

IDRC FEATURE

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IS THE WORLD GETTING COLDER?

by MICHELLE HIBLER

The weather, long a favourite topic of conversation, has recently been occupying the front pages of the world's newspapers and has become the subject of much scientific research. The reason? Climate is changing and those changes have had, and could continue to have, serious consequences on all aspects of modern life.

The 1970s have seen drought in the Sahel, England, Australia, and the American prairies, failure of the monsoon in India and now, fears of renewed drought in the Sahel. Accompanying this worldwide reduction of rainfall have been generally colder temperatures in the northern hemisphere, so much so that some pessimistic scientists have warned of the coming of a new ice age. Yet, cereal harvests have been good and, in July, the world stock of grain -- some 169 million tonnes -- was the highest in seven years.

While scientists may disagree on the severity of today's climatic problem, or even about the existence of a problem, it is now almost certain that the world is getting colder. But how much colder? From the 1890s to the mid 1940s, global air temperatures increased by approximately $\frac{1}{2}^{\circ}$ C, to reach an all time high -- well, at least for the past few hundred years. And if $\frac{1}{2}^{\circ}$ doesn't seem like much, it was enough to bring milder winters and longer growing seasons to the northern farmlands.

Since then, however, the trend has reversed and in the past 30 years temperatures have fallen by about $\frac{1}{3}^{\circ}$ C. Between 1968 and 1973, ocean observation ships recorded temperatures more than $\frac{1}{2}^{\circ}$ lower than in the mid 1940s. So the world indeed appears to be cooling, or at least, returning to the conditions that existed before it warmed up.

And the droughts? According to Dr Derek Winstanley, a London-based meteorologist who has been studying rainfall over Africa, the world is experiencing a period of weak atmospheric circulation patterns. This means, among other things,

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that the winds that blow over Europe, from west to east, like a wave that undulates between Scandinavia and the north Mediterranean, have for the past few years been oscillating zig-zag fashion over a wider range of latitudes, further north and much further south. So Britain's legendary rains are now falling on the Mediterranean and the Middle East. And the dry belt that was over North Africa has also moved further south.

For India and the Sahel, this shift means that the tropical winds that brought the monsoons are squeezed further south, causing widespread drought. Records indicate that this could be part of a 200-year cycle. If that indeed is the case, when it ends in 2030, the Sahara may well extend 100 km further south, but its northern border will have moved south as well. North Africa may bloom again, but this is of little consolation to the nations of the Sahel.

These recent anomalies in climate, by no means unusual in world history, result from changes in the overall circulation of the atmosphere. And changes in circulation correspond largely with changes in ice cover. Satellite photographs show that, in 1972 -- the most calamitous year --, snow and ice cover in the northern hemisphere formed much earlier than in the previous few years and extended over 4 million square kilometres more land. Since then, the situation seems to have stabilized at the 1972 figures with snow and ice cover averaging approximately 37 million kilometres. The same increase appears in the southern hemisphere.

Because ice reflects the sun's rays rather than absorbing them, it causes lower temperatures, which in turn cause more ice to form and so forth. It is estimated that if the earth received from 1 to 1.5 percent less radiation from the sun, or experienced a temperature drop of 10^0 C, the ice would move well into the middle latitudes of the earth and a new ice age would be upon us. Large amounts of volcanic dust in the atmosphere could, for example, prevent enough of the sun's rays from reaching earth and start the icing process. So far, no volcanic eruption has been large enough to do so, although colder temperatures are recorded during the few years following volcanic activity.

At present we are in the warmest stage of an interglacial period. The transition from interglacial to glacial has previously taken from five to ten thousand years, but from warm to cold within that transition may take only a few hundred. Scientists consider that we could, within a hundred years, enter a "little ice age" such as existed between 1500 and 1850 when temperatures were approximately 1^0 C below average.

Other factors are involved in the process. First there is the sun and the now well documented 11-year sun-spot cycle which releases solar particles (dust) into the atmosphere. Falling on clouds, this dust acts as seeds on which crystals of ice and snow can form and then be released as rain. When the sun is most active, the rains increase. We are now in a period of low activity which should increase to reach a peak around 1982.

The earth's magnetic field also affects circulation and the weather as it moves slowly from east to west. Generally, higher magnetic activity means lower temperatures and that is now the case over Europe.

Clouds come into play because they intercept radiation from the sun and heat reflected from the earth. Scientists at the National Centre for Atmospheric Research in Colorado, have recently discovered that the type of clouds is as important as the quantity. Wide, low clouds that block out heat but are warm enough to radiate heat out into space can cause global cooling, they say.

Add the little-known interactions of oceans with the atmosphere and ice, and the effects of man's activities -- pollution, jet airplanes and aerosol sprays -- and one begins to understand why the most sophisticated computer modelling techniques cannot accurately predict climate or its changes and why apparently contradictory theories abound.

Knowing why climate changes is important, but knowing and preparing for its consequences is more so. In a cooler world, such as is being predicted, shorter growing seasons and less rainfall would make grain production difficult in much of the northern hemisphere -- Canada, the U.S.A. and the U.S.S.R.

A few years of bad weather may cause a five percent reduction in grain production, but, explains British science writer John Gribbin, this means a 20 to 30 percent decrease in food grains available to countries who now import them.

More irrigation, more fertilizers, machinery, etc would be needed for farmers to cope with the new conditions, putting an additional strain on limited water and energy sources. And if farmers in the West can afford these inputs, what of those in Asia and Africa? While world population is increasing at about 2 percent a year, researchers participating in the Global Atmospheric Research Programme estimate that energy consumption is now increasing by more than 5 percent and fresh water consumption by close to 4 percent. If present cooling, drying, trends continue, these figures should rise dramatically.

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All aspects of "modern" society could be affected by colder weather. A change in prevailing winds affects air transport routes. Water shortages hamper industrial processes. Lower temperatures and more storms in the North Sea and Alaska, like those experienced during the past three years, make oil drilling difficult, restricting supplies at a time when fuel and fertilizer needs increase. A change in ocean currents affects the fishing industry by changing the fish's breeding and migration patterns -- the cod industry has already experienced this problem in the Atlantic.

Much more research will be needed before the "weather machine" is fully understood, let alone controlled, and man can forecast with some degree of accuracy just what changes may come. But we can be prepared for fluctuations such as this decade has known by finding new sources of energy, developing faster-maturing, drought resistant grain varieties, putting into use the presently unused marginal lands and, more important, building a food reserve in the good years so all can weather out the bad.

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