

# Global warming: The trend intensifies

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A decade ago the idea that the planet was warming up as a result of human activity was largely theoretical. We knew that since the beginning of Industrial Revolution in the 18th century factories and power plants and automobiles and farms have been loading the atmosphere with heat-trapping gases, including carbon dioxide and methane. But evidence that climate was still going hotter was still murky.

But not any more. An authoritative report issued in March 2001 by the United Nations sponsored Intergovernmental Panel on Climate Change (IPCC) made plain that the trend toward a warmer world has unquestionably begun. Worldwide temperatures have climbed more than 0.5C over the past century. After analysing data going back for two decades on everything from air and ocean temperatures, the spread and retreat of wild life, the IPCC asserts that this slow but steady warming has had an impact on no fewer than 420 physical processes and animal and plant species on all continents.

From melting glaciers to rising oceans, the signs are everywhere. Mount Kilimanjaro has lost 75 per cent of its ice cap since 1912. The ice on Africa's tallest peak could vanish entirely within 15 years. Coral reefs are dying off as the seas get too warm for comfort. Coral reefs suffer from the loss of algae that colour and nourish them. The process, called bleaching, is caused by warmer ocean. Pacific salmon populations fell sharply beginning from 1997 when local ocean temperatures rose by 3°C. Drought is

the norm in parts of Asia and Africa. El Nino events which trigger devastating weather in the eastern Pacific are more frequent. The Arctic permafrost is starting to melt. Lakes and rivers in colder climates are freezing later and thawing earlier each year. Plants and animals are shifting their ranges poleward and to higher altitudes, and migration patterns for animals as diverse as polar bears, butterflies and even whales are being disrupted. Lake Baikal in eastern Siberia now freezes for the winter 11 days later than it did a century ago. Venezuelan mountain-

Worst of all, this increase in temperature is happening at a pace that outstrips anything the earth has seen in the past 100 million years. Humans will have a tough time adjusting, especially in poor countries like Bangladesh, India the Philippines and even China, but for wildlife the changes could be devastating. Because of shrinking forest region the ranges for many animals and species, especially tigers, lions, rhinos and zebras are on the decline.

Faced with these hard facts, scientists no longer doubt that global warm-

severely eroded by rising seas, rainfall scarcer on agricultural land and ecosystems thrown out of balance."

But if the rise is significantly larger the result would be more disastrous. With seas rising as much as 1 m enormous areas of densely populated lands -- coastal Florida, the Nile Delta, the Maldives, parts of Bangladesh -- would become uninhabitable. Entire climate zones might shift dramatically in central Canada, Georgia, Bangladesh, India etc. Agriculture would be thrown into turmoil. Hundreds and millions of people would have to migrate out of

can finally begin to reverse the warming trend a century from now, the effort would hardly be futile. Humanity embarked unknowingly on the dangerous experiment of tinkering with climate. Now that we know what we're doing, it would be utterly foolish to continue.

Not surprisingly, president Bush's stance has infuriated other nations since the US is by far the biggest polluter in the planet. With only 4 per cent of world's population, America produces 25 per cent of its greenhouse gases. Time/CNN poll in 2001 showed that 75 per cent of those surveyed consider global warming "a very serious problem and 67 per cent said that the president should develop a programme to address it.

With concerted action and new technologies, the environmentalists assert, it is not too late to cool down the greenhouse. Even when the US government effort has fallen through, state and local governments in the US have been increasingly active in implementing greenhouse programme of their own clamping down on emissions within their borders, stepping up mass-transit initiatives and enforcing conservation laws.

Corporations in such sooty industries as oil and autos have been climbing on board too, imposing on themselves the very restrictions Washington won't. Outside the US, green-leaning developed nations like the EU members and emerging polluters like China and Mexico have seemed to be getting the message, implementing new programmes and testing new technologies to control global warming, even without the cudgel of Kyoto. What was needed to complete the picture was a vigorously engaged US to control its own titanic greenhouse output and help get Kyoto enacted.

But an effective programme to fight climate change need not involve huge increases in energy prices or draconian rules that choke industries at the smokestacks. The emphasis could be on introducing new technologies that would make conservation not only easier but also economical, if not profitable. The report from the Intergovernmental Panel on Climate Change recommends a range of new devices, including hybrid gas-electric cars that run half the time on a traditional internal-combustion engine and the rest of the time on batteries, boosting gas mileage considerably. Also promising is the combined cycle gas turbine that can be used in place of traditional turbines to generate electricity. The new hardware operates at up to 60 per cent efficiency, twice that of any other turbine. Add a device that captures escaping heat and use that to warm buildings or other factory implements, and the efficiency jumps to 90 per cent.

In an effort to ward off disaster, developed countries may choose alternative measures to store carbon. The atmosphere isn't the only place CO<sub>2</sub> can go. With a little ingenuity, it can be wrung out of the air and set aside for safekeeping:

**PLANTING TREES** : They draw CO<sub>2</sub> from the air and give oxygen. One hectare of forest can sponge up 13.6 tons of CO<sub>2</sub> per year.

**ORGANIC AND NO-TILL AGRICULTURE** : Decaying organic material in the soil is rich in carbon. Limiting tilling keeps the carbon from mixing with oxygen and forming CO<sub>2</sub>, thus preventing the production of 2.7 tons of the gas per hectare per year.

**SEQUESTRATION** : Greenhouse gases captured from smoker stacks could be injected into abandoned oil and gas wells.

**CARBONATE ROCKS** : Theoretically, CO<sub>2</sub> could be pumped into calcium-based minerals that would bind with the gas and trap it.

