CASH CRUNCH P38
Green tech that will save you thousands

THE 2023 BEST 50 P46
Renewables top our annual ranking

FUTURE 50 P54
The fastest-growing green firms of 2023

Corporate Knights

TERMINATING CLIMATE CHANGE

CAN AI HELP US FIGHT THE CLIMATE CRISIS – OR IS IT AN EVEN GREATER THREAT?

SUMMER 2023
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Forward Focused

PAPER EXCELLENCE

» 2022 SUSTAINABILITY REPORT

Our forward focus is clearly reflected in our strategies for and investments in product development and operational transformation, and in our exploration of longer-term innovations and opportunities. This report details our progress, including numerous specific metrics, and areas we are focusing on for further improvement.

From an operational standpoint, Paper Excellence has achieved the following in 2022:

- 82% of our energy use came from renewable sources
- 67% reduction of our carbon emissions since 1990
- Contributed $1.8 billion to Canada's GDP
- Supported approximately 2,160 direct jobs in Canada

Learn more about our recent performance and our long-term vision at:
paperexcellence.com/sustainability-report or scan the QR shown here.

Table of Contents

Future of fungi
Product engineers are tapping into mycelium's tensile strength to create a wide range of goods.
p59

Features

Clean capitalism: An economic system in which prices incorporate social, economic and ecological benefits and costs, and people know the full impacts of their marketplace actions. ›

Cover and above by Jack Dylan with Midjourney AI. Illustration (right) Joren Cull

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Not so natural gas

I was troubled to see *Corporate Knights* running sponsored content by Enbridge Gas to promote "renewable natural gas" (RNG) as a "carbon negative … clean energy supply, which reduces emissions." This is exactly the kind of greenwashing that *CK* regularly calls out in its reporting. Enbridge is confusing the public and consumers about the urgent need to transition away from fossil fuels while manipulating readers into thinking that Enbridge is a responsible climate leader. RNG may have a small role to play in capturing methane to marginally reduce emissions in the medium term. But it's difficult to take North America's largest fossil fuel pipeline company's supposed commitment to climate action seriously when Enbridge is actively trying to lock customers across the continent into using oil and gas for decades to come with its pipeline expansion and fossil fuel export plans. There's only one direction of travel to avoid a climate catastrophe: phasing out fossil fuels. Enbridge is doing the opposite.

—Patrick DeRochie, Toronto, ON

CK: Thanks, Patrick. While *Corporate Knights* has a strict policy separating ads from editorial content, for two decades we have channelled our ad revenue into speaking truth to power. Noam Chomsky once told us he was amused we were pulling it off and liked the magazine's editorial, but he said it would not be economically sustainable. That was almost 20 years ago.

Shame on Schneider

I have learned that a company you have named one of the most sustainable, Schneider Electric, is involved in a climate and human bomb, the EACOP (East African Crude Oil Pipeline) Project. With this project, TotalEnergies aims to build the longest heated pipeline in the world in Uganda and Tanzania. Schneider will provide the electrical infrastructure and the equipment for the supervision and security of the installation. If built, this pipeline will add a minimum of 361 million metric tons of CO2 to the atmosphere during the 25 years of the project – approximately 10% of the emissions of a country like France, every year.

EACOP could have disastrous impacts on livelihoods and biodiversity. The project is already a disaster for local communities. On one side, tens of thousands of farmers whose land is affected by the construction are still waiting for fair compensation. On the other side, Uganda and Tanzania are authoritarian regimes that repress all opposition: threats, arrests of people opposing the project, burglaries and closures of NGOs are frequent.

Twenty-four of the world's largest banks and 22 (re)insurance companies, including AXA, have decided not to support EACOP, and the European Parliament has called for a moratorium. Local Ugandan economic leaders are also asking to stop this project and invest in existing sectors instead, especially in the renewable-energy sector.

Schneider must stop participating in this destructive project and truly commit itself to the ecological transition. How can a company enabling the longest heated crude oil pipeline in the world be considered a sustainability hero by *Corporate Knights*? As you know, the transformation of our societies will take place, either too late and with catastrophic consequences or quickly and with as few people as possible left behind.

—Emma Levy

CK: Thanks for alerting us to this project. Our criteria emphasize the percentage of revenue a company makes from sustainable activities. On this score Schneider does quite well, earning 71% of revenues from sustainable sources (this number does not include revenues earned from oil and gas projects). We have about two dozen red flags we use to weed out egregious behaviour. We are reviewing how we can implement a fair red flag in our next ranking cycle to penalize companies that are providing material support for major new carbon bombs.

Dig deeper on waste

As the founder of a small community activist group (Waste Watch Ottawa), I thought Naomi Buck's "Cities Go Full Circle" was just right, for now. But the brevity of the article acts like an appetizer for a more complete meal.

—Brian Tansey, Ottawa, ON

Please submit brief letters to the editor (50–150 words) to **letters@corporateknights.com** or by mail to our address below.
We reserve the right to edit letters.

