



PowerSwitch!

C A M P A I G N

Europe feels the heat

the power sector and extreme weather

The worst offender

the power sector

The biggest source of man-made carbon dioxide (CO₂) pollution is electric power generation – in particular coal-fired production. Coal is the most carbon-rich of the fossil fuels, and burning it generates 70 per cent more CO₂ per unit of energy produced than natural gas. Globally the power industry contributes 37 per cent of man-made CO₂, and in Europe 39 per cent.

Increased power production meant that in 2003 CO₂ emissions by the EU's 25 member states increased by 1.5 per cent, after having fallen in 2002. Under the Kyoto protocol, the EU pledged to reduce overall CO₂ emissions by 8 per cent over the period 2008 to 2012, compared to 1990 levels. Although the 'old' 15 member states reduced their overall greenhouse gas emissions by 1.7 per cent between 1990 and 2003, their CO₂ emissions increased by 3.4 per cent over the same period.

The next 20 years will offer a historic window of opportunity for Europe to dramatically reduce the rate of power sector emissions. Over that period, most of Europe's worst polluting coal-fired power stations will be decommissioned. If they're replaced with new coal plants, the continent will be locked into high levels of CO₂ pollution for decades to come – and will be unable to achieve even the modest Kyoto protocol target. However, if current coal-fired plants are replaced by clean alternatives, Europe will lead the world towards a low-carbon economy and the Earth could avoid the dangerous effects of abrupt climate change.

WWF's PowerSwitch! campaign urges power companies to make the vital switch to less polluting fuels, such as natural gas – or, ideally – clean renewable technologies, such as wind, biomass, water and solar power.

It's been another scorching summer in much of Europe.

Across the continent, heatwaves have brought death, droughts, forest fires and ruined crops.

The precise causes of individual heatwaves are complex, but most climate scientists agree that global warming has probably made them more frequent and intense. The global average temperature increased by 0.6°C during the 20th century. In Europe, the average temperature rise was 0.95°C.

The summer of 2003 is believed to be the hottest in Europe for the past 500 years, and, if global warming continues as predicted, this could become the norm.

The main cause of global warming is the build-up of atmospheric greenhouse gases, and in particular carbon dioxide (CO₂). The power sector is responsible for the biggest share of man-made CO₂ emissions due to its heavy reliance on fossil fuels – especially coal.

Europe now has a historic opportunity to tackle this problem, but must act immediately to replace dirty, antiquated power stations with cleaner alternatives. This report tells you why we must take action and explains what you can do to help.



Germany

Extreme summer weather has wreaked havoc in Germany in recent years. 2003's heatwave left the river levels at an all-time low. One estimate from the Cologne area suggested the death rate increased by 16.5 per cent during August 2003. Agricultural losses were around €1billion, with the wheat harvest in some areas down by 80 per cent.

By contrast, in August 2002, intense rainstorms created the worst floods in more than a century, with the Eastern states of Saxony and Saxony-Anhalt badly hit. The River Elbe in Dresden rose from its normal summer level of about two metres to a record 9.4 metres. This summer has brought more weather extremes. In June, there was 30 per cent more sunshine than average and very high temperatures recorded in the South of the country.

In early July, days of heavy rain caused floods in the South. As global warming continues, it is predicted that central, North and East Germany can expect drier summers, but also an increased risk of heavy rainstorms. Summer droughts are expected to hit agriculture, especially in the state of Brandenburg.

Summer weather in the South of Germany is projected to be more like Southern Europe, with the average number of hot days (over 30°C) in Bavaria likely to double between 2021 and 2050.

Germany's CO₂ emissions fell by 18.2 per cent between 1990 and 2003. The most important reasons are the industrial downturn and the replacement of old coal-fired power plants in former East Germany by more energy efficient coal plants.

As Europe's leading industrial nation, with the largest population, Germany still tops the continent's greenhouse gas emissions. The country aims to generate 50 per cent of its energy needs from renewable energy sources by 2050, but, so far, its power industry remains heavily reliant on coal and oil-fired stations.

