PowerSwitch!

CAMPAIGN

Stormy Europe

the power sector and extreme weather

Dangerous wind of change

Europe and other industrialized countries have been burning large amounts of fossil fuels since the beginning of the 19th century, incessantly pumping carbon dioxide (CO_2) and other greenhouse gases into the atmosphere, trapping heat over the planet. The fact that this global warming is changing the climate as we know it – the length of the seasons, the timing and amount of heavy rain, the presence and absence of snow and ice – is indisputable. Winters in Europe have become warmer, wetter and less snowy over the course of the 20th century. If we continue our habits as heavy users of fossil fuels, not only will this trend continue but we will also begin to see more and stronger storms coming our way.

The North Atlantic Ocean is the source of winter storms in western and central Europe. If CO_2 emissions continue to rise unabated, the frequency and intensity of storms over the North Atlantic are likely to increase, and would in turn increase storm activity over neighbouring countries.

This report summarizes recent scientific findings on future storm activity across western and central Europe under the scenario that the world continues on a business as usual pathway and that little to no action is taken to reduce emissions[1]. Seven countries were included[2] in the analysis and three parameters were examined: 1) increase in the number of severe winter storms[3], 2) increase in the number of days with extremely high wind speeds[4], and 3) increase in maximum wind speeds.

Among the countries analyzed, the UK would be likely to see the strongest increase in storm intensity and frequency. The number of severe winter storms passing through the country each year would likely increase by up to nearly 10 more storms over a 30-year period, while top wind speeds could increase by 8-16%. This would lead to significant increase in economic losses: winter storms that hit the UK between 1987 and 1998 each cost between 200 million to over 2 billion Euros (ABI, 2003; Munich Re, 2002).

The worst offender
the power sector

The biggest source of man-made carbon dioxide (CO_2) 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% more CO_2 per unit of energy produced than natural gas. Globally the power industry contributes 37% of man-made CO_2, and in Europe 39%.

Under the Kyoto Protocol – the global treaty that cuts CO_2 pollution – Europe has pledged to reduce greenhouse gas emissions by 8% below 1990 levels by 2012. However, at the moment EU emissions are actually rising, not falling.

European governments have a vital role to play by enforcing strict pollution limits under the European Emissions Trading Scheme. The scheme – known as the ETS – has placed CO_2 limits on the chimney stacks of utilities and other big companies. Utilities that exceed their limits have to pay the penalty by being required to buy unused pollution allowances from cleaner companies.

The next 20 years 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 CO_2 pollution for decades to come – and will be unable to achieve Kyoto Protocol targets or to stop dangerous climate change.

However, if current coal-fired plants are replaced by clean alternatives, e.g. highly efficient natural gas, wind, biomass, water and solar power – Europe will lead the world towards a low-carbon economy and the earth could avoid the dangerous effects of even faster and more unexpected climate change.

