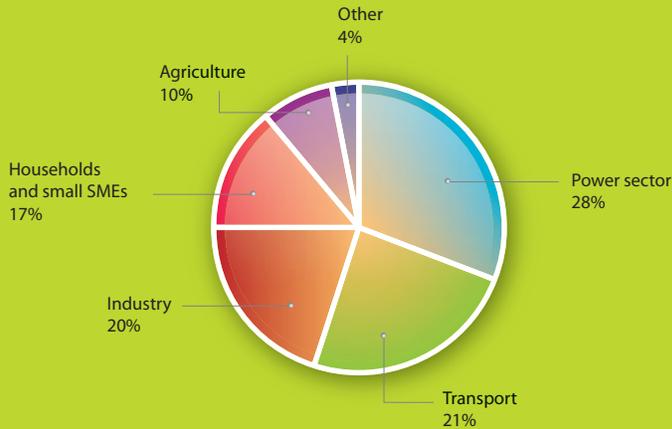
In December 2007, after two years of informal talks, all the countries that have signed up to the UNFCCC decided to start formal negotiations on an international climate change agreement for the post-2012 period. In recognition of the urgency of the problem, they agreed the deal should be completed at the end of 2009 at a United Nations climate conference in Copenhagen. This should give governments enough time to implement the agreement by 2013.

For the European Union it is essential that the new agreement involves action by all major emitting countries, including the United States but also developing giants like China and India. By 2020, the emissions of greenhouse gases from all developing countries together are expected to overtake those from the industrialised countries.

Europe is also determined to ensure the agreement keeps global warming to less than 2° Celsius above the pre-industrial level (that is, about 1.2°C above today's



Greenhouse gas emissions in the EU



Source: European Environment Agency

temperature). A bigger increase would bring a much greater risk of environmental disasters and of diminished food and water supplies. To prevent such dangerous levels of climate change, worldwide emissions will need to be cut to less than half of their 1990 levels by 2050. Though this will be a huge challenge, the technologies to achieve it are already available or soon will be, and the cost is affordable – in fact it is much less expensive than the damage that climate change would cause if we do nothing to stop it.

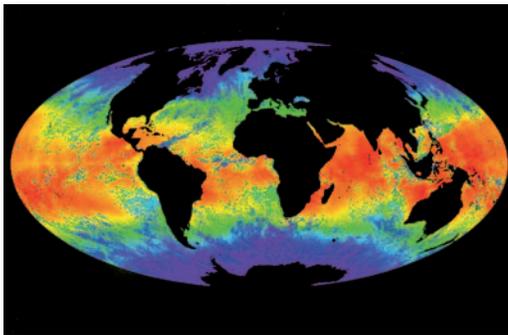
What the EU is doing to combat climate change

The European Union is at the forefront of the global fight against climate change. As a major economic power the EU has a duty to lead by example, even if it is responsible for only 14% of global emissions.

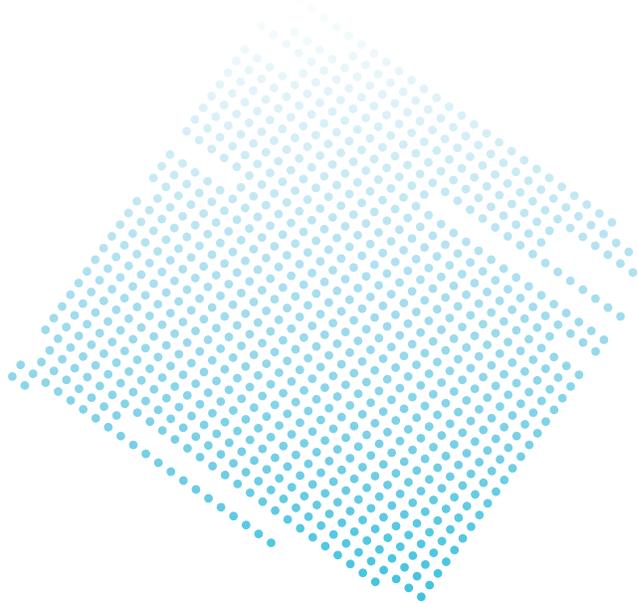
The EU is convinced that we can cut our greenhouse gas output and go on improving people's standards and quality of life at the same time. The two are not incompatible. But it will mean making adjustments to the way we live and how we produce and use energy.