Heatwaves and extreme weather – the facts

If you're not convinced there's a problem, consider the following facts

→ Figures compiled for the UN World Meteorological Organisation show that, globally, the ten warmest years since 1856 have now occurred since 1990. In descending order, they are: 1998, 2002 and 2003 (joint), 2004, 2001, 1997, 1995, 1990 and 1999 (joint), 1991 and 2000 (joint).

→ In Europe, the average number of climate-related disasters doubled during the 1990s, as compared to the previous decade.

→ Weather stations across Europe have recorded a rise in the occurrence of extremely hot summer days in recent years – in some places, up to 36 per cent more over the past three decades, and in a few areas even more than that. Most significantly, out of over 250 stations, none recorded a decrease in the number of extremely hot days.

→ Heatwaves kill – especially the old and vulnerable. The record-breaking summer of 2003 claimed around 40,000 lives. Common causes of death include respiratory and cardiovascular disease, as well as heatstroke and dehydration.

→ Like other extreme weather, heatwaves are now – at least partly – caused by humans. A study by British scientists, published last year in the leading scientific journal *Nature*, estimated that man-made greenhouse gas emissions have at least doubled the risk of record-breaking heatwaves (such as the one in 2003) occurring throughout Europe. The power sector is the biggest polluter, responsible for 37 per cent of global man-made CO₂.