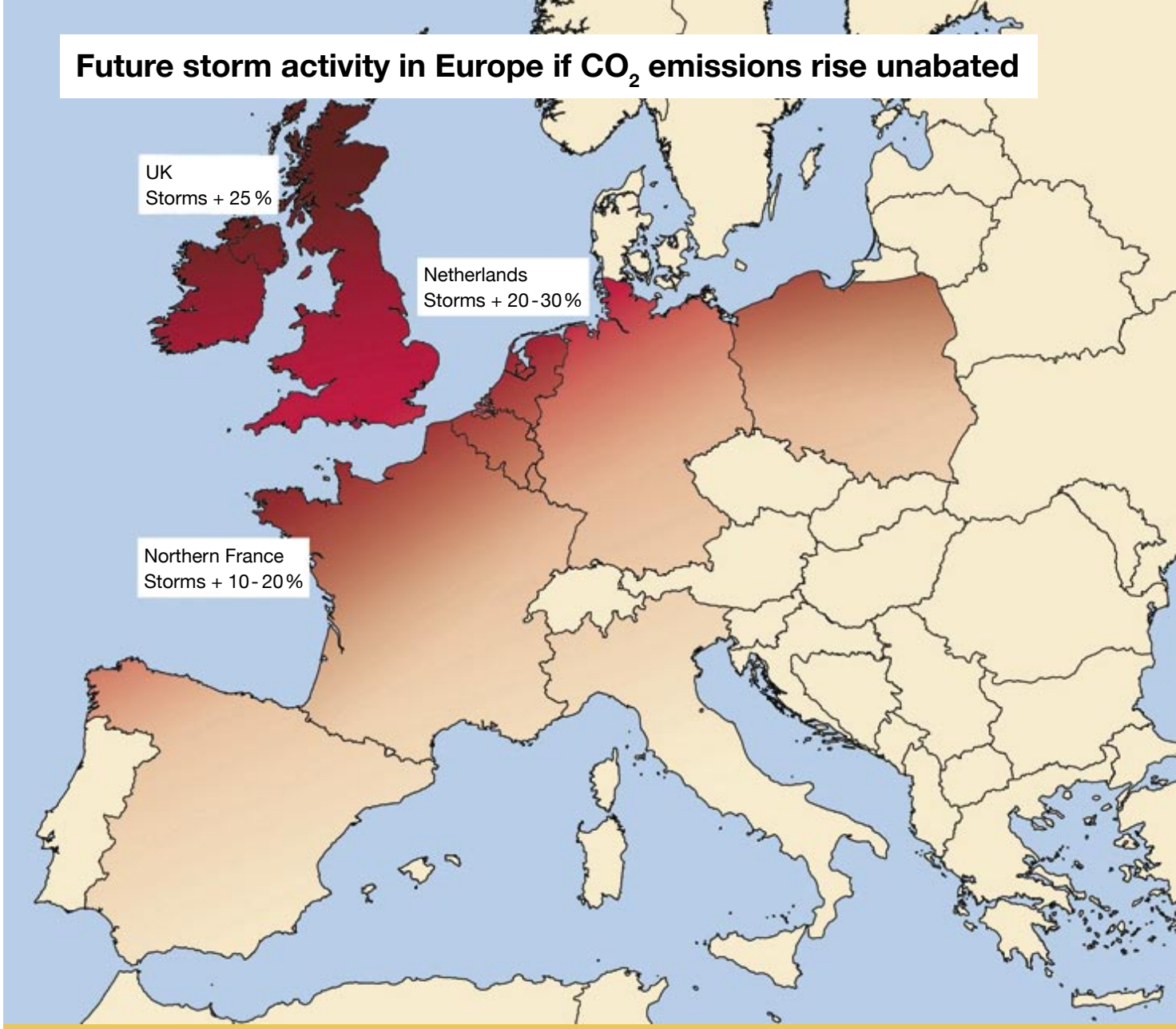
WWF's PowerSwitch! campaign urges power companies to make the vital switch to cleaner, less polluting fuels.

Under the same scenario, the Netherlands would likely be the country that sees the next largest increase in storm frequency and intensity. Not only would there be more severe winter storms, but storms would also become stronger and lead to more economic damage. Top wind speeds could increase by up to 15%. Earlier studies have shown that a mere increase in storm wind speeds of 6% in the Netherlands could increase average annual damage by five-fold or 100 million Euros. France would be likely to see the third largest increase in storm frequency and intensity. Most of the increase would be expected to be concentrated over the northern parts of the country. There could be 5-10 more severe winter storms over a 30-year period, top wind speeds could rise by 8-16%, and the number of stormy days by 25-50%.

Countries that are further away from the North Atlantic Ocean would likely be less affected by the increased storminess over the North Atlantic. No clear trend can be identified in the increase in number of severe storms for countries like Germany, Poland or Spain as a whole. However, some evidence shows that north western Germany and northern Poland could see up to 50% more days with extremely high wind speeds and 10-15% higher maximum wind speeds by the end of the century. The north western shores of Spain would also be expected to experience up to 10% increase in the number of extremely windy days, and maximum wind speeds could increase by 2-4%. The protected Mediterranean coasts of Spain and Italy, on the other hand, would be unlikely to see any increase in winter storm activity.

➜ No one can escape from the effects of climate change. Even in the regions far from the destruction of winter Atlantic storms, heavier rains, warmer winters and less snow are likely to force the inhabitants of Europe to come face to face with climate change and deal with its consequences. We need to significantly reduce our dependence on dirty fossil fuels now, before climate changes happen faster than we can adapt.