With this in mind, in March 2007 EU leaders agreed on an ambitious and far-reaching strategy on energy and climate change. It includes some tough targets:

- Reducing the EU's greenhouse gas emissions by at least 20% by 2020, and by 30% if other industrialised countries do likewise under the international climate agreement currently being negotiated.
- Increasing renewable energy, such as wind and solar power², to 20% of all energy use by 2020, more than double today's level.
- Saving 20% of energy consumption by 2020 by improving the energy efficiency of a wide range of appliances and machines, such as cars, televisions and air-conditioning units.



² Other forms of renewable energy include hydro-electric power (electricity generated by water flowing through dams), burning of biomass (organic material such as wood, mill residues, plants, animal droppings, etc.) and biofuels (fuels made from plants or crops), geothermal power (heat from hot springs or volcanoes), tidal power and wave power.



Concrete measures for achieving these targets were agreed in 2008. They put Europe on the path to becoming a climate-friendly, 'low carbon' economy. Saving energy and using more renewable energy will not only help to reduce the EU's greenhouse gas emissions – they will also make Europe's power supply more secure, and save money, by reducing the need for imports of oil and gas from other countries.

Progress in the EU

Under the Kyoto Protocol, the 15 countries that made up the EU when it was negotiated in 1997 (marked in lighter green in the table opposite) took on a particularly ambitious target: to reduce their collective greenhouse gas emissions by 2012 to 8% below the levels they had been at in a chosen base year (1990 in most cases). They then agreed how much each of them should contribute towards this collective target, taking into account the economic situation and industrial structure in each country. Most have to reduce their emissions, but some are allowed to increase them up to a certain limit, while others must keep their emissions at the same levels as in 1990.

Ten of the twelve countries that joined the EU in 2004 and 2007 (marked in darker green) have individual targets under the Protocol which require them to reduce their national emissions by 6 or 8% within the same timescale. Only Cyprus and Malta have no targets under the Kyoto Protocol.

The EU Emissions Trading System

By far the most important measure developed under the European Climate Change Programme (ECCP) is the EU Emissions Trading System (EU ETS), launched at the start of 2005. The first international trading system for CO₂ emissions in the world, the EU ETS is the cornerstone of the Union's strategy for reducing emissions cost-effectively in its 27 member countries. Since the start of 2008, the EU ETS also covers Iceland, Liechtenstein and Norway.

The system currently applies to some 11,000 power plants and energy-intensive factories, which together account for almost half of the Union's CO₂ emissions. The EU ETS works like this. EU governments grant each power station or factory allowances to emit a certain amount of CO₂ each year. Those that emit less

can sell the unused quotas to other factories that are not doing so well. This gives them a financial incentive to reduce emissions. Companies that exceed their emission limits and do not cover them with emission rights bought from others have to pay hefty penalties. The Emissions Trading System lowers the overall cost of cutting emissions by ensuring they are reduced where it is cheapest to do so.

From 2012, the system will be expanded to cover emissions from commercial aircraft flying to and from EU airports, and a number of important changes to the EU ETS will take effect from 2013 to strengthen it and make it more effective. By 2015 the European Union wants to see the EU ETS linked up to similar emission trading systems being developed in other developed countries.

Kyoto targets of EU member countries

EU countries sharing an 8% reduction target under the Kyoto Protocol		EU countries with individual targets under the Kyoto Protocol	
Austria	-13%	Czech Republic	-8%
Belgium	-7.5%	Cyprus	-
Denmark	-21%	Estonia	-8%
Finland	0%	Hungary	-6%
France	0%	Latvia	-8%
Germany	-21%	Lithuania	-8%
Greece	+25%	Malta	-
Ireland	+13%	Poland	-6%
Italy	-6.5%	Slovak Republic	-8%
Luxembourg	-28%	Slovenia	-8%
The Netherlands	-6%	Bulgaria	-8%
Portugal	+27%	Romania	-8%
Spain	+15%		
Sweden	+4%		
United Kingdom	-12.5%		

Through the ECCP, the EU works with representatives from industry, environmental associations and other interested groups to identify measures to cut greenhouse gas emissions in a cost-effective way. The dozens of measures developed include, for example, improving the energy efficiency of buildings (better insulation can reduce heating costs by 90%!), restricting the leakage and use of some fluorinated industrial gases, and tackling emissions from airplanes.