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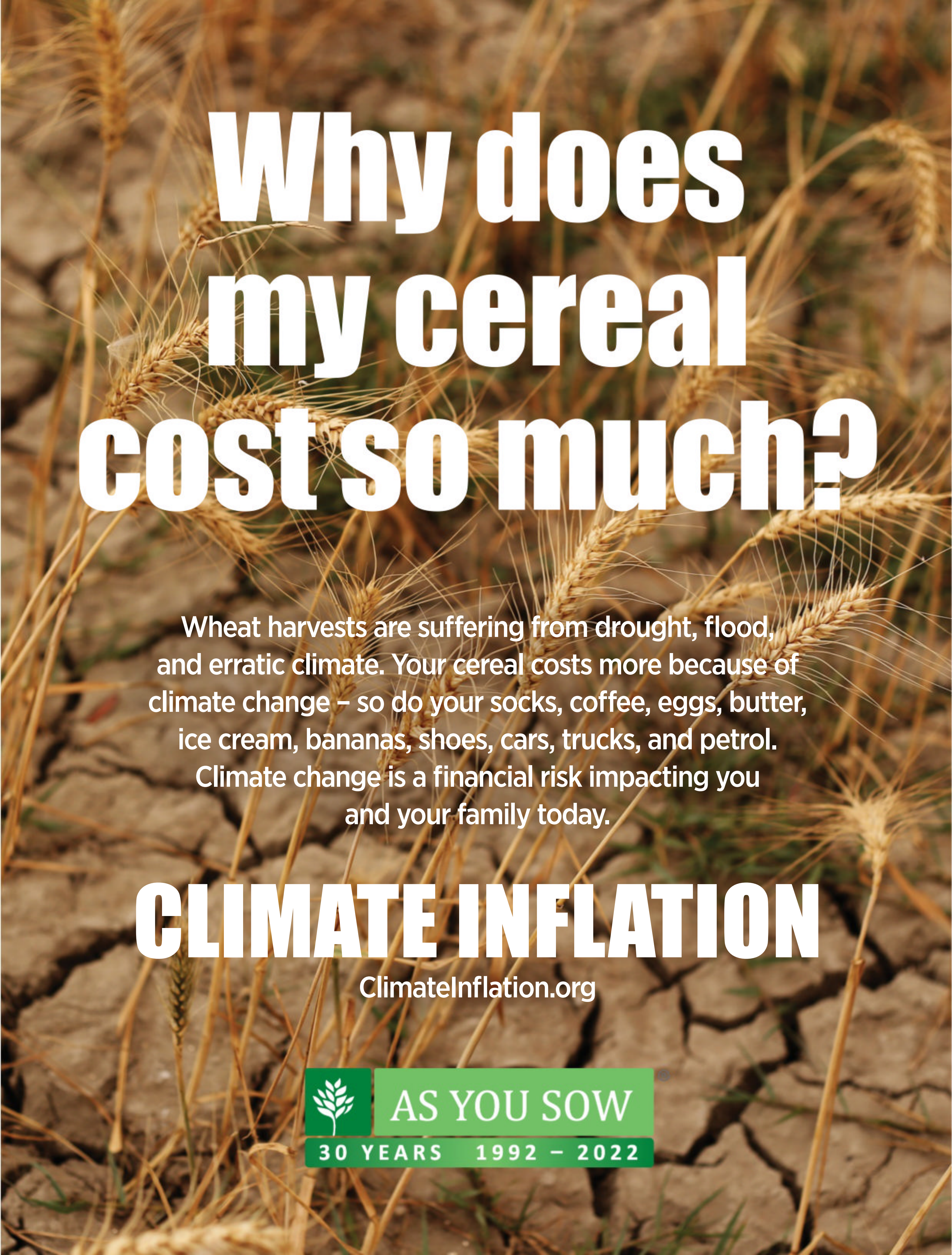
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Wheat harvests are suffering from drought, flood, and erratic climate. Your cereal costs more because of climate change – so do your socks, coffee, eggs, butter, ice cream, bananas, shoes, cars, trucks, and petrol. Climate change is a financial risk impacting you and your family today.
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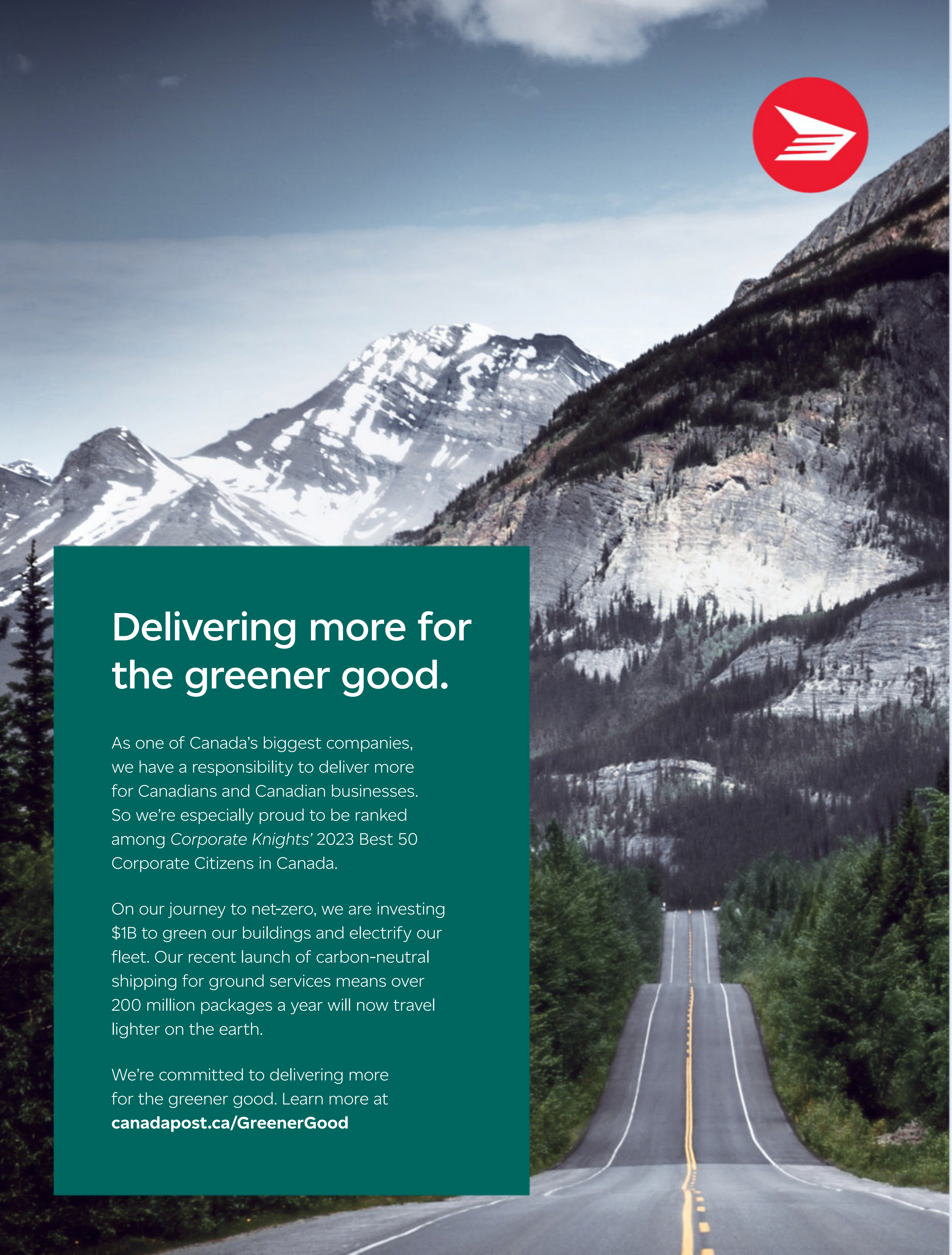
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Into the arena

Why I decided to stop being a critic on the sidelines and run for office

By Toby Heaps

I have had a lot of jobs in my life, from putting up a shingle as a seven-year-old private detective for hire, to batboy, paperboy, Fairmount bagel bagger, centrefielder for Yugoslavia and rickshaw runner in Toronto – but head of Corporate Knights takes the cake.

For the past two decades, we have helped to fan what was once considered the quaint idea of stakeholder capitalism (where companies serve us instead of the other way around) into a full-blown social movement. Today, this sustainable brand of business is the main competitive advantage for many of the world's leading corporations – as evidenced by the 18-year track record of financial outperformance by Canada's Best 50 Corporate Citizens and our Global 100 Most Sustainable Corporations Index.

Our formula has been a well-measured recipe of management guru Peter Drucker ("What gets measured gets managed"), two of my forefathers ("Carrots motivate people to act" and "Always respect justice but question authority") and my late social worker mother ("If you believe in people, anything is possible").