Future storm activity in Europe if CO_2 emissions rise unabated

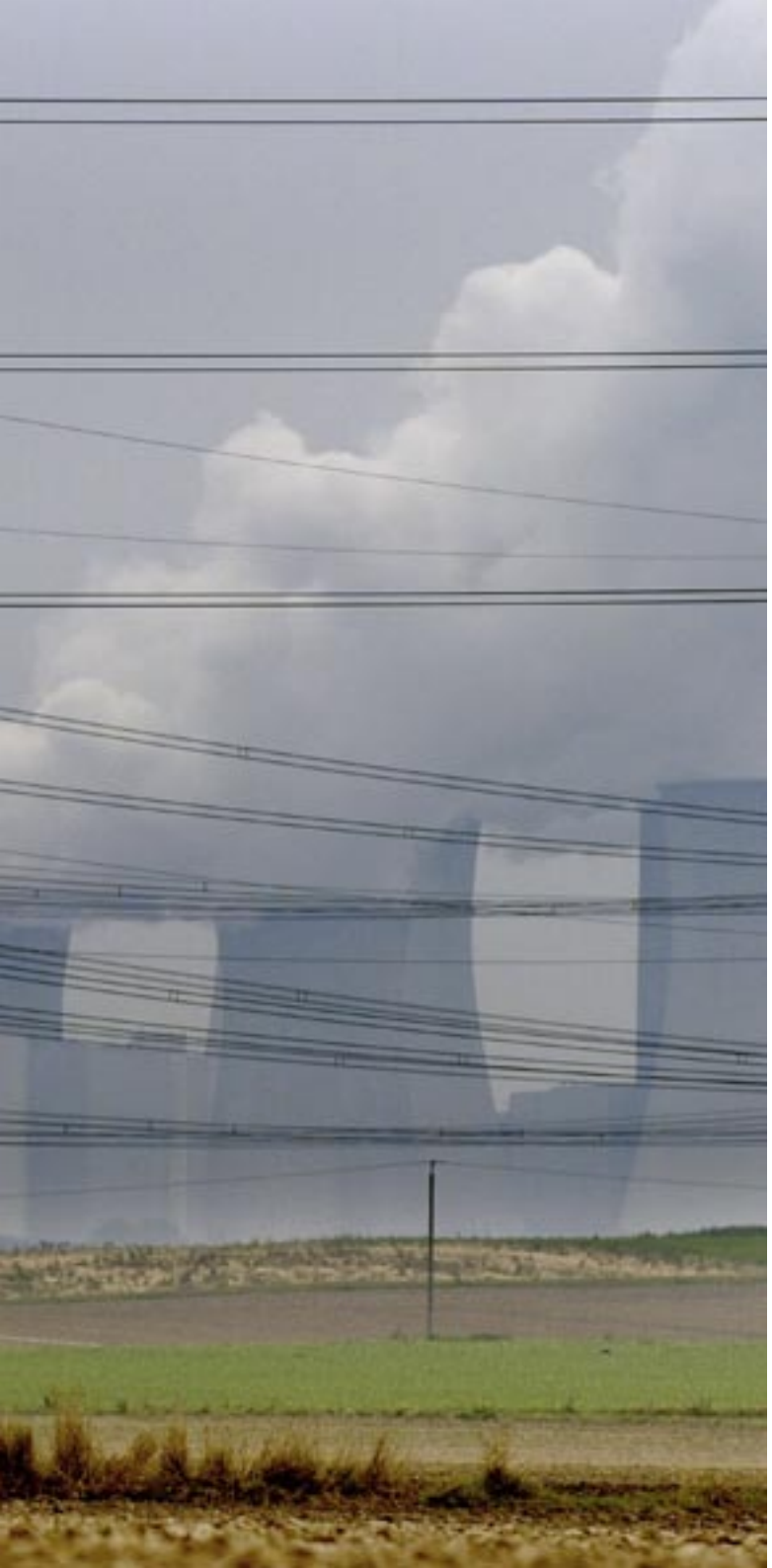


[1] These results follow from analysis using the IPCC A2 Emissions Scenario, which projects that atmospheric CO_2 concentration will reach 771ppm by year 2090 (IPCC, 2001). This would correspond to a warming of the earth by 3-5°C above pre-industrial levels by the period 2071-2100 (New, 2005). In 2004, the Mauna Loa observatory measured an average atmospheric CO_2 concentration of 377ppm.

[2] The United Kingdom, the Netherlands, France, Germany, Poland, Spain, Italy

[3] Severe winter storms are defined as the 5% strongest cyclones which emerge in the northeast Atlantic and European region.

[4] Extremely high wind speeds are wind speeds which exceed the 99th percentile threshold - a threshold that is only exceeded by 1% of all wind speed values.