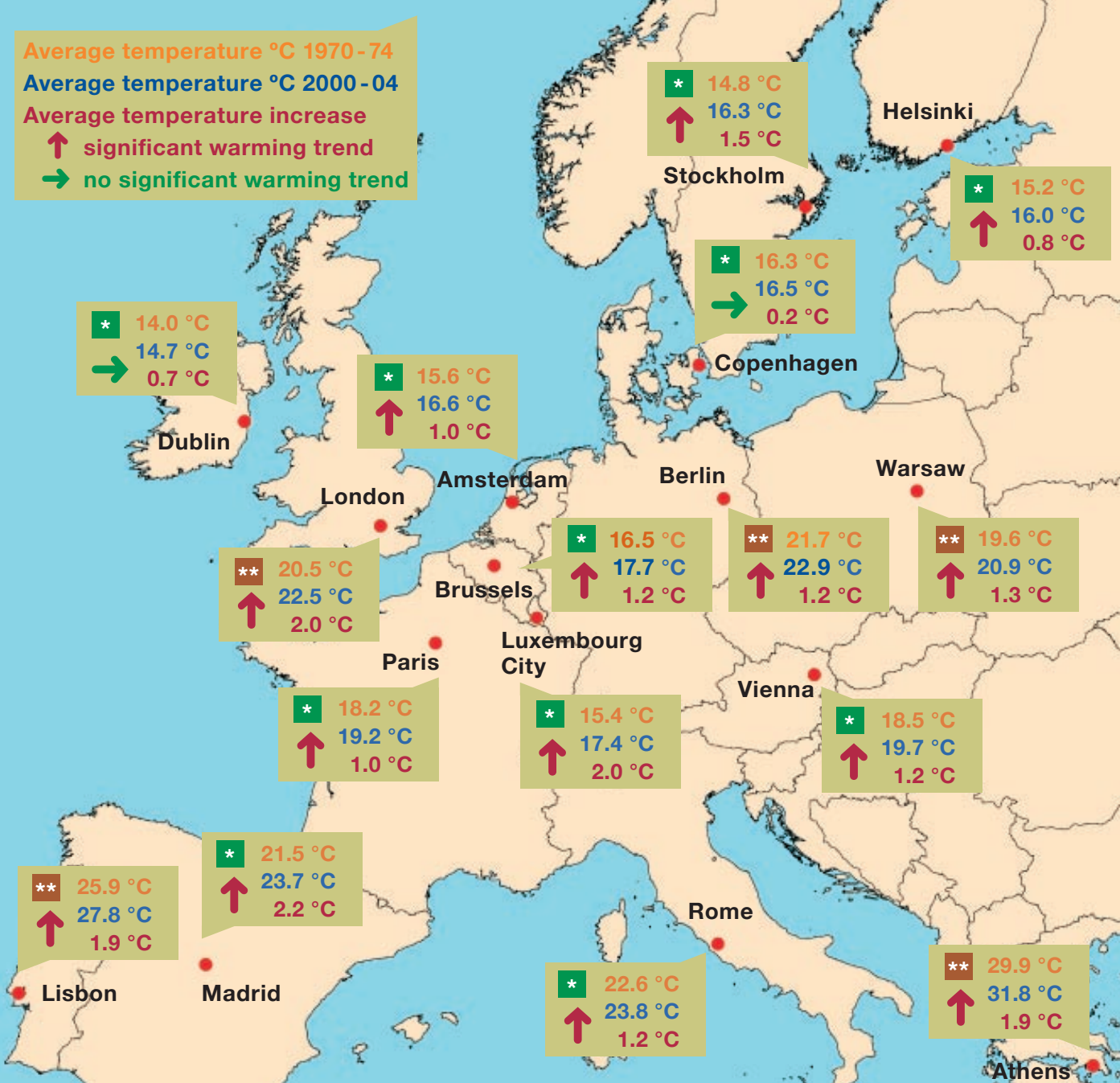
Average temperature °C 1970-74

Average temperature °C 2000-04

Average temperature increase

↑ significant warming trend

→ no significant warming trend



Revealed – EU capitals feel the heat

WWF analysis of climate data for the 'old-EU' 15 capital cities, and the Polish capital, Warsaw, reveals another startling temperature statistic. During the first five years of this decade, average – or mean – temperatures in 13 of the 16 cities were at least 1°C higher than during the first five years of the 1970s.

Europe's average temperature rose by 0.95°C during the 20th century and the global average by 0.6°C. The much greater temperature increases in our analysis, calculated by different but broadly comparable methods, took place over just three decades.

We looked first at average summer maximum temperatures. The greatest increase between 1970-'74 and 2000-'04 was in London at 2°C, followed by Athens and Lisbon, tied at 1.9°C, Warsaw (1.3°C), and Berlin (1.2°C). Other cities did not record a rise using summer maximum temperature and in some cases such data was difficult to obtain. However, when we analysed summer mean temperatures for those cities, they showed a similar pattern of temperature increase. The greatest rise was in Madrid, at 2.2°C, followed by Luxembourg, at 2.0°C, Stockholm (1.5°C), Brussels (1.2°C), Rome (1.2°C), Vienna (1.2°C), Paris (1.0°C), Amsterdam (1.0°C), Helsinki (0.8°C), Dublin (0.7°C), and Copenhagen (0.2°C).

As well as comparing the two five year periods, WWF also calculated overall temperature trends for the 16 cities between 1970 and 2004. Plotted on a graph, the trend lines rose significantly in 14 of the cities analyzed, which is further compelling evidence of their rapid warming. Only Dublin and Copenhagen did not show a significant trend.

The average temperature measures used were as follows:

* Daily summer mean temperature. This is the average – or mean – of the daily temperature for the period June 1st to September 30th. Mean daily temperature is the average temperature over the course of a 24-hour day. The temperature data used for Madrid does not cover the year 1970.

** Daily summer maximum temperature. This is the mean of the maximum daily temperatures for the period June 1st to September 30th.

UK

Since the start of the 1990s, the UK has experienced nearly three times as many extremely warm months as in previous decades. Data indicates that the 1990s were the warmest decade of the last century – with 1998 the hottest year. During just nine days in August 2003, more than 2,000 people in the UK died as a result of the heatwave.

The UK has an international reputation for wet weather – but it seems to be becoming increasingly chaotic and unpredictable. Last August, flash floods devastated the village of Boscastle in Cornwall and in June 2005, similar conditions caused roads and bridges in North Yorkshire to be washed away. Yet, much of the South East of the country is currently suffering a serious water shortage.