We have shared (and sometimes force-fed) this recipe with many of the world's most powerful companies and governments, who listen because they know that our research and reporting cannot be dismissed. After 17 years of pushing the idea of stakeholder capitalism on the Davos crowd from the sidelines, the World Economic Forum adopted our mantra as its credo in 2021.

We also popularized – and in some cases catalyzed – many big ideas that are now central features of our economy: from pricing pollution and putting the money back in people's pockets, to board diversity requirements, mandatory sustainability reporting and carbon budgets for large funds and companies. We planted the seed to make Toronto a global hub for sustainable finance with 100,000 new jobs and helped spawn the Financial Centres for Sustainability network, launched by the G7 in 2017, as well as Canada's $8-billion net-zero accelerator to speed up green businesses and jobs.

We took the fight to investors in 2022, offering them a special view into who will own the low-carbon economy of tomorrow, with a unique database showing which companies are plowing the most into green capital expenditures. Earlier this year, we struck a transformational partnership with one of Canada's largest asset managers (Mackenzie Investments) to share the financial gains of Global 100 companies with the masses in one simple solution that anyone with $20 can invest in.

But on my daily runs with my friend Karim (and now my late mother's wolf-shepherd Molly), I heard myself increasingly sounding like the "critic" in Teddy Roosevelt's "The Man in the Arena" speech. I was on the sidelines pointing out "where the doer of deeds could have done them better." I didn't like the sound of it and decided I would jump in the political arena with bold ideas – in a few years' time, when my boys were older.

But then the salt started to sting. I am talking about the excessive salt that the City of Toronto lathers all over the streets in the winter that was burning Molly's paws, not to mention the billions it costs Torontonians to prematurely replace our corroding cars, shoes and the Gardiner Expressway. When I found out that many other cities, like my hometown Calgary, had long ago found less toxic and more affordable, effective solutions to keep the roads safe, I got a little mad.

When the premier of Ontario threatened to lock Molly and me out of our daily running routine by privatizing one of our most wonderful public spaces, Ontario Place, into a mega spa for millionaires, I set a new course. We could not sit on the sidelines for this once-in-a-generation by-election for the mayor of Toronto. We had to get in the arena together – bringing all my entrepreneurial energy and Molly's love for, well, everyone.

It may sound strange to run for the highest office of North America's fourth-largest city alongside a dog (to be clear, I am the human candidate on the ballot and Molly would be Toronto's first honorary dog mayor, following in the footsteps of Niagara Falls, Ontario, and cities in California, Minnesota and Kentucky), but I believe we make more compassionate decisions with animals around.

Win or lose, I hope Molly and I inspire other unusual suspects to take a chance at stepping into the arena. In the words of Teddy Roosevelt, we will strive to spend ourselves in a worthy cause; and at the worst, if we fail, at least we will fail while daring greatly, so that our place shall never be with those cold and timid souls who know neither victory nor defeat.

Corporate Knights
SUMMER 2023 — NEWS BRIEFS — VOL 22 ISSUE 3

Rivers run dry
A long-standing drought has pushed the Colorado River to dangerously low levels, threatening water supply and energy production.

The water emergency is here, and we can do something about it

On every corner of the planet, the water emergency is in plain sight.

In Madagascar, where children are skipping school to dig into bone-dry river beds, and Argentina, where corn husks come up hollow. Across the parched Mediterranean, subject to another blistering heat wave in April, and in massive reservoirs in the United States, where dangerously low water levels threaten power generation.

"Water is a human right," said United Nations Secretary-General António Guterres at the UN's first water conference in 46 years, held in New York in March. "But water is in deep trouble. We are draining humanity's lifeblood through vampiric overconsumption and unsustainable use, and evaporating it through global heating."

Photo by George Rose

Nearly three out of every four natural disasters on this planet are linked to water, and one in four of us live without safely managed water services or clean drinking water, the UN says. Water usage has been increasing by roughly 1% every year for the last 40 years, according to a new UN report released for the conference – *World Water Development Report 2023: Partnerships and Cooperation for Water* – a pace that is expected to continue until 2050. At this rate, the number of people facing water scarcity could double, from 930 million in 2016 to between 1.7 and 2.4 billion by 2050.

"If we don't address it, there definitely will be a global crisis," said Richard Connor, the lead author of the UN report.

Population growth, socio-economic development and changes to our consumption are the key factors behind the accelerating usage. Most of this is happening in middle- and lower-income countries, where economies are growing. Climate change is exacerbating the complexity of the problem, driving seasonal water scarcity in parts of the world where it is currently abundant, such as Central Africa, East Asia and parts of South America, the UN warns. In places where water is already in short supply, such as the Middle East and the Sahel region of Africa, it will get worse.

Darkening forecasts, the World Meteorological Organization reported in May that it's more likely than not that the planet will eclipse 1.5°C of warming by 2027.

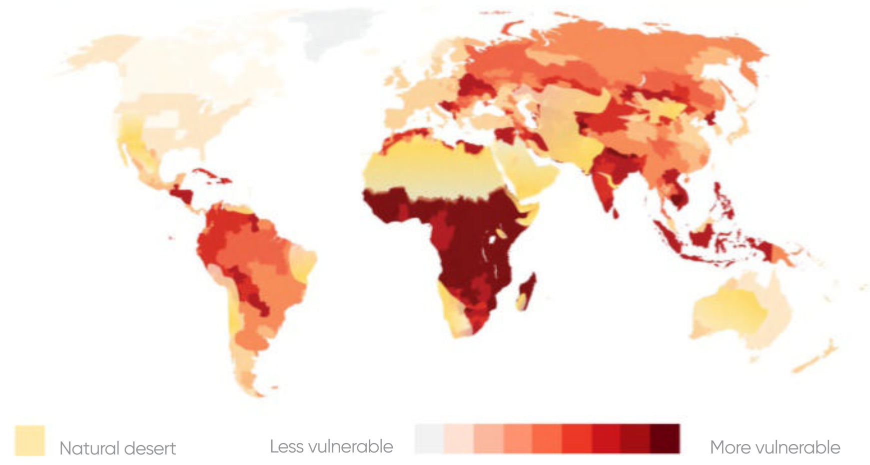
The numbers are so big it can be hard to fathom – but the urgency demands it. In 2021, the UN Economic and Social Council estimated that desertification threatened the livelihoods of nearly one billion people in 100 countries. In the Horn of Africa, where three years of extreme drought has displaced 1.4 million Somalis and killed 3.8 million livestock, dozens died this spring in flash flooding in Somalia and Ethiopia.

"Soils are baked hard, so when rainfall does occur . . . we get more flash flooding."

–Caroline Wainwright, Cardiff University

Scorched earth

Who is vulnerable to drought?



Climate change is expected to exacerbate the risk of drought in places with rapid population growth, particularly those facing other challenges, such as food insecurity.