Introduction

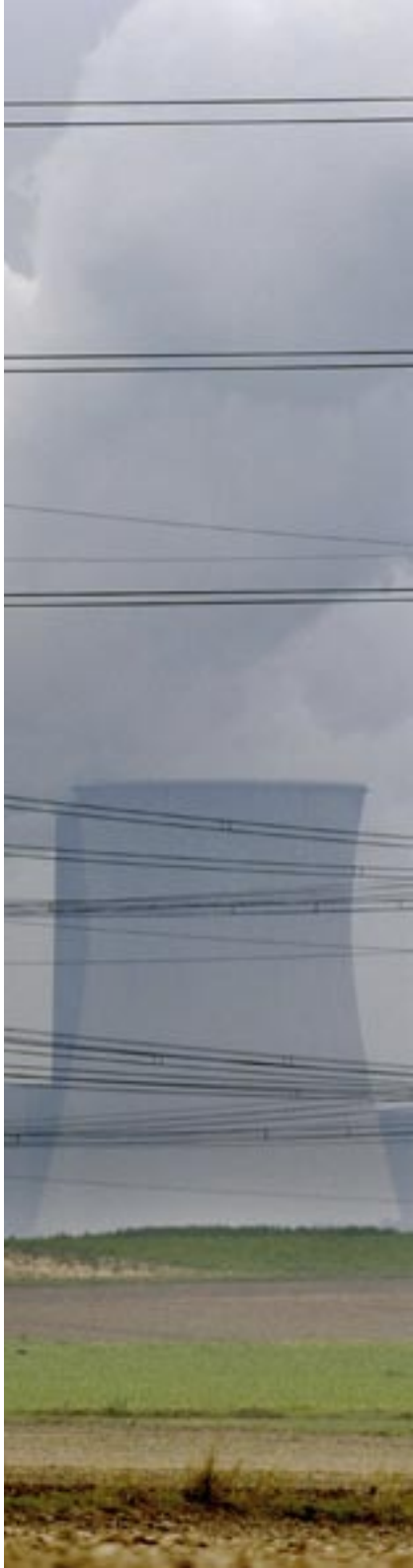
Cold and wet – the words most usually associated with winter in Europe. Although not always pleasant, cold and wet winters form an essential part of the seasonal cycle: land parched by a scorching summer is now replenished; fruit trees enter the rest period where they internally prepare leaves and flowers for the next season; and for many Europeans, it is the time for their favorite winter sport – skiing.

However, too much of a good thing can become a problem too. Heavy snowfall at the end of 2005 brought powder to many skiers in Europe but stranded thousands of travelers on roads in the Netherlands, England and France and knocked out electricity in the homes of 250 000 people in Germany. The very cold winter of 2002/2003 created the worst damage to winter crops in years in Poland. Similar damages could be sustained by Russian farmers in 2006 as extremely cold and snowy weather swept through the country in January. The same cold front continued across eastern, central and even southern Europe, killing hundreds of people along the way and causing traffic chaos from Greece to Spain.

Another usual though rarer winter weather phenomenon - the windstorm - can also wreak a great deal of havoc. To date, the throne of the most costly insurance losses in Europe still belongs to the winter windstorms Daria, Lothar and Vivian, which hit central and western Europe in the 1990s (Swiss Re, 2005) and left behind over 12 billion Euros in insured losses and nearly 300 fatalities in nine countries.

It is true that such extreme events are intense but rare and can be considered as part of the natural variability of the earth's climate. However, since the beginning of the 19th century, humans have been pumping large amounts of CO_2 into the atmosphere as we burn more and more fossil fuels. This CO_2 has been acting as a blanket over the earth, trapping more of the sun's heat and increasing the earth's temperature. Temperature is only one link in the chain that makes up the earth's complex climate system. By pumping CO_2 into the atmosphere, humans are perturbing the natural variability range of the earth's climate.

Scientists studying the earth's climate project that winters in Europe could become wetter, warmer and stormier if the globe continues to warm. Some of these changes – such as warmer temperatures and heavier rain – have already been observed, others – e.g. an increase in storminess across western Europe – have only been partially observed (Alexander et al., 2005; Smits et al., 2005; Pirazzoli et al., 2004). As the population density and wealth of Europe continue to grow, and the frequency and intensity of extreme events increases, the cost of climate change will continue to climb inexorably.



Winter weather in Europe today

Weather is a favorite conversation subject for many Europeans. It provides many variations and surprises from day to day and from year to year. Some of these variations are part of the natural cycle. For example, scientists know that there is a natural cycle – that they call the North Atlantic Oscillation - which brings periods of alternatively cold or warm and wet winters to Europe every ten years or so. However, scientists are increasingly finding trends in our weather that are not explained by long-term cycles and can only be explained by human-induced climate change.