As global warming continues, heatwaves are likely to become more common. By 2080, average annual temperatures in the UK could rise by 2 to 3.5°C degrees, and by up to 5°C in some areas. The UK Department of Health predicts a 250 per cent increase in heat-related summer deaths by 2050.

Sea levels in the South of the UK are expected to continue rising by as much as 50cm by 2050 and 86cm during the 2080s. Combined with the predicted increase in heavy rainstorms, this will double the number of people at high risk of flooding to nearly 3.5 million.

The UK is the second biggest CO₂ polluter in the EU after Germany. Between 1990 and 2003, its overall greenhouse gas emissions fell by 13.3 per cent – largely as a result of a shift from coal to gas-fired power production. However, CO₂ emissions rose by 2.2 per cent between 2002 and 2003, and more than half of the country's electricity is still generated by fossil fuel-fired power stations. Provisional figures indicate that the UK's CO₂ emissions rose again in 2004 by about 1.5 per cent.

Where does global warming fit in?

Global warming is a reality.

During the 20th century the global average temperature increased by 0.6°C, and the European average by around 0.95°C. Around two thirds of the global rise has occurred since 1975.

Most climate scientists agree that the warming is due, in a large part, to human activity. We are exacerbating the greenhouse effect, a natural phenomenon, which traps the sun's radiation, creating a 'blanket' that warms the Earth and makes it habitable.

The impact on the world's weather

0.6°C may not sound like very much. But, just like in people, a small, relatively rapid temperature rise can have serious consequences. Most climate scientists believe the increase is enough to upset a delicate natural balance, resulting in more extreme weather events, such as heatwaves, droughts, and rainstorms.

It's not a straightforward process. Warmer temperatures increase the amount of water vapour in the atmosphere, which in turn brings more rain and makes some regions wetter. However, wind and ocean circulation patterns are likely to make other regions significantly drier. Yet, these drier places will probably experience more intense rainstorms.

→ Unfortunately, the worst is yet to come.



Italy

The human cost of the 2003 heatwave was higher in Italy than in any other EU country. According to revised government figures released in June, 20,000 people died. This is twice the original estimate and even higher than in France, previously thought to be Europe's worst hit country. Almost 2,000 forest fires were reported during that summer and drought-related agricultural damage cost around €5 billion.

This summer the country has experienced another heatwave, as well as severe droughts. Temperatures have nudged 40°C in parts of the country, with the Government warning that around a million people are at risk. In June a number of large cities – including Rome, Milan and Turin – went on health alert, with tens of thousands of (mostly elderly) people being monitored.

Italy has generally become drier, with the number of rainy days falling by about 14 per cent since 1996. But the drop in the quantity of rainy days was accompanied by a rise in intensity, meaning more heavy rainstorms.

It is predicted that Italy will be one of the EU countries worst affected by future global warming, with overall rainfall levels shrinking still further, and many more prolonged and intense heatwaves.

It seems that the Mediterranean Sea is also heating up rapidly: a recent study found that sea temperatures around Italy rose by almost 4°C between 1985 and 2003. Sea levels are expected to rise by between 20 and 30cm by 2100, which threatens around 4,500 square kilometers of coastal plains.

Italy is the EU's third biggest greenhouse gas polluter and has one of the EU's worst records on controlling emissions. They rose by 11.6 per cent between 1990 and 2003, and by 2.7 per cent between 2002 and 2003 alone. The country's power sector is heavily reliant on oil, which, after coal, is the worst CO₂ polluter.



The people factor: the greenhouse gas build-up

The global temperature rise has been mirrored by a rise in man-made greenhouse gases. CO₂ accounts for over 80 per cent of these gases. Around 24,400,000,000 tonnes are churned out every year – around 12 times the level in 1900. The single greatest contributor is the power sector, which is responsible for 37 per cent of global man-made CO₂ emissions and 39 per cent of Europe's.

The concentration of CO₂ in the atmosphere has increased by 36 per cent since the start of the Industrial Revolution in the mid-1700s, and is higher than at any time in the past 420,000 years.

