

What will climate change do to our planet?

Richard Girling

March 11, 2007

Excerpt from: The Sunday Times

Even if greenhouse emissions stopped overnight - of which there is about as much chance as Tony Blair holidaying in Skegness - the concentrations already in the atmosphere would still mean a global rise of between 0.5 and 1C. A shift of a single degree is barely perceptible to human skin, but it's not human skin we're talking about. It's the planet; and an average increase of one degree across its entire surface means huge changes in climatic extremes.

Six thousand years ago, when the world was one degree warmer than it is now, the American agricultural heartland around Nebraska was desert. It suffered a short reprise during the dust-bowl years of the 1930s, when the topsoil blew away and hundreds of thousands of refugees trailed through the dust to an uncertain welcome further west. The effect of one-degree warming, therefore, requires no great feat of imagination.

"The western United States once again could suffer perennial droughts, far worse than the 1930s. Deserts will reappear particularly in Nebraska, but also in eastern Montana, Wyoming and Arizona, northern Texas and Oklahoma. As dust and sandstorms turn day into night across thousands of miles of former prairie, farmsteads, roads and even entire towns will be engulfed by sand."

What's bad for America will be worse for poorer countries closer to the equator. The Hadley centre calculates that a one-degree increase would eliminate fresh water from a third of the world's land surface by 2100. Again we have seen what this means. Lynas describes an incident in the summer of 2005: "One tributary fell so low that miles of exposed riverbank dried out into sand dunes, with winds whipping up thick sandstorms. As desperate villagers looked out onto baking mud instead of flowing water, the army was drafted in to ferry precious drinking water up the river - by helicopter, since most of the river was too low to be navigable by boat." The river in question was not some small, insignificant trickle in Sussex. It was the Amazon.

While tropical lands teeter on the brink, the Arctic already may have passed the point of no return. Warming near the pole is much faster than the global average, with the result that Arctic icecaps and glaciers have lost 400 cubic kilometres of ice in 40 years. Permafrost - ground that has lain frozen for thousands of years - is dissolving into mud and lakes, "destabilising whole areas as the ground collapses beneath buildings, roads and pipelines". As polar bears and Inuits are being pushed off the top of the planet, previous predictions are starting to look optimistic. "Earlier snowmelt," says Lynas, "means more summer heat goes into the air and ground rather than into melting snow, raising temperatures in a positive feedback effect. More dark shrubs and forest on formerly bleak tundra means still more heat is absorbed by vegetation."

Out at sea the pace is even faster. "Whilst snow-covered ice reflects more than 80% of the sun's heat, the darker ocean absorbs up to 95% of solar radiation. Once sea ice begins to melt, in other words, the process becomes self-reinforcing. More ocean surface is revealed, absorbing solar heat, raising temperatures and making it unlikelier that ice will re-form next winter. The disappearance of 720,000 square kilometres of supposedly permanent ice in a single year testifies to the rapidity of planetary change. If you have ever wondered what it will feel like when the Earth crosses a tipping point, savour the moment."

Mountains, too, are starting to come apart. In the Alps, most ground above 3,000 metres is stabilised by permafrost. In the summer of 2003, however, the melt zone climbed right up to 4,600 metres, higher than the summit of the Matterhorn and nearly as high as Mont Blanc. With the glue of millennia melting away, rocks showered down and 50 climbers died. As temperatures go on edging upwards, it won't just be mountaineers who flee. "Whole towns and villages will be at risk," says Lynas. "Some towns, like Pontresina in eastern Switzerland, have already begun building bulwarks against landslides."

At the opposite end of the scale, low-lying atoll countries such as the Maldives will be preparing for extinction as sea levels rise, and mainland coasts - in particular the eastern US and Gulf of Mexico, the Caribbean and Pacific islands and the Bay of Bengal - will be hit by stronger and stronger hurricanes as the water warms. Hurricane Katrina, which in 2005 hit New Orleans with the combined impacts of earthquake and flood, was a nightmare precursor of what the future holds.

"Most striking of all," says Lynas, "was seeing how people behaved once the veneer of civilisation had been torn away. Most victims were poor and black, left to fend for themselves as the police either joined in the looting or deserted the area. Four days into the crisis, survivors were packed into the city's Superdome, living next to overflowing toilets and rotting bodies as gangs of young men with guns seized the only food and water available. Perhaps the most memorable scene was a single military helicopter landing for just a few minutes, its crew flinging food parcels and water bottles out onto the ground before hurriedly taking off again as if from a war zone. In scenes more like a Third World refugee camp than an American urban centre, young men fought for the water as pregnant women and the elderly looked on with nothing. Don't blame them for behaving like this, I thought. It's what happens when people are desperate."