For example, winters in the 20th century have been found to be the warmest over the past five centuries (Luterbacher et al., 2004). The year 2005 has been the warmest ever in the Northern Hemisphere since records began (UK Met Office, 2005). Recent warm winters (1976-1999) included an increase in the number of warm days as well as an increase in the number of cold days – a phenomenon which implies that the winter climate is increasingly being dominated by swings between extremes (Klein Tank et al., 2002). Winters have become wetter: not only is there more winter precipitation (typically rain) than before, but more of it is falling in heavy episodes, especially over most of central Europe, the UK and Scandinavia, (Haylock and Goodess, 2004) and has resulted in flooding in some areas.

However, more winter precipitation does not necessarily mean more snow. In the Swiss Alps, snow depth and the length of the snow season have decreased over the late 20th century. At altitudes below 1.000 m, snow depth has decreased by as much as 30-50% since the 1950's and heavy precipitation is falling increasingly as rain instead of snow (Laternser and Schneebeli, 2003).

Thus far, a uniform increase in winter storms across the continent has not been seen (e.g., Bärring and von Storch, 2004; Lozano et al., 2004), although increases have been observed over the UK (Alexander et al., 2005). However, winter storms remain the cause of nearly 70% of all insured losses in Europe, costing an average of over 2 billion Euros in financial losses a year (Munich Re, 2000; Climate Risk Management Ltd., 2005). In addition, Europeans are projected to become richer (income per capita is expected to triple by the end of the century, Climate Risk Management Ltd, 2005), and the amount of assets and property at risk from extreme weather will climb.

The United Kingdom

Situated between the North Sea and the northeast Atlantic, the UK is no stranger to storms blowing from the Atlantic. Since 1987, windstorms have cost nearly 5 billion Euros in insured losses and over 150 fatalities in the country (ABI, 2003).

Among the analyzed countries, the UK would be likely to see the most drastic increase in storm activity if CO_2 emissions continue to rise unabated. Three out of four climate models investigated show that the number of severe winter storms would likely increase by up to 25% by the end of the century, translating into an increase of up to nearly 10 more storms over the 30-year period between 2071-2100. Top wind speeds would be likely to increase by 8-16%.

Winter storms hitting the country between 1987 and 1998 have each cost between 200 million to over 2 billion Euros (ABI, 2003; Munich Re, 2002). As in the case of the series of storms of 1990, wind speed increases of 15% could lead to up to 50% more houses being damaged (Munich Re, 2002).

Scotland and Ireland would likely see the largest increase in storm activity under climate change (Leckebusch et al., 2006) – a trend that is already visible over the last 50 years (Alexander et al., 2005). The Association of British Insurers (ABI, 2003) estimated that London, followed by Birmingham and Swansea are likely to be the cities at highest risks of property damage from future windstorms.

Performance in the greenhouse

The UK is the second largest emitter of greenhouse gases in the European Union after Germany. Over the past 15 years, the country has reduced its emissions over 13% compared to 1990 levels. However, more than half of the UK's electricity is still generated by power stations running on dirty fossil fuels. These 100 power stations produce 85% of all the greenhouse gases emitted by the country.

What could winter in Europe become?

Winter storms in Europe are likely to cost even more if CO_2 emissions continue to rise unabated. A warmer atmosphere can provide more energy to power storms at mid-latitudes, and as a result winter storms could become stronger and more frequent, especially over western and central Europe (Leckebusch and Ulbrich, 2004; Leckebusch et al., 2006; and see boxes[5]).

Under this scenario, the number of severe winter storms could increase by up to 25%, translating into up to nearly 10 more storms over a 30-year period by the end of the 21st century. Top wind speeds could also increase by up to 15%, increasing the probability for larger economic losses. For example, in the Netherlands, a mere increase in storm wind speeds of 6% has been shown to lead to increases in average annual damage by five-fold or 100 million Euros.

The countries most hit are likely to be those on the edge of the North Sea: the UK, the Netherlands and France. Regions that are further away from the North Atlantic Ocean, such as northern Poland, north western Germany and Spain, are likely to feel the effect of the increased storminess over the North Atlantic as the number of extremely windy days and maximum wind speeds increase. On the other hand, the protected Mediterranean coasts of Spain and Italy are unlikely to see any increase in winter storm activity.