Like global warming, most of this increase has occurred in the past few decades. Between the mid-1700s and the late 1950s, average CO₂ levels rose from 280 to 315 parts per million (ppm). By 2004, they had reached an all-time-high of 378 ppm.





What needs to be done

It's vital that we keep the global temperature rise below 2°C, compared to pre-industrial times.

To prevent this increase from happening, CO₂ emissions, especially by the power industry, must be cut rapidly – even more rapidly than the EU's target under the UN agreement known as the Kyoto Protocol. The Kyoto target for the EU is an 8 per cent reduction of greenhouse gas emissions over the period 2008 to 2012, compared to 1990 levels.

→ If we don't act now, the future could be grim.

The Future more extremes, more suffering

The climate

Precise predictions of future climate are impossible, but there is now a scientific consensus that global warming is likely to cause many more extreme weather events.

The world's leading expert body, the UN's Intergovernmental Panel on Climate Change (IPPC), projects average global temperature to rise between 1.4 and 5.8°C by the end of the century. A recent study suggests the rise could be anything up to 11°C.

A climate modelling study by the US National Center for Atmospheric Research (NCAR), based on the 2003 Paris heatwave, suggests that such events could become more commonplace and severe. The study projected that the number of heatwaves in Paris could increase by 31 per cent during this century, and that they would also last longer – up from the current length of 8.3-12.7 days, to 11.4 - 17 days.

Poland

Dry summers have left Poland with a serious water problem, with current water resources estimated to be only about a third of the European average. However, like Germany, Poland suffered severe flooding in the summers of 1997 and 2002.

In July this year, Dr. Halina Lorenc, a climatologist at the country's Meteorology and Water Economy Institute, predicted that the month-long drought and high temperatures were likely to reduce the grain harvest to two-thirds of its 2004 level.

Future temperature rises will likely mean bad news for farmers, by extending the length of the dry summer period and exacerbating water shortages.

According to Polish government scientists, rising sea levels – predicted to be around 50cm over this century – are likely to threaten the country's entire 790-km Baltic Sea coastline with erosion and flooding.

Poland's greenhouse gas emissions fell by 32.1 per cent between 1988 and 2003, which was largely due to a reduction in coal-fired electricity production. Nevertheless, around 95 per cent of the country's power stations remain fossil-fuel powered (mainly hard coal and lignite) and it has one of the EU's largest coal industries. Polish production exceeds the combined total of the 15 old EU member states.



High greenhouse gas emission scenarios project that by the end of the century one in two summers are likely to be as warm as 2003's record-breaker, and in Southern Europe this is projected to happen even earlier.

The IPCC suggests that a doubling of CO₂ levels compared to pre-industrial times could cause a 2°C increase in the global average temperature. At the current rate of increase, this could happen by the middle of the century, bringing significant and abrupt climate change to Europe. In Southern Europe, this could mean an additional six weeks of extremely hot days per year, coupled with severe droughts.

While many people in Northern Europe may enjoy the warmer summers, they will also have to endure a rise in droughts and severe rainstorms – a combination likely to bring about dangerous flash floods.

Health impacts

Longer and more intense heatwaves pose a major health risk. According to a US study, heat-related deaths caused by climate change are likely to increase several-fold by 2050. Tick-borne diseases, which were once a local problem in some Northern and Central European countries, could also spread. Tick-borne encephalitis (TBE), which has already reached epidemic proportions in large parts of Europe, can result in meningitis and other serious neurological problems.

More floods will also have serious consequences for public health. As well as death by drowning, the populations they displace suffer from increased psychological and behavioural disorders, and are more prone to suicide.





Economic impacts

If the average global temperature increases by 2°C from its pre-industrial level, water shortages and increased forest fires are likely to hit Southern Europe's tourist industry.

Already this summer, Spain and Portugal have applied for EU food assistance. With agricultural yields in the region predicted to fall by 40 per cent, this is a trend that could be repeated frequently throughout countries in Southern Europe.