"It's not that one flood season undoes a period of drought. In some ways it creates more challenges," says Caroline Wainwright, a climate scientist at Cardiff University in Wales who studies Africa. "The temperature has been a big factor in the recent drought," she says. "Soils are sort of baked hard, so when rainfall does occur, we get a lot more runoff. The water doesn't infiltrate the soil, so we get more of this flash flooding, and therefore crops still don't respond to it very well."

Climate change means more intensity, Wainwright notes – the heat is hotter and storms are more fierce. Parts of the U.S. and Canada experienced an unusually hot, dry spring, which helped trigger raging wildfires in Alberta and Nova Scotia, while a recent study of satellite imagery found that Europe's groundwater supply is precariously low after four years of drought. Punishing heat across the Mediterranean region this April conjured up memories of last summer, when riverbeds ran dry, draining wildlife of their ecosystems and causing a domino effect for energy production. This year, protracted dry conditions in Spain and France are fuelling conflicts between farmers and environmentalists over water usage.

In Argentina, farmers are still reeling from a record drought that ravaged this year's harvest. "The ground profile is very dry," says Walter Malfatto, who harvests 700 hectares of soybean, barley and wheat in the typically fertile soil of Buenos Aires Province. He lost 100 hectares of crops to the dry conditions. "You dig down a metre, and there is no humidity in the earth. The lagoons are dry. The drought has been terrible, and it's not over," he says.

Agriculture consumes on average 70% of water use every year. And in some cases, it's in direct competition with the cities it feeds for the water it needs to feed them. Agriculture is a sector hit hard by the scarcity, which brings economic consequences, along with an imperative to adapt. In the southwestern U.S., federal officials are developing a plan to cut water usage of the Colorado River, which is at dangerously low levels and used to irrigate crops like alfalfa and almonds. The UN report notes that the only real way to safeguard and manage water supply is cooperation. Of the 153 countries that share nearly 900 rivers, lakes and aquifer systems, more than half have signed agreements regarding usage.

Innovation will be key to withstanding the volatility. In Cambodia, for example, solar-powered water pumps are providing a steady irrigation system that is helping small-scale farmers maintain their rice paddy fields, and may have the added benefit of reducing water waste. Across Africa, more countries are deploying early-warning systems that help forecast dry or rainy seasons and plan water-management strategies accordingly. This is especially important given the competing priorities for the precious resource.

"Where we cooperate on water in partnership, in solidarity, we can leverage additional benefits – for water management, for food, for energy and for climate change mitigation and adaptation," said Johannes Cullmann, the vice-chair of UN Water, at the water conference in March. "Water is a connector. People don't see it, but it connects us, in an immensely powerful way." —*Natalie Alcoba*

Source: UN Convention to Combat Desertification, *Drought in Numbers 2022*

In May, the EU voted to outlaw carbon-neutral claims based solely on carbon offsetting schemes. Some airlines had already dropped the use of carbon credits to offset emissions.

'Carbon neutral' and 'net-zero' claims face global crackdown on greenwashing

When a problem is likely to be resolved at some point in the future with no lasting harm, they say it will all come out in the wash.

Back in 1986, an ecologist on a research trip to Fiji reportedly coined the term "greenwashing" in an essay critiquing a beachfront resort's towel reuse policy. Four decades later, greenwashed marketing claims, did not, it turns out, come out in the wash. They've permeated nearly every product category, from "carbon neutral" burgers and disposable cola bottles made with "plastic from the sea" to net-zero oil companies and ESG labels slapped on trillions of dollars in poorly regulated investment funds.

But the Wild West era may be coming to an end. As *The Atlantic* put it in March, "The world is finally cracking down on 'greenwashing.'"

On May 11, the European Parliament voted to ban carbon-neutral claims that are based on carbon offsetting schemes. At the same time, the U.K.'s Advertising Standards Authority also said it would immediately begin stricter enforcement of "unqualified" carbon-neutral, nature-positive and net-zero claims; companies will now have to prove that offsets, which have come under heavy fire, are effective. Meanwhile, Gucci dropped the term "carbon neutral" from its website this spring. EasyJet and JetBlue backed away from carbon offsetting schemes in December.

"Climate-related claims have been shown to be particularly prone to being unclear and ambiguous, misleading the consumer," EU Environment Commissioner Virginijus Sinkevičius told *The Guardian*. "We need to set things straight for consumers and give them full information."

In North America, both agencies in charge of overseeing marketing claims are retooling their approaches. For the first time in a decade, the U.S. Federal Trade Commission (FTC) is revamping its Green Guides, guidelines for environmental advertising and labelling claims. The FTC first published the Green Guides back in 1992 to "help marketers avoid making misleading environmental claims," which had flourished.

The agency issues greenwashing fines only every few years. In 2022, the FTC went after Walmart and Kohl's for deceptively marketing rayon bedding, clothing and towels as being "eco-friendly" and "made from bamboo" (the U.S. Textile and Wool Act requires that they be labelled as "made with rayon," since bamboo is converted to rayon using hazardous air-polluting chemicals). The companies agreed to pay the FTC US$3 million and $2.5 million, respectively, in penalties. Now environmental and consumer groups want the agency to go after a wider array of claims, including plastic companies claiming that their "advanced" and "chemical" recycling methods are sustainable, as well as financial products purporting to be net-zero or "Paris aligned."

"The explosive rise of the ESG investment space has raised new questions about what constitutes fair and faithful marketing and disclosure around financial products and services," said Americans for Financial Reform in an April letter to the FTC.

Across the border, the federal Canadian government has launched a review of the Competition Act after it became clear that the Competition Bureau, like its American cousin, has been hamstrung by limited enforcement powers and funding. In the meantime, the regulator has been more active than ever on the greenwash file. After fining Keurig $3 million for misleading coffee-pod-recycling claims last year, the Competition Bureau is currently investigating the climate claims made by Canada's largest bank (RBC), the country's six largest oil companies (operating under their umbrella organization, Pathways Alliance) and the Canadian Gas Association, as well as a greenwashing complaint against North America's largest forestry certifier (Sustainable Forestry Initiative).

Still, agencies on both sides of the Atlantic have been accused of taking a whack-a-mole approach to a widespread problem. While multiple studies have found that more than half of green claims are misleading, vague or unfounded, in Canada investigations are opened only after complaints are formally lodged by groups such as Ecojustice, Greenpeace and the Canadian Association of Physicians for the Environment.

The EU's proposed Green Claims Directive would deliver a stricter framework, one that former Canadian environment minister Catherine McKenna wants Canada to emulate in tackling greenwashing "head on."

"The Canadian government should set standards and enforce against greenwashing, not only for the good of consumers and the planet, but also so our marketplace is not distorted by false or confusing green claims," McKenna said in a press release.