The measures to reduce emissions that are being taken by EU member countries and at EU level are bringing progress towards meeting the Kyoto targets. In 2006, emissions from the 15 countries that made up the EU until 2004 stood 2.7% below their levels in the chosen base year (1990 in most cases),



and projections of their future emissions showed these countries were on track to meet the 8% reduction target. For today's 27 member countries, the emissions cut achieved by 2006 amounted to 10.8%.

Cutting emissions is good for the economy

Action to combat climate change will save money in the long run, even if it means investing some money now.

Indeed, we cannot afford to do nothing. An influential report by the British economist Lord Stern has warned that climate change will take an increasingly heavy toll on the world economy if we fail to stop it. He estimates climate change will cost at least 5% of the world's economic output – or gross domestic product (GDP) – each year, and this could rise to as much as 20% or more in the long term. The economic impact would be similar to a world war or the Great Depression, the global economic crisis of the 1930s. On the other hand, Lord Stern estimates that the measures needed to bring climate change under control will cost around only 1% of GDP.

Many climate-friendly technologies, such as renewable energy sources, already exist while others are close to being ready for widespread use. For example, one promising technology makes it possible to capture much of the carbon that is released when fossil fuels are burnt and then bury it in old mines or former oil fields so it does not reach the atmosphere. This technology is called 'carbon capture and storage'. Another promising technology which, however, requires considerably more research, is the production of hydrogen from renewable energies and its use in 'fuel cells'. The fuel cell converts the hydrogen with oxygen into water, and in the process it produces electricity. The only emission is water vapour.

The development of climate-friendly technologies also creates employment and opens up new markets. Thanks to support schemes for wind power in several EU countries, European companies now supply 90% of the booming global market for wind power equipment. In Germany, introducing wind power has generated work for 40,000 people. The European market has a turnover of €30 billion, supporting some 350,000 jobs today. Raising renewable energy's share of total energy use to 20% by 2020, as the EU intends to do, is expected to increase the number of jobs to almost 1 million.





Moving to a 'low-carbon' economy offers tremendous opportunities for innovation and economic growth, which are key objectives for the European Union. If European companies are quick to develop new climate-friendly technologies, they will have a competitive advantage as global demand for these technologies grows.

We must adapt to climate change

Even if we take action to cut greenhouse gas emissions today, and start to reduce the speed of climate change, we cannot halt many of the changes that are already under way. All countries therefore need to learn to live with climate change, and adapt to it. Adaptation means anticipating the effects of climate change and taking action to minimise them. By acting now we can save money and effort later.

- As storms increase and sea levels rise, more people will find their homes threatened by flooding. New EU rules require member countries to assess and manage flood risks.
- For warmer countries, crops can be developed that need less water or can tolerate drought.
- Constructing buildings and cities to save energy and resist storms, floods and hot weather will save lives in the long run. Taking account of climate change in this way is often referred to as 'climate proofing'.
- Industry must plan ahead to adapt to new conditions. Vital health and social services need to be ready for heatwaves and other unusual weather conditions.
- Climate change will put pressure on freshwater resources. It is estimated that in Europe we could cut the amount of water we use by around 40% through technological innovation and by avoiding waste.
- Through its Natura 2000 network of nature conservation areas, the EU aims to help Europe's wildlife adapt to environmental changes.

In short, planners need to take account of the likely future impact of climate change in all their decisions and investments. Much of the work has to be done at local level in response to specific conditions. The European Union can also support adaptation to climate change by adjusting its policies and its financial assistance, particularly to developing countries.



Useful websites on climate change:

European Commission, Directorate-General for Environment
www.europa.eu.int/comm/environment/climat/home_en.htm

European Commission Climate Change Campaign
<http://ec.europa.eu/environment/climat/campaign/index.htm>

European Commission Climate Action site
<http://ec.europa.eu/climateaction/>

European Environment Agency
www.eea.europa.eu/themes/climate

United Nations Framework Convention on Climate Change and Kyoto Protocol
www.unfccc.int/

Intergovernmental Panel on Climate Change
www.ipcc.ch/

United Nations Environment Programme
www.unep.org/themes/climatechange/

WWF
http://panda.org/about_wwf/what_we_do/climate_change/index.cfm

Greenpeace
www.greenpeace.org/international/campaigns/climate-change



European Commission

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