Warmer and longer summers generally mean an increased growing season in Central and Northern Europe, but droughts and a rise in agricultural pests and weeds could prevent farmers from reaping the benefits.

According to the European Environment Agency, some regions may also become crowded by 'climate change refugees.' Most will be escaping from the heatwaves and droughts of Southern Europe, but melting ice and permafrost could also drive people down from the far North.

The leading insurance company Allianz estimates that climate change is increasing the potential of property damage by two to four per cent a year. Major storms are especially costly. According to the Association of British Insurers, even small increases in the number of storms could increase their worldwide costs by as much as two thirds – to £15 billion a year – by the end of the century. Business and domestic insurance premiums are expected to rise steadily.



Spain

Currently suffering what is probably the worst drought in the past 60 years, Spain's rainfall this year is over 50 per cent below average. Water rationing has been implemented in large parts of the North East and South East and many crop yields are down by 50 per cent.

Climate modelling suggests that, if global greenhouse gas emissions continue at the current rate, by 2020, one in two summers in Spain are likely to be as hot as 2003.

Spain is warming faster than other parts of the world. If global average temperatures rise by 2°C above pre-industrial levels, Spanish summer inland temperatures are likely to rise by an average of 4 to 5°C. The centre of Spain will potentially experience an extra six weeks of days with temperatures over 35°C. Spain's coastal areas could experience an average of two extra weeks above 35°C.

In June, the Spanish government suggested that a third of the country could become desert-like as climate change exacerbates the loss of topsoil caused by overgrazing and irrigation.

Spain's recent record on greenhouse emissions is the second worst in the EU after Cyprus. Between 1990 and 2003, they rose by 40.6 per cent, which reflects the fact that over the same period fossil fuel consumption in electricity and heat production increased by 53 per cent. Between 1990 and 2002, coal and oil-fired energy production rose by 11.3 and 44.7 per cent respectively.

The hot weather has pushed Spain into a vicious cycle of CO₂ pollution, as many people have invested in energy-intensive air-conditioning units to cope with the heat. Around 1.3 million units were bought in 2004, of which most are energy inefficient.

Environmental impacts

A 2004 study published in *Nature* predicted that climate change could wipe out up to a million terrestrial species around the world over the next 50 years.

It's thought that many species will be unable to cope with the rapid changes in climate, and are likely to reduce in number, or even disappear. Mediterranean species will be especially hard hit by drought, forest fires and soil erosion.

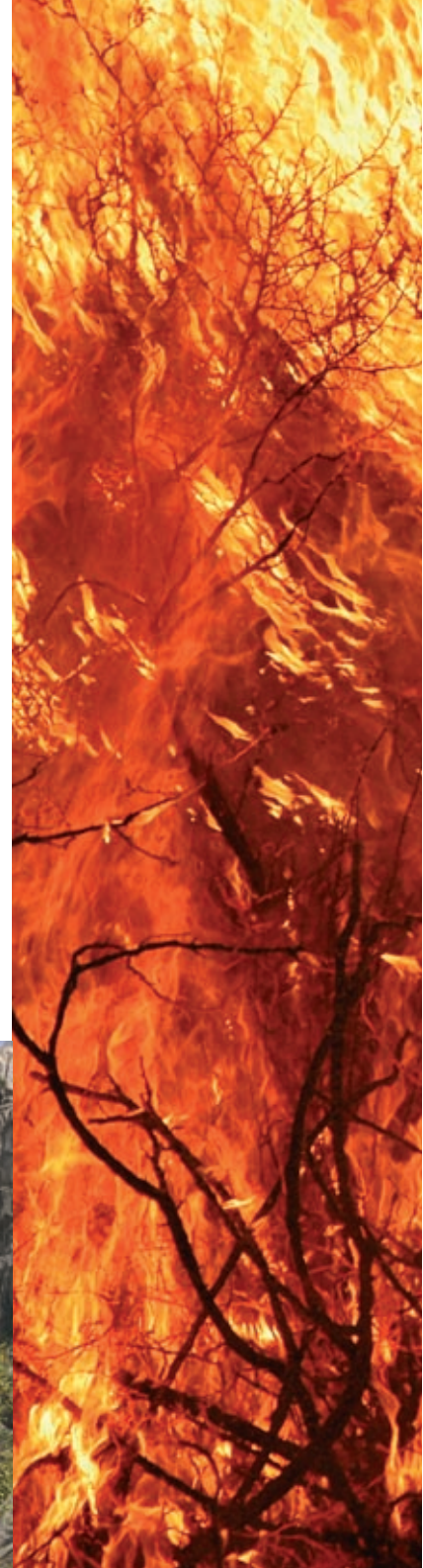
Rivers and glaciers will also be severely affected. By 2070, river discharges are likely to decrease by up to 50 per cent in Southern Europe due to the hotter, drier weather. In Northern Europe they are expected to increase by the same amount, due to higher rainfall and melting glaciers.