In the U.K., industry insiders are hopeful. One senior brand advisor told *The Guardian* that "the era of unspecific claims such as 'environmentally friendly' is over." Depending on how this year in regulatory overhauls shakes out around the globe, they may be right.
—Adria Vasil

Illustrations by Benoit Tardif. Photo iStock

Insurance giants exit net-zero pact

Some insurance companies have started to decline coverage for certain new fossil fuel projects, untangling themselves from the risks that come with propping up coal, oil and gas.

So climate activists were surprised and disappointed when three large reinsurance companies backed out of the United Nations' Net-Zero Insurance Alliance (NZIA) within just three weeks of each other this spring.

Munich Re, Zurich Insurance Group and Hannover Re each announced they were quitting NZIA. In late March, Munich Re said that it was leaving the alliance because of antitrust concerns but that it was still committed to decarbonization. Zurich followed days later. Hannover Re didn't give any reasons for its decision but said it is also still committed to its climate targets.

Climate campaigners fear that the antitrust risks cited by Munich Re may hamper insurers' ability to tackle net-zero goals collectively. But they also believe that the concerns are likely without legal merit and that pressure from American anti-ESG politicians is to blame.

"Munich Re, Zurich and Hannover Re derive about one third of their revenues from the US market and are vulnerable to its political follies," wrote Peter Bosshard, of the Insure Our Future campaign, in *Environmental Finance*. "Net Zero alliance members that are less exposed should call out the current anti-ESG campaign as the cynical ploy of the fossil fuel lobby which it is, rather than continuing to coddle their coal, oil and gas clients."

"Net Zero alliance members that are less exposed should call out the current anti-ESG campaign."

—Peter Bosshard, Insure Our Future

As the costs of climate catastrophes mount, some reinsurance companies have stopped insuring new oil and gas projects. So why are they quitting the UN Net-Zero Insurance Alliance?

Bosshard points out that competition regulators in the U.K. released guidance to ensure competition law won't limit companies' ability to pursue collective climate action. He urged regulators in the U.S., EU and elsewhere to issue similar clarifications.

"The weaponized antitrust campaign is a headache for some climate leaders and an easy excuse for continued inaction for climate laggards," he adds. "Some financial institutions have argued that they can't take individual action due to competitive pressures and now argue that they can't take collective action due to antitrust concerns. They are making a strong case for stronger regulation."

These moves followed a threat by big banks back in the fall to leave the Glasgow Financial Alliance for Net Zero (GFANZ), a group convened by former Bank of England (and Canada) governor Mark Carney. Facing this mutiny, GFANZ went on to announce it would not require its members to set rigorous science-based emission-reduction targets in line with the UN Race to Zero campaign.

When it comes to the insurance industry, climate campaigners can take some comfort in the fact that these companies have not deserted their net-zero commitments. Munich Re still expects to cut emissions related to its investment portfolio by 29% by the end of 2025 and achieve net-zero by 2050.

Munich Re was set to stop insuring new oil and gas projects in April. That's something that might have seemed an unlikely outcome just a few years ago. —*Alex Robinson*

As AI threatens jobs, green gigs offer silver lining

ChatGPT did not write this. But artificial intelligence will continue to have a profound impact on the job market over the next five years. That's one of the takeaways from a new report from the World Economic Forum (WEF) that maps out the future of employment. The report says that by 2027, nearly one-quarter of the labour market will experience disruption – signalling a significant shift as jobs are lost and created.

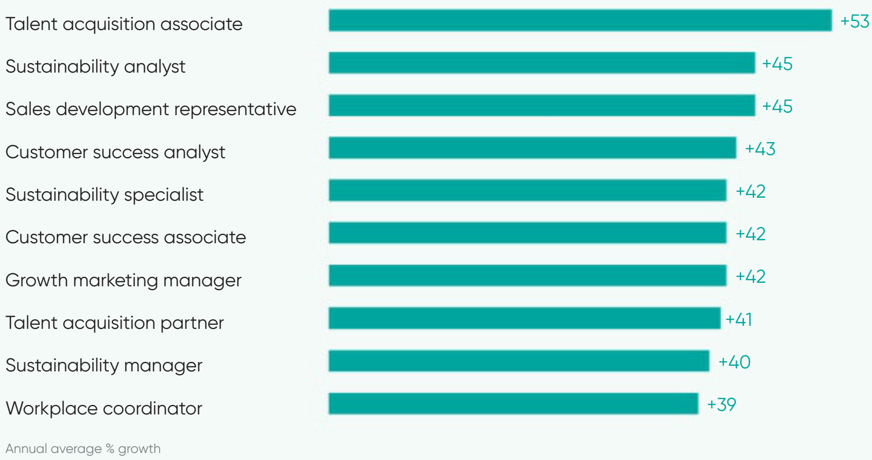
The key drivers of this change are the technology, environmental and economic sectors. There's going to be a net loss of 14 million jobs, or about 2% of current employment, according to the WEF.

This is the fourth edition of the *Future of Jobs Report*, which poses questions to 803 companies that collectively employ more than 11.3 million people working in 27

Photo iStock

Fastest-growing job posts on LinkedIn 2018–2022

LinkedIn postings reveal changing job market, in WEF's *Future of Jobs Report*



Despite estimates that AI will contribute to the loss of 14 million jobs globally, the World Economic Forum and LinkedIn note that sustainability job posts are surging.

sectors and 45 economies across the globe. And it's reflective of growing analysis of the impact that AI is having on the labour market. A Goldman Sachs report released earlier this year found that around 300 million jobs could be affected by AI. Microsoft's *2023 Work Trend Index* found that 82% of business leaders surveyed said employees will need new skills to be prepared for the growth of AI.

Amid the AI growth was another parallel trend in a positive direction for the green jobs: in addition to big-data analytics, the largest drivers of job growth are expected to be climate-change mitigation and environmental-management technologies, as well as encryption and cybersecurity, the WEF report says. "Globally, the green transition could create 30 million jobs in clean energy, efficiency and low-emissions technologies by 2030." Sustainability specialists were among the fastest-growing job posts, according to LinkedIn research conducted for WEF.

Other surveys have also pointed to the employment opportunities for those with expertise in sustainability. A report from Clean Energy Canada found that the clean energy sector was slated to grow by almost 50% from 2020 to 2030 – from 430,500 jobs to 639,200 jobs. In the United States, some 142,000 new clean energy jobs for electricians, mechanics and construction workers, among others, have been created since August 2022, according to advocacy group Climate Power. On the other hand, Ford announced earlier this year that it is slashing 11% of its European workforce, driven in part by its pivot to an electric car lineup.

"Globally, the green transition could create 30 million jobs."

–World Economic Forum, *Future of Jobs Report*

The winds are indeed changing. According to the *Future of Jobs Report*, it's largely clerical or data-entry positions that will be replaced by more digitization and technology in the workplace. The companies surveyed for the WEF report estimated that 34% of all business-related tasks are now performed by machines. That's less than what companies had predicted in the 2020 edition of the report. Respondents to the 2023 survey forecast that by 2027, some 42% of business tasks will be automated.