The IPCC was particularly keen on wind power. In the US, wind turbines have generally been limited to the environmental fringes. In Europe, however, they mean business. The EU produces 70 per cent of the world's wind-generated energy, with Germany, Spain and Denmark leading the way. Worldwide, wind turbines account for about 15 gigawatts of energy, which is the equivalent of 15 coal-fired power plants. The Netherlands will soon be getting into the game in a big way, building one of the world's largest wind farms five miles offshore, a remote location that can take advantage of brisk sea breezes while keeping the sometimes noisy mills out of human earshot.

Outside the E.U., other countries are unexpectedly taking a leadership role in curbing global warming. Mexico, which for decades has been choking on its own exhaust, is planning to double its output of geothermal power-energy generated by natural underground heating which would place it third in the world in geothermal production, behind the U.S. and the Philippines. Mexican government is also promising a bill that would open the national power grid to electricity produced by all manner of alternative sources.

China, with 11 per cent of the world's CO<sub>2</sub> output -- second to the US -- has cracked down on emissions and reduced its greenhouse output by 17 per cent between 1997 and 1999, eliminating more than the entire CO<sub>2</sub> production of Southeast Asia. However, Beijing's goal was less to curb global warming than to clean the air and protect the health of its population.

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tops had six glaciers in 1972. Today only two remain.

Public health has suffered and could suffer more. Rising seas could contaminate water supplies with salt. Higher levels of urban ozone, the result of stronger sunlight and warmer temperature, could worsen respiratory illnesses. More frequent hot spells could lead to a rise in heat related deaths. Warmer temperatures have already affected wide range of populations in many countries around the globe and could still widen the range of disease carrying rodents and bugs, such as mosquitoes and ticks increasing the incidence of dengue fever, malaria, encephalitis, and other afflictions.

ing is on its way and nobody questions the fact that humans are at least partly responsible. Already humans have increased the concentration of carbon dioxide, the most abundant heat trapping gas in the atmosphere, to 30 per cent above pre-industrial levels and each year the rate of increase gets faster. That means temperatures will keep going up. By 2100, says the IPCC, "average temperature will increase by anything between 1.4C and 5.8C, more than 50 per cent higher than predictions of just a decade ago". Scientists warn, "The changes could have severe implications with storms getting more frequent and intense, droughts more pronounced, coastal areas even more

unlivable regions. The computer models are now much advanced. They are able to take into account the heat trapping effects of not just of CO<sub>2</sub>, but also of other greenhouse gases including methane. They can also factor in natural variations in the sun's energy and the effects of substances like dust from volcanic eruptions and particulate matter spewed from smokestacks.

Ominously, studies by leading ozone scientist like Jonathan Shanklin of BAS (British Antarctic Survey) team suggests that the gaping man made hole in the ozone layer over Antarctica has hit record high and could even get bigger in the near future. The hole measured about 28 million sq. km at the biggest has again peaked in the second week of September last.

Mentionably, the stratospheric ozone layer protects the earth's surface from the damaging ultraviolet rays that can cause skin cancer. Shanklin who discovered the ozone hole in 1985 says that "the ozone hole is continuously in motion. It is rather like a spinning top". Hopefully the 1985 discovery forced a radical review and ultimately a complete change in many industries that were belching ozone-depleting chemicals into the atmosphere. The consequent drop in output of these chemicals began to bite in 1994 and is now about 6 per cent down from its peak. However the time lag in the chemicals reaching the upper atmosphere and attacking the key atmospheric layers has meant that the benefits of the output reduction has taken several years to feed through.

In the backdrop of the outrageous refusal of the Bush administration, Shanklin has warned that it was vital for countries to stick to the Montreal Protocol curbing the emission of ozone depleting chemicals. Most major polluting nations have signed up to the Kyoto protocol curbing carbon dioxide emissions. But sadly true, the United States has refused, even going so far as to refuse to accept that the gas is a pollutant. Mentionably, it won't take the greatest extremes of warming to make life uncomfortable for large number of people. Even slightly higher temperatures in regions that are already drought- or flood-prone would exacerbate these conditions. In temperate zones warmth and increased carbon dioxide would make some crops flourish at first. But beyond 1.5° of warming, says Bill Easterling, a professor of geography and agronomy at Penn State and a leading author of the IPCC report "there would be a dramatic turning point". US crop yields would start to decline rapidly. In the tropics where crops are already at the limit of their temperature, the decrease would start right away. Even if temperatures rise only moderately, some scientists fear, the climate would reach a "tipping point" -- a point at which even a tiny additional increase would throw the system into violent change. If peat bogs and Arctic permafrost warm enough to start releasing the methane stored within them, for example, that potent greenhouse gas would suddenly accelerate the heat-trapping process.

By contrast, if melting ice caps dilute the salt content of the sea, major ocean currents like the Gulf Stream could slow or even stop, and so would warming effects on northern regions. More snowfall reflecting more sunlight back into space could actually cause a net cooling. Global warming could, paradoxically, throw the planet into another ice age. World Bank chief scientist, Robert Watson, currently serving as IPCC chair, points out: "If we stabilise CO<sub>2</sub> emissions now, the concentration will continue to go up for hundreds of years. Temperatures will rise over that time." That could be truly catastrophic. The ongoing disruption of ecosystems and weather patterns would be bad enough. But if temperatures reach the IPCC's worst case levels and stay there for as long as 1,000 years, says Michael Oppenheimer, chief scientist at Environmental Defense, vast ice sheets in Greenland and Antarctica could melt, raising sea level more than 9 m. Florida would disappear, and every city on the US eastern seaboard would be inundated. Bangladesh faces the worst calamity.

In the short run, there's not much chance of halting global warming, not even if every nation in the world ratifies the Kyoto Protocol tomorrow. The treaty doesn't require reductions in carbon dioxide emissions until 2008. By that time, a great deal of damage will already have been done. But we can slow things down. If action today can keep the climate from eventually reaching an unstable tipping point or