Chance of avoiding one degree of global warming: zero.

BETWEEN ONE AND TWO DEGREES OF WARMING

At this level, expected within 40 years, the hot European summer of 2003 will be the annual norm. Anything that could be called a heatwave thereafter will be of Saharan intensity. Even in average years, people will die of heat stress.

"The first symptoms," says Lynas, "may be minor. A person will feel slightly nauseous, dizzy and irritable. It needn't be an emergency: an hour or so lying down in a cooler area, sipping water, will cure it. But in Paris, August 2003, there were no cooler areas, especially for elderly people.

"Once body temperature reaches 41C (104F) its thermoregulatory system begins to break down. Sweating ceases and breathing becomes shallow and rapid. The pulse quickens, and the victim may lapse into a coma. Unless drastic measures are taken to reduce the body's core temperature, the brain is

starved of oxygen and vital organs begin to fail. Death will be only minutes away unless the emergency services can quickly get the victim into intensive care.

"These emergency services failed to save more than 10,000 French in the summer of 2003. Mortuaries ran out of space as hundreds of dead bodies were brought in each night." Across Europe as a whole, the heatwave is believed to have cost between 22,000 and 35,000 lives. Agriculture, too, was devastated. Farmers lost \$12 billion worth of crops, and Portugal alone suffered \$12 billion of forest-fire damage. The flows of the River Po in Italy, Rhine in Germany and Loire in France all shrank to historic lows. Barges ran aground, and there was not enough water for irrigation and hydroelectricity. Melt rates in the Alps, where some glaciers lost 10% of their mass, were not just a record - they doubled the previous record of 1998. According to the Hadley centre, more than half the European summers by 2040 will be hotter than this. Extreme summers will take a much heavier toll of human life, with body counts likely to reach hundreds of thousands. Crops will bake in the fields, and forests will die off and burn. Even so, the short-term effects may not be the worst:

"From the beech forests of northern Europe to the evergreen oaks of the Mediterranean, plant growth across the whole landmass in 2003 slowed and then stopped. Instead of absorbing carbon dioxide, the stressed plants began to emit it. Around half a billion tonnes of carbon was added to the atmosphere from European plants, equivalent to a twelfth of global emissions from fossil fuels. This is a positive feedback of critical importance, because it suggests that, as temperatures rise, carbon emissions from forests and soils will also rise. If these land-based emissions are sustained over long periods, global warming could spiral out of control."

In the two-degree world, nobody will think of taking Mediterranean holidays. "The movement of people from northern Europe to the Mediterranean is likely to reverse, switching eventually into a mass scramble as Saharan heatwaves sweep across the Med." People everywhere will think twice about moving to the coast. When temperatures were last between 1 and 2C higher than they are now, 125,000 years ago, sea levels were five or six metres higher too. All this "lost" water is in the polar ice that is now melting. Forecasters predict that the "tipping point" for Greenland won't arrive until average temperatures have risen by 2.7C. The snag is that Greenland is warming much faster than the rest of the world - 2.2 times the global average. "Divide one figure by the other," says Lynas, "and the result should ring alarm bells across the world. Greenland will tip into irreversible melt once global temperatures rise past a mere 1.2C." The ensuing sea-level rise will be far more than the half-metre that the IPCC has predicted for the end of the century. Scientists point out that sea levels at the end of the last ice age shot up by a metre every 20 years for four centuries, and that Greenland's ice, in the words of one glaciologist, is now "thinning like mad and flowing much faster than [it] ought to". Its biggest outflow glacier, Jakobshavn Isbrae, has thinned by 15 metres every year since 1997, and its speed of flow has doubled. "At this rate," says Lynas, "the whole Greenland ice sheet would vanish within 140 years. Miami would disappear, as would most of Manhattan. Central London would be flooded. Bangkok, Bombay and Shanghai would lose most of their area. In all, half of humanity would have to move to higher ground."

Not only coastal communities will suffer. As mountains lose their glaciers, so people will lose their water supplies. The entire Indian subcontinent will be fighting for survival. "As the glaciers disappear from all but the highest peaks, their runoff will cease to power the massive rivers that deliver vital freshwater to hundreds of millions. Water shortages and famine will be the result, destabilising the entire region. And this time the epicentre of the disaster won't be India, Nepal or Bangladesh, but nuclear-armed Pakistan."

Everywhere, ecosystems will unravel as species either migrate or fall out of synch with each other. By the time global temperatures reach two degrees of warming in 2050, more than a third of all living species will face extinction.

Chance of avoiding two degrees of global warming: 93%, but only if emissions of greenhouse gases are reduced by 60% over the next 10 years.