Alpine glaciers shrunk by an average of 50 per cent between 1850 and 1980, and have reduced a further 20 to 30 per cent since then. By 2050, Swiss glaciers are likely to have shrunk to 75 per cent of their current size. It's predicted that a 4°C global temperature rise would eliminate nearly all the world's mountain glaciers.

Aletsch Glacier, Switzerland, 1979



Aletsch Glacier, Switzerland, 2002





Action! the PowerSwitch! campaign

The only solution to the global warming problem is to drastically reduce greenhouse gas emissions, especially CO₂. The most effective way to do this is by radical changes to electricity production, in particular the replacement of coal-burning power stations with clean and renewable alternatives, such as solar, wind, water and biomass.

The two-pronged goal of the PowerSwitch! campaign is to ask governments to cut CO₂ pollution produced by coal power stations and force a switch to clean, more efficient power.

European governments have a vital role to play by enforcing strict pollution limits under the European Emissions Trading Scheme. From January 2005, the scheme – known as the ETS – has placed CO₂ limits on the chimney stacks of big companies. Companies that exceed their limits have to pay the penalty by being forced to buy unused pollution allowances from cleaner companies.

Tough pollution limits combined with a powerful financial incentive to invest in cleaner, more efficient technologies would transform the power sector and automatically reduce its CO₂ emissions. Unfortunately, EU governments agreed to weak limits and weak financial incentives. Now the ETS is being reviewed, opening up a big opportunity to get it right next time.

→ **Get involved!**

Join the PowerSwitch! campaign by signing the power pledge

‘I will demand the PowerSwitch! I will urge companies and governments to stop polluting our atmosphere. I will make the PowerSwitch! to clean and efficient energy. I will ask my family and friends to join me and take action. For our climate, our planet and our health – I will act NOW!’

You can sign the pledge and get more details on the PowerSwitch! campaign at www.panda.org/powerswitch



How to survive the heat

- **Increase fluid intake** – don't wait until you're thirsty to drink. Try to avoid drinks containing caffeine, alcohol, or large amounts of sugar, as these cause the body to actually lose fluid.
- **Replace salt and minerals.** Perspiration removes vital salt and minerals from the body, which must be replaced. However, if you are on a low-salt diet, you should consult your doctor.
- **Avoid hot foods and heavy meals** – these add to your overall body heat.
- **Be sure to cover yourself properly in the sun.** Wear pale-coloured, lightweight, loose-fitting clothes, a wide-brimmed hat and sunglasses. Use sunscreen (at least factor 15) on any exposed skin.
- **Stay in the shade.** Seek a cool indoor space, or, if you're outdoors, stay out of the sun as much as possible.
- **Pace yourself.** Try to limit physical activity, especially if you're outside in the sun.

WWF International, CH-1196 Gland, Switzerland.
Written by John Ashton
Design by katja grubitzsch, corporate design, www.grubitzsch.de

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WWF's mission is to stop the degradation of the planet's natural environment and to build a future in which humans live in harmony with nature, by:

- conserving the world's biological diversity
- ensuring that the use of renewable natural resources is sustainable
- promoting the reduction of pollution and wasteful consumption.