"But while expectations of the displacement of physical and manual work by machines has decreased, reasoning, communicating and coordinating – all traits with a comparative advantage for humans – are expected to be more automatable in the future," the report notes.

Amid the AI buzz, the Microsoft report highlights what it describes as an "AI–employee alliance." It notes that "while 49% of people say they're worried AI will replace their jobs, even more – 70% – would delegate as much work as possible to AI to lessen their workloads." —*NA*

New York City gets tough on beef

The home of the New York striploin is coming for your meat.

Food accounts for 20% of the Big Apple's greenhouse gas emissions – parking it in third spot, greenhouse gas–wise, behind the city's traffic jams and drafty old buildings. "But all food is not created equal," said Mayor Eric Adams in a press release. "The vast majority of food that is contributing to the emissions crisis lies in meat and dairy products."

Under former mayor Bill de Blasio, NYC committed to cutting the city government's food-related emissions by 25% by 2030. This April, Adams raised that target to 33%. In doing so, he said, "We have to talk about beef" – a comment that *The New York Times* called "an unusually frank admission from a national political leader that Americans will have to eat differently if they want to rein in climate change."

The beef industry tops environmentalists' hit lists due to its high carbon footprint, links to deforestation and, of course, the everyday methane from the back end of cattle.

As Adams declared war on both carbon and beef, the (mostly) vegan mayor also announced that New York will start tracking the carbon footprint of household food consumption. Adams is working with C40 Cities, a network of 96 cities collaborating on urgent climate action. Some 14 cities, including London, Paris, Montreal and Toronto, are already tracking the footprint of food, with the shared goal of producing a "planetary health diet" for all by 2030.

New York schools already serve vegan meals on "Plant Powered Fridays," and hospital patients now receive plant-centric foods as the default option at the city's public hospitals. The city is urging the private, institutional and non-profit sectors to follow its lead through a "voluntary challenge" to reduce their food-based emissions by 25% by 2030.

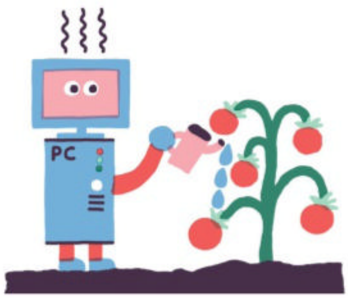
Naturally, Adams's announcement bent some people out of shape. "My personal purchasing choices are NOT up for approval

Source: LinkedIn

by politicians, banks or anyone else," said one correspondent at NYC news site *Gothamist*.

But the plant-based cause is getting support from at least one everyday hero. Actor Robert Downey Jr., who plays Iron Man/ Tony Stark in Marvel movies, is a vegan on a mission to find a no-compromise beef substitute. "If plant-based foods are going to make a real impact on sustainability, we need an approach that's both delicious and nutritious," he said in a statement last year. His philanthropic and venture capital arm, the California-based FootPrint Coalition, supports promising climate solutions, from building software to green hydrogen. Recently it invested in Chunk Foods, an Israeli start-up that ferments soy, wheat and micro-organisms to produce a 25-gram portion that has the colour, texture and apparently the taste of real steak.

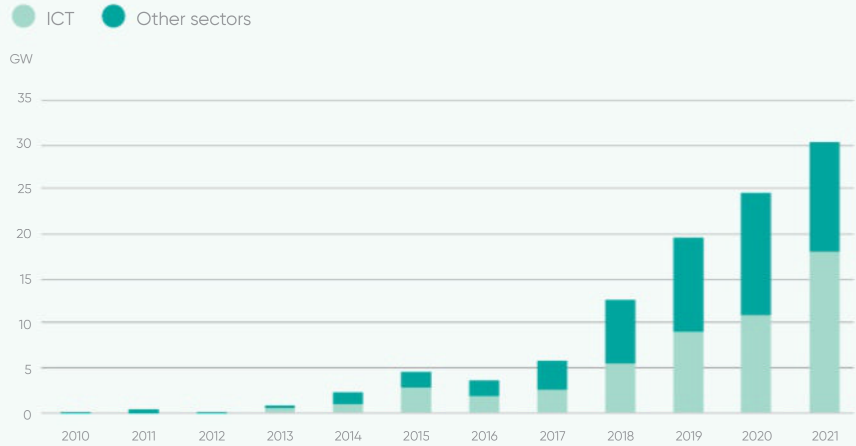
The three-year-old company is using its recent US$15-million capital raise to build a production plant capable of making "millions of steaks per year," says Chunk founder Amos Golan. But his "steaks" have already been tested in some NYC restaurants. "There was unanimous praise," claims a FootPrint exec. —*Rick Spence*



Growing tomatoes with the heat from computers?

Power-hungry data centres going green

Global renewable-energy power purchase agreements, 2010–2021



Information and communications technology companies are pouring more money into renewable-energy projects to reduce the massive environmental impact of their data centres.

Source: IEA, *Data Centres and Data Transmission Networks* report, 2022

There are more than seven million data centres in the world, housing servers that store massive amounts of digital information. They act as the world's IT brain or hive, receiving and transmitting all sorts of information and enabling everyday conveniences like online shopping. But these facilities, which are notorious for their high electricity consumption and enormous carbon footprints, may soon have a new spinoff function: helping grow food.

A Canadian company called QScale is developing a $1-billion 30-acre data-centre campus in Lévis, Quebec, and will use the warmth that emanates from its servers to grow more than 80,000 tonnes of produce in adjacent greenhouses every year.

Indoor farming, often hailed as the future of food production, is also very energy-intensive. Being able to recycle some heat from data centres could be a big win for both.

"Data centres consume something on the order [of] 4% of the planet's energy. So if we could use that as a heat source, we could . . . kill two birds with one stone," said QScale's co-founder and head of strategy, Vincent Thibault, in an interview with *Sustainable Biz Canada*.

The size of data centres varies, but the largest have thousands of servers running 24 hours a day, sucking up a huge amount of electricity and giving off a lot of heat. The United States is home to the most data centres, with more than 2,600 (as of 2022). Canada has the seventh-largest number (behind the U.S., the U.K., Germany, China, the Netherlands and Australia), and those server farms use 1% of Canada's annual electricity consumed. Just a handful of companies are behind most of the global energy used by data centres – Amazon, Microsoft, Google, Alibaba, Facebook and Apple are all among the top users (although many of these companies are trying to curb their carbon footprints by tapping into renewable energy).

Some companies and governments have taken action to make data centres less energy-intensive so that less stress is put on the electricity grids that power them. The European Commission unveiled regulations in 2019 that set up technical standards to lessen the centres' environmental impacts. And data centres must become carbon neutral by 2030 under the European Green Deal. The U.S. Energy Act (enacted in 2021) included several initiatives aimed at making data centres more energy-efficient.

