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THE HAMILTON SPECTATOR

SPECIAL REPORTS

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How are we changing the earth?

Eric McGuinness, Environment Reporter
The Hamilton Spectator

It's Kieran Cunningham's first summer on Earth.

Just three months old, the dark-haired, blue-eyed, Flamborough boy and other children of the new millennium are subjects of an unplanned, worldwide experiment.

As they grow, so will the effects of global warming, already beginning to appear as the result of greenhouse gases generated over the last two centuries.

Henry Hengeveld, Environment Canada's science adviser on climate change, recently told a Hamilton audience, "We are moving into totally uncharted territory in terms of human history."

So what do Kieran and members of his generation have to look forward to? What changes will occur around the Great Lakes in the next 50 to 100 years?

No one can say for sure, but it appears likely winters will be warmer, spring will start earlier, there will be less snow, more rain, and a longer growing season.

If you're not a skier, skater or someone whose livelihood depends on winter recreation, you might find the prospect attractive.

But there may also be more intense storms, more hot, smoggy summer days, more drought, lower lake water levels and complex ecosystem changes affecting all life, including people.

James Teeri, biology professor and director of University of Michigan's global climate change project, warns that increasing concentrations of carbon dioxide in the atmosphere could change the way plants grow,



TOMORROW'S WORLD: What kind of future does this child face? The Earth is warming at a disturbing pace and no one can say for sure what hazards the changing climate might bring.



Parched conditions in southern Ontario have stunted some

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making them less nutritious. That would have huge implications for the whole food chain and for human health.

Environment Canada researcher Linda Mortsch says we might have a longer growing season, but not enough water to grow the plants we want. Hengeveld says the Great Lakes could be lower in 50 to 80 years than they've been any time in the last 100.

As population increases around the lower lakes, and demand for clean water grows, both quantity and quality of water could become problems.

We've seen below-normal lake levels in recent years, and southern Ontario farmers are again complaining of summer drought. Mortsch, who works in Waterloo for the Meteorological Service of Canada, says, "The situations you are experiencing right now with low water are issues you must consider and that may occur with greater frequency. We can't predict exactly what's going to happen in the future, but people have to start to plan for what they would do with less water."

For instance, it may be time to start planning gardens with plants that need little water, to use rain barrels to irrigate them and to invest in low-flow toilets.

Mortsch says less winter snow means less spring melt to fill reservoirs and maintain stream flow. Low flow in streams and rivers can be a problem when they're expected to dilute treated sewage and serve as a source of drinking water.

The list goes on.

Less winter ice leaves lakeshores vulnerable to erosion from wind-whipped storm waves. Warmer water in summer promotes growth of algae that fouls beaches and depletes oxygen needed by fish.

Carbon dioxide (CO₂) is one of the principal gases that trap solar energy and cause our climate to heat up. Since the Industrial Revolution, humans have been burning so much wood, coal and other fossil fuels that the level of CO₂ in the atmosphere has increased 30 per cent.

The most hopeful scenario, one that assumes low population growth and large-scale conversion to renewable energy sources, suggests the level in 2100 will be 75 per cent higher than in pre-industrial times. The most extreme scenario puts the level up more than 200 per cent.

The Canadian government's computer climate simulator, one of the most advanced modelling programs, suggests average global surface temperatures

crops, such as this corn planted in a Winona field. July 2001 was the second driest in Hamilton since record-keeping began at the Mount Hope airport in 1959. More of the same is on the way: temperatures Monday and Tuesday are forecast to hit 32 to 33 C, with high humidity and no rain.

could increase by almost half a degree each decade of this century.

That's as great a change in temperature as occurred between the peak of the last ice age, 25,000 years ago, and today.

Scientists say that even if we were to curb our fuel use and stabilize the CO₂ level, the climate would continue to heat up and sea level to rise, but at a slower rate.

Developed countries are blamed for 80 per cent of the anthropogenic or human-caused carbon dioxide in the atmosphere, but developing countries face some of the greatest disruption from coastal flooding, drought and food shortages.

Under the Kyoto protocol, still being debated, Canada has so far agreed only to cut its CO₂ output to 6 per cent below the 1990 level by 2010. Because our output has gone up since 1990, that's a big cut, but not enough to make a big impact.