[5] Over the following pages we present a more detailed breakdown of results from Leckebusch and Ulbrich (2004) and Leckebusch et al. (2006, in press) in order to compare the changes of storm activity over central and western European countries under climate change. The results from Leckebusch and Ulbrich (2004) and Leckebusch et al. (2006, in press) were produced within the framework of the Modelling Impacts of Climate change in Europe (MICE) project (EU project number: EVK2-2001-00118; **http://www.cru.uea.ac.uk/cru/projects/mice/**) which aimed at studying the impact of climate extremes. These studies examined the results from ensembles of four global climate models, four regional climate models and one emission scenario (SRES A2). The SRES A2 scenario describes a world where global population increases continuously and atmospheric CO_2 concentrations are projected to reach 771 ppm by the year 2090, a level far beyond a dangerous threshold defined by WWF and the EU Council as 2°C. Extratropical storms were identified using established tracking algorithms. More information on the methodology and the reference list of the study can be found at **www.panda.org/powerswitch/stormyeurope**.

The Netherlands

In the Netherlands, the total damages due to the storm Daria in 1990 amounted to over 1 billion Euros (Dorland et al., 1999). Three out of four climate models show that the number of severe storms could increase by up to 20-30% by the end of the century - if CO_2 emissions continue to rise unabated. This translates into up to nearly 10 more storms – from 30 to 40 – over the period 2071-2100. Top wind speeds would likely rise by 2-16%. A mere 6% increase in storm wind speeds could already increase average annual damage by 500% (Dorland et al., 1999). Even small increases in storm activity have been shown to lead to significant increases in storm surge heights at Rotterdam and Dordrecht (Jacobs et al., 2000).

Sea level could rise by an expected average of 60 cm in this century (VROM, 2005; IPCC, 2001). In addition, the number of severe storm surge events could increase by 50-100% by the end of the century (Woth et al., 2005). The combined effects of both could put the Dutch coast under even greater risk of flooding.

Climate change is also expected to increase winter rainfall by 10%, accompanied by a possible increase of 40% in river discharges (VROM, 2005). 50% increase in winter precipitation and a 2°C increase in temperature would increase the annual average damage of flooding in the South Limburg Meuse Valley from 4.5 to 10 million Euros (Tol, 2001).

Performance in the greenhouse
Dutch CO_2 emissions have increased by 12% between 1990 and 2003. In 2003, less than 5% of the country's electricity was generated from renewable sources (Klein et al., 2005). The situation is not likely to change: forecasting up to the year 2020, the Dutch government expects that energy consumption will continue to rise while renewable energy will only play a modest role (van Dril and Elzenga, 2005).

Greater risk to human safety

The experience of the insurance industry shows that even small changes (<10%) in event severity can generate large increases in damage (Innovest Strategic Value Advisors, 2002). A 20% increase in the frequency of the largest storms – as projected to be a consequence of climate change by the end of the century if CO_2 emissions are not reduced – is expected to raise associated financial losses by over 600 million Euros a year (Climate Risk Management Ltd., 2005).

It is not only financial assets that are at stake. More frequent winter storms and other extreme weather events would also pose greater risks to human safety, especially to those who live in vulnerable areas, such as coastal lowlands and river basins.

France

France saw a number of destructive winter storms at the end of the 20th century. Storms Herta and Daria in 1990 and Lothar and Martin in 1999 left behind over 8 billion Euros in insured losses (Munich Re, 2002).

Most Atlantic storms cross France from west to east, wreaking the most havoc in the northern parts of the country. If CO_2 emissions continue to rise unabated, this pattern is likely to continue and maybe even strengthen. Among the analyzed countries, France would likely be one of those that will see the largest increase in storm activity. Three out of four climate models investigated show that the number of severe winter storms would likely increase by 10-20% by the end of the century. Top wind speeds could increase by 16%.

Winter storms hitting the country between 1990 and 1999 have each cost between 100 million to over 4 billion Euros (Munich Re, 2002).

Following the series of storms in 1999, the French Federation of Insurance Companies estimated that global warming could lead to a 20% increase in insurance claims over the next 50 years, translating to an additional cost of 5 to 15 billion Euros to insurers and their clients (MIES, 2001).

Performance in the greenhouse
France is the fourth largest emitter of greenhouse gases in the European Union, contributing about 12% of all emissions in the Union. The average French person consumes 4.4 tonnes oil equivalent of energy per year – 20% higher than the European average and nearly 300% higher than the world average. But, due to a high share of nuclear in the power sector, the CO_2 emissions per capita and per Gross Domestic Product are lower than the European average. In 2003, only 13.5% of the French electricity production came from renewable sources, which comprised mainly of hydroelectric power.