QScale, for its part, says it's trying to make data centres more sustainable. It's trumpeted the fact that its campus in Lévis will run on 99.5% renewable sources (thanks to Quebec's hydro-heavy grid), and its waste-heat-recovery system will help make its energy use more circular. The company will also be able to grow a decent amount of veggies. QScale says that the greenhouses on its campus will be able to produce 2,800 tonnes of small fruit and 80,000 tonnes of tomatoes per year.

Farming isn't the only innovative solution to recycle all the heat waste that data centres generate. Last year, Microsoft announced that two of its data centres in Finland would heat homes and businesses in Helsinki. A Swiss IT company called GIB-Services is heating a public swimming pool in Zurich from a data centre that was built in an old military bunker.

QScale expects its heat recovery system to be up and running at its Lévis campus in early 2024. The company says part of its mission is to set an example for the industry so that other firms will follow.

"I think by giving the example that it can be done, we can force the Google[s], Amazon[s] [and] Microsofts of the world to put some effort into actually reusing all the heat that's generated by those facilities," said Thibault. —*AR*

Saving forests one piece of clothing at a time

More than five billion trees are cut down every year for paper, packaging and fashion. Many of them are in ancient, old-growth forests that are not just rich in biodiversity but are crucial carbon sinks that absorb massive amounts of the C02 we belch out every year.

But what if you could take the mountains of clothes and paper that are discarded and turn that into clothes and paper again, leaving those endangered forests alone to do much more important work?

It's already happening. And a major cash investment into a Canadian non-profit is designed to help scale up this innovative engine of the circular economy at a critical time in climate action.

Last month, Vancouver-based Canopy received US$60 million from The Audacious Project, a funding initiative affiliated with TED Talks, to accelerate the commercial-scale production of fabrics, pulp, paper and packaging from textiles and food scraps that usually end up in landfills or are burned.

"If we're going to protect 30 to 50% of the world's forests, which is what the world's scientists are calling for, then we have to stop mowing them down to make pizza boxes and T-shirts," says Nicole Rycroft, founder and executive director of Canopy. "And the only way that we're going to actually do that is if we have an off-ramp – alternative raw-material inputs to these supply chains that carry a fundamentally lower environmental footprint."

They are known as "next-gen" solutions – everything from making viscose from the cellulose in old cotton jeans to takeout containers from agricultural residue like straw after a food harvest. We are surrounded by materials that have forest-saving capacities, and harnessing those new raw materials is crucial for us to meet our climate targets. On average, next-gen solutions produce 95% to 130% less greenhouse gases, have 88% to 100% less land-use impacts, and typically use much less water, according to Canopy.

Canopy has been working to protect forests for 20 years and now partners with some 900 brands – including fashion giants H&M and Zara, along with publishing stalwart Scholastic and home furnishing icon IKEA – to ensure that the oldest trees remain standing. It has done the deep work of mapping out where these discarded materials are abundant and where facilities such as decommissioned wood mills exist to prime them for second lives.

The targets – like the stakes – are massive. The Audacious investment is intended to help Canopy spur the production of 60 million tonnes of low-carbon next-gen pulp, packaging and viscose by 2030. That, in turn, will alleviate the pressure on trees and enable the protection of 90 million hectares of forest, says Rycroft. It's not just about the carbon-absorption capacity of forests, but the fact that old-growth trees are vaults of carbon, and releasing that into the atmosphere is the last thing we all need.

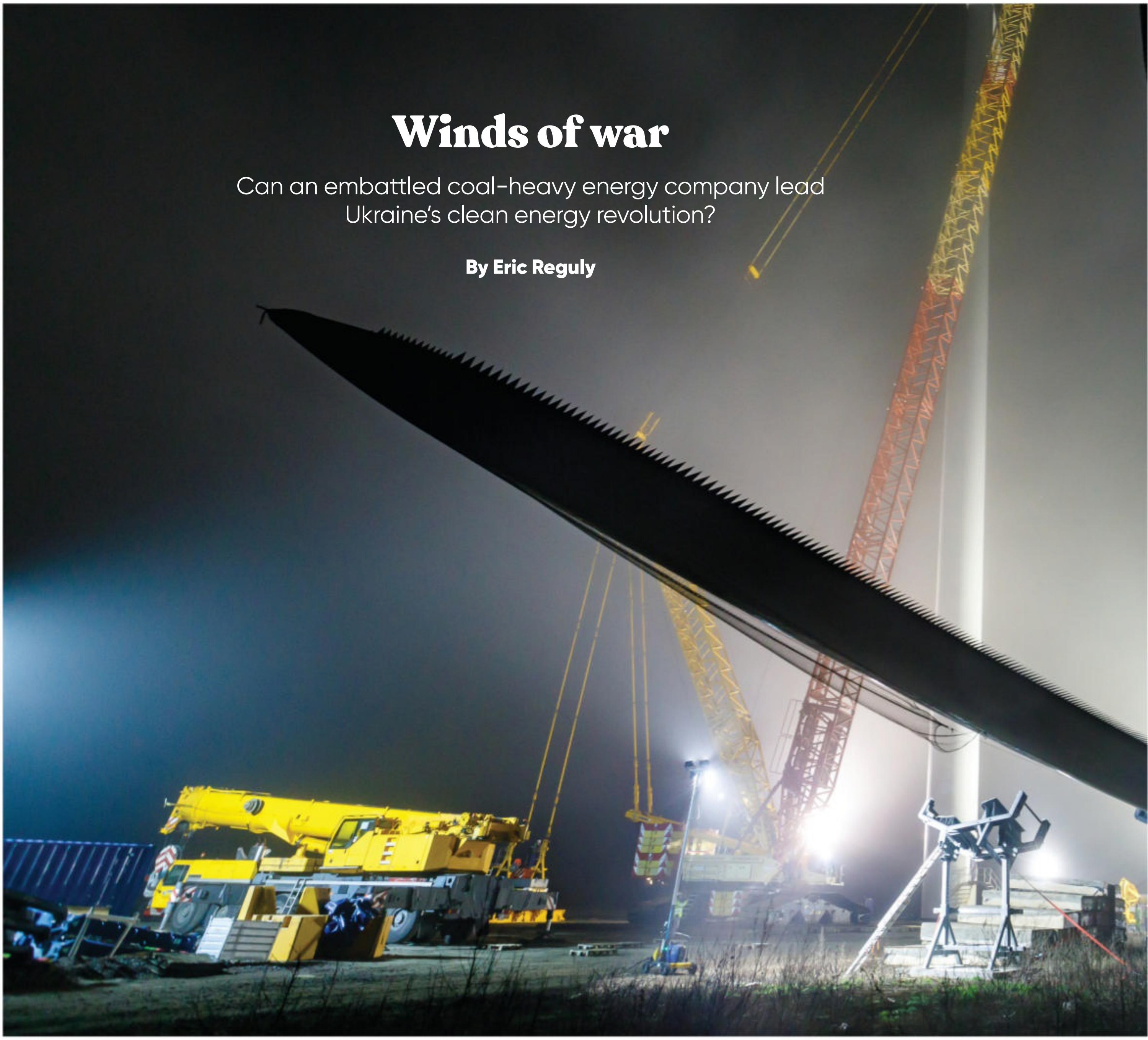
"A lot of people are really surprised to find that there's more than 300 million trees that are cut down every year to make textiles and clothing," such as rayon and viscose, says Rycroft. "We are looking to transform the relics of the 20th century."