However, Hengeveld says it could reduce the rate and magnitude of change, buying us time to adapt. He stresses that it's not enough for people to demand government and industry do something. "Because it involves use of energy, we all have to do something about it. The danger is real and significant, but the risks can be managed."

□ He says the key argument for Kyoto is that it has forced the world community into coming together to do something, "but we need to go far beyond Kyoto."

The global warming process was set in motion in the 1800s and accelerated in the 1900s. The greatest effects will be felt by members of Kieran's generation, their children and grandchildren.

Professor Teeri says with certainty: "It's going to happen, in 50 to 60 years, and it's not going to stop. It will continue for 100 to 200 years.

"We can't make a big enough change fast enough to slow climate change in the next few decades. It will take centuries."

Tony Socci, a senior climate adviser in the U.S. Environmental Protection Agency, says we can expect more rain to fall in intense downpours, with heavy lake-effect fall rainstorms off lakes Erie and Ontario in places now subject to lake-effect snow.

While winter storms might be weaker, Socci warns we might see a "cloudy, dismal situation like Europe now, too warm to snow, too cold to allow other sorts of activities to go on."

He says alfalfa, feed corn and soybean yields could go up considerably, "and double crops may be possible by the end of the century," but that's where Teeri's concerns about CO₂ levels come into play.

Carbon dioxide is the greenhouse gas being emitted in the largest quantity and concentrations in the atmosphere are steadily rising.

"Carbon dioxide changes how plants grow, and the changes have a ripple effect through the food chain. Climate change and ecosystem changes will interact in ways we can't forecast."

Teeri says when we burn coal, oil or gas, we are burning fossilized sunlight, captured by green plants over hundreds of millions of years. The resulting rise in the rate of carbon dioxide production is unprecedented and will have direct ecosystem effects as well as the indirect results of global warming.

"CO₂ changes how plants grow and those changes have a ripple effect through the food chain. Hardwood forests will expand north as the boreal forest contracts southward. Trout habitat will contract in size and bird ranges will move north.

In the Great Lakes region, "the frequency of severe drought increases, irrigation increases and the average size of farms increases because you need bigger farms to pay to install and operate the irrigation systems.

"If the Midwest experiences droughts like the 1930s, a couple of dry years back to back will cause food shortages."

Teeri stresses that increasing carbon dioxide levels can change ecosystems, independent of climate change.

He explains that an ecosystem consists of producers (green plants), herbivores (plant eaters), carnivores (which eat herbivores), and decomposers -- fungi and bacteria that release the carbon stored in higher life forms.

Professor David Karowe has grown plants at the University of Michigan biological station in chambers containing carbon dioxide at the level expected to prevail worldwide in about 60 years.

They grow taller, with bigger leaves, but the leaves contain less nutrition. Caterpillars eating the leaves spend 30 to 60 per cent more energy feeding and digesting. Their growth slows and their adult weight is reduced.

They, in turn, are less nutritious to wasps feeding on them. The wasps lose weight and become more susceptible to disease.

Teeri, a former professor of human nutrition at the University of Chicago, says, "There's no reason to think humans will respond any differently from insects.

"High CO₂ will be an agent of natural selection. The question is whether there's enough time for plants and animals to evolve and adapt. Some will. Some won't."

Hamilton Spectator reporter Eric McGuinness recently completed a course in

Great Lakes environmental journalism at Michigan State University and was designated a Fellow of the Knight Centre for Environmental Journalism. He was one of two dozen Canadian and American journalists who heard from academics and government officials on the issue of climate change. This special report draws on that experience.

Canadian Government
Climate Change Web site
climatechange.gc.ca/english/index.shtml

Environment Canada
Climate Change
www.ec.gc.ca/climate/index.html

David Suzuki Foundation
Climate Change
www.davidsuzuki.org/Campaigns_and_Programs/Climate_Change

Pembina Institute
Climate Change
www.pembina.org/climate/default.htm

U.S. Environmental Protection Agency
Climate Change Web Site
www.epa.gov/ghginfo

Canadian Association of Physicians for the Environment
Climate Change
www.cape.ca/climate.html

Intergovernmental Panel on Climate Change
World Meteorological Association/United Nations Environment Program
www.ipcc.ch

U.S. National Safety Council's
Environmental Health Center
www.nsc.org/ehc/climate.htm

Knight Center for Environmental Journalism
Michigan State University
environmental.jrn.msu.edu

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