Germany

In 1999, storm Lothar led to timber losses of nearly 300 million m^3 in the province of Baden-Württemberg. The storms Anatol and Lothar in 1999 cost the country 750 million Euros in insured losses (Munich Re, 2002).

Tucked inside the European continent, Germany is under less influence from Atlantic storms than its western and northern neighbours. No clear trend can be identified in the increase in the number of severe storms for Germany as a whole. However, two out of four climate models investigated show that the north western parts of the country would likely see an increase of up to 50% in the number of days with extremely high winds and an increase of up to 10% in maximum wind speeds – if CO_2 emissions continue to rise unabated. Another consequence of climate change would be a significant increase in storm surge heights and in the number of severe storm surge events. By the end of the century, the number of severe storm surge events along the southern North Sea coast could increase by 50-100% (Woth et al., 2005). This would require the strengthening of existing coastal defences, particularly around important seaports, such as Hamburg and Bremerhaven, and popular tourist destinations, such as the Isle of Sylt.

Performance in the greenhouse
Germany has reduced its greenhouse emissions by nearly one-fifth since 1990. Around half of these reductions come from the economic decline of East Germany in the early 1990's. Germany's performance in the Emissions Trading Scheme is poor: the government provides only little incentives for existing power plants to reduce their emissions or to replace existing facilities with others that emit less (Matthes et al., 2005). Such half-hearted policies damage the potential that an efficient and ambitious Emissions Trading Scheme has. If the incentives are not set correctly, ambitious future climate targets cannot be met.

Lower heating bills and fewer cherries?

If CO_2 emissions continue to rise unabated, climate change is likely to shorten the cold season, cutting down the number of days below 0° C by up to 120 days per year across Europe by the end of the 21st century (MICE, 2005). On the surface, this may sound like good news, heralding lower heating bills and fewer cold-related health problems. However, many cereals and fruit trees, such as cherries and apples, need a certain amount of cold to complete their development. Unusually mild winters have already led to lower harvests in blackcurrants in the UK. Additionally, pests and diseases could have better chances to survive warmer winters and could spread more rapidly during warmer springs (Bisgrove and Hadley, 2002). In the Mediterranean, warmer temperatures all year round could also mean that the winter wheat gets a much shorter growing season (MICE, 2005).

➜ Warmer winters are not necessarily good news all around.

Wetter winters …

Together with the warmer temperatures comes more precipitation (rain or snow). If emissions are not reduced, scientists project that winter precipitation over central and northern Europe is likely to increase by 20-60% by the end of this century (Räisänen et al., 2004). A large proportion of this precipitation is likely to come in episodes of heavy rainfall, which can saturate soils and increase flooding risks (MICE, 2005). Heavy rainfall combined with snowmelt in January 2003 unleashed floods that displaced nearly 1500 people across Germany, Belgium, France and Portugal. Similar winter and spring flooding events are expected to be on the rise across Europe, especially in the river basins of the Rhine, Rhone, Main and Neckar (SAEFL, 2005; Zebisch et al., 2005; MIES, 2001).

Poland

Poland lies far away from the Atlantic. However, Poland has a coastline of nearly 500 km along the Baltic Sea and hence, is affected by the winter storms that cross southern Scandinavia, such as the storm Erwin that tore across Denmark and southern Sweden at speeds of over 180 km/h in January 2005.

All four climate models investigated show that the number of storms crossing southern Scandinavia would likely increase by 6-25% if CO_2 emissions continue to rise unabated. This would directly lead to an increase in the frequency and intensity of winds over northern Poland, leading to a 25-50% increase in the number of days with extremely high winds, accompanied by an increase of up to 16% in maximum wind speeds.

Performance in the greenhouse
Poland's greenhouse gas emissions fell by over 30% between 1988 and 2003, which was largely due to a reduction in coal-fired electricity production and economy transformation. Nevertheless, around 95% of the country's power stations still run on fossil fuels, mainly coal and lignite. In addition, the government's policies for the Emissions Trading Scheme provide little incentives to stimulate reductions of greenhouse emissions in the power sector (Matthes et al., 2005).

… but less skiing?

More winter precipitation does not necessarily mean more snow in the mountains. Warmer temperatures are expected to cause more precipitation to fall as rain instead of snow and to reduce the length of the snow season, especially at lower altitudes. Snow depth in the Alps is expected to decrease by about 20-30% over the next 15 years, unless CO_2 emissions are reduced drastically (MICE, 2005). Climate change would make the snowline climb by up to 100m per decade (MICE, 2005). In France, for example, more than two-thirds of all ski resorts lie partially or completely below 1500m. If all other influencing factors remain the same, ski resorts at lower altitudes – many of them small family businesses – are likely to have to close because of the lack of snow. (Céron and Dubois, 2005; Elsasser and Bürki, 2002). As snow becomes available further uphill, ski resorts may have to follow the receding snow line, increasing the pressure on the sensitive ecosystems in the high Alps.