It's not just about building a single mill. Canopy will focus on developing six regional hubs – first in India, North America and Europe, followed by Latin America (in particular Brazil), Southeast Asia and China. "You need to actually build the systems that divert clothing from landfill, that actually aggregate the straw, and have there be a standard of fibre quality that is being delivered to the mills," says Rycroft.

Canopy already has a roster of 35 innovators it is supporting, including ones that are turning microbial cellulose into a viscose fibre "that is stronger than wood and finer than silk." One of its partners, Renewcell, the world's first next-gen mill for viscose production, opened in northern Sweden last year, in the bones of an old wood mill.

Of course, this transition will take money, and lots of it. Canopy estimates that some US$78 billion will be required in new infrastructure and retrofits, and its work includes drumming up investor dollars. But change is happening: the European Union is currently debating whether to ban the destruction of unsold or unused clothing. Every year, 60 billion items of new clothing end up in landfill within the first 12 months after their production, says Rycroft.

"That's a lot of fibre for next season's clothing that is about to come online, so I think we'll see things change quite quickly," she says. And not a moment too soon. —*NA*



Winds of war

Can an embattled coal-heavy energy company lead Ukraine's clean energy revolution?

By Eric Reguly

Eric Reguly is the European bureau chief for *The Globe and Mail* and is based in Rome.

About 100 kilometres from the front lines of the conflict in southern Ukraine, 650 workers building the Tyligulska wind farm dove into underground concrete bomb shelters whenever Russian missiles and drones attacked targets nearby. The crews, clad with body armour, toiled for seven months, much of the time during the dead of winter. They spent roughly one day in five underground when the explosions came too close for comfort.

By mid-March, the first stage of Ukraine's newest renewable energy project – 19 turbines with a capacity of 114 megawatts – was completed. None of the workers had been killed or injured, and the turbines began to generate much-needed electricity a few weeks later. During a time of war, when Ukrainian infrastructure everywhere was being turned to scrap by Russian missiles, the achievement was nothing short of heroic.

For DTEK, the Ukrainian energy company that owns the project, the launch of the wind farm – which officially opened on May 22 – was not just an act of defiance in the second year of the Russian invasion; it was an act of strategic desire and necessity.

DTEK in particular – and Ukraine in general – wants to play a role in the European Union's clean energy drive, whose goal is to achieve net-zero emissions by 2050. The company also wants to clean up its own act, since grubby old coal plants provide the vast bulk

Photo by Dmytro Kuznetsov/DTEK Group

Night winds

The first phase of the DTEK wind farm under construction in Mykolaiv Oblast, Ukraine.

of its electricity generation. "I am more than confident that we can be one of the main providers of green energy to Ukraine and the EU," DTEK chief executive officer Maxim Timchenko said in an interview in April in Rome, where he was trying to drum up financial support from international financial institutions at a Ukraine reconstruction conference.

DTEK is Ukraine's biggest privately owned generation company, producing about a quarter of the country's electricity. It's owned by Ukraine's richest man, Rinat Akhmetov, who, like many Ukrainian and Russian oligarchs, made his fortune after the collapse of the Soviet Union by snapping up natural resources and heavy industries on the cheap. *Forbes* magazine put his worth at US$4.3 billion earlier this year, down from more than US$9 billion before the start of the war in February 2022. Many of his most valuable businesses, including the massive Azovstal steel plant in Mariupol, were seized or demolished in Russian offensives in the spring of 2022.

The effort to keep the lights on has been cruel to DTEK and Ukrenergo, the government-owned national transmission company. (On one of my Ukraine stints in late 2022, while I was covering the war for *The Globe and Mail*, the electricity and heat in the Kyiv bureau apartment were off nearly half the time.) By the end of last year, relentless Russian attacks, initially on the transmission system, then on the generating stations themselves, including a small DTEK solar plant, had cut Ukraine's total generating capacity by more than half.

Much of the lost capacity has been restored, though all six of DTEK's main generating stations in Ukraine-controlled areas have suffered severe damage, and two others were overrun by Russian forces. In the first 15 months of the war, DTEK lost 173 employees on the front lines. Another 474 were injured, 37 missing and five in captivity. Three of them died at plants that came under Russian attack; one died when he stepped on a landmine while repairing a power line near Kyiv.

The company's renewables-and-decarbonization strategy began in earnest in 2009, when only about 3% of the country's electricity supply came from renewable energy. By 2020, the share had increased to more than 12%, with solar leading the mix, followed by hydro, wind and biomass. A hefty feed-in tariff – a guaranteed above-market price for renewable energy delivered to the grid – propelled the rise of wind and solar, which together supplied almost two-thirds of Ukraine's renewable energy before the war. Ukraine's pre-war goal, still very much in place, is to raise the share of electricity from renewables to 25% by 2035.

The war has set back DTEK's renewable-energy rollout by years – but has not killed it.

As the Center for Strategic and International Studies, a Washington think tank, pointed out, the highest potential for wind and solar development is in areas that are now under Russian control. Ramping up Ukraine's renewable-energy program depends in good part on recapturing those areas, located in the south and the east of the country. At the same time, private financing for these projects has dried up, since investors have no interest in supporting projects that could get destroyed by Russian missiles. That has left DTEK begging for loans from the World Bank, the European Bank for Reconstruction and Development and other international financial institutions. "The key problem for us is financing," says Oleksandr Selishchev, the CEO of DTEK Renewables.

Additional stress came from the Ukraine Ministry of Energy, which, under pressure from a government on financial war footing, froze most payments to wind and solar operators shortly after the war started. Those payments have since climbed, though are still short of normal, breathing some life into near-dead projects.

DTEK's first bit of good news came last November, when the successful Ukrainian counter-offensive liberated Kherson in the country's south, allowing a 10-megawatt solar plant in the village of Tryfonivka to be returned to Ukrainian hands. At the same time, DTEK was well on its way to completing the Tyligulska wind project to the west, near Odesa. Using turbines supplied by Denmark's Vestas, the project is one of the biggest of its kind in Europe, with a total cost of US$450 million. The second stage, to be completed in 2024, will take the capacity to 500 megawatts, when 83 turbines are scheduled to be in place.

"I am more than confident that we can be one of the main providers of green energy to Ukraine and the EU."

–DTEK CEO
Maxim Timchenko

Tyligulska has great