Spain

Spain has nearly 8 000 km of coastline (including Canary Islands and Balearic Islands). Half of it lies along the Atlantic and the rest borders the Mediterranean. Compared to its neighbours further north, Spain is less affected by winter storms from the Atlantic. However, higher storm activity under climate change over the adjacent Atlantic is likely to lead to an increase in the intensity of winds over some parts of the country by the end of the century. Maximum wind speeds could increase by 2-4% in north western Spain by the end of the century, while in Galicia, the number of days with high winds could increase by up to 10%.

Another type of storm made its first appearance on the Iberian Peninsula in 2005: Europe's first hurricane – Hurricane Vince – landed on the south western coast of Spain in October. It was the farthest northeast a tropical storm had ever developed in the Atlantic and it developed over water that was thought to be too cold to be able to support a tropical storm. Following Hurricane Vince, the tropical storm Delta hit the Canary and Madeira Islands in November 2005, leaving behind severe damage, power outages and fatalities. However, so far scientists cannot say whether there is a relationship between such unusual storms and climate change.

Performance in the greenhouse

Spain's recent record on greenhouse emissions is one of the worst in the European Union. Between 1990 and 2004, emissions rose by over 45% and make up nearly one-tenth of all EU emissions. In 2002, the EU countries agreed to reduce their greenhouse emissions and set targets to achieve by 2010. Spain is far from being on track – following present trends, it will be emitting one-third more greenhouse gases than it should by 2010.

Italy

Italy occupies an enviable location in the central Mediterranean region. Far away from the Atlantic Ocean, it is rarely visited by winter storms from the Atlantic and is likely to remain so in a warmer world. However, cyclones generated over the Gulf of Genoa are common occurrences in this part of the world. They can form any time of the year and are characterized by high wind speeds and can cause damaging impacts on infrastructure and the natural environment. The relationship between global warming and Genoa cyclones is not very well understood. While limited evidence suggests a reduction in the number of such storms under climate change, other studies also indicate that such a reduction in numbers could be accompanied by an increase in storm severity (Anagnostopoulou et al., 2006).

Uncertainty about future storm activity does not mean that Italy, being the third biggest emitter of greenhouse gases in the European Union, will not be touched by climate change. In the Italian mountains, half of the winter sport villages are below 1300m. A 1°C temperature increase in December could imply a drop of about 30 reservations per night in the month of January in the alpine regions alone, potentially making significant impact on the economy of these small villages (MATT, 2002).

Performance in the greenhouse

Between 1990 and 2003, greenhouse gas emissions in Italy rose by over 11%. Like Spain, Italy is far from being on track to meeting its emission reduction targets set for 2010. The country's policies on the Emissions Trading Scheme are not helping. They strongly favour hard coal power plants and provide very little incentive to build or use other facilities that produce lower emissions.

Action: the PowerSwitch! campaign

- The only solution to the problem of climate change is to drastically reduce greenhouse gas emissions, especially CO_2, now. One of the most effective ways to do this is by replacing coal-burning power stations with clean, efficient and renewable alternatives, such as solar, wind, water, biomass and natural gas.

- The two-pronged goal of the PowerSwitch! campaign is to ask governments to cut CO_2 pollution produced by coal power stations and to force a switch to clean, more efficient power.

- European governments have a vital role to play by strengthening pollution limits under the European Emissions Trading Scheme. The scheme – known as the ETS – has placed CO_2 limits on the chimney stacks of utilities and other big companies. Utilities that exceed their limits have to pay the penalty by being required 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, reducing CO_2 emissions.

- The ETS started in January 2005 with disappointing and insufficient CO_2 pollution limits. However, over the first half of 2006 it will be reviewed, and this time hundreds of millions of tonnes of dirty CO_2 emissions are at stake.

- Either Europe decides to cut CO_2 emissions drastically and meets the Kyoto target, or it carries on polluting and putting people and nature at risk.

Get involved!

Join the PowerSwitch! campaign and help WWF lobby for tough pollution limits 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 of the PowerSwitch! campaign at www.panda.org/powerswitch

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Methodology and reference list of this report can be found at www.panda.org/powerswitch/stormyeurope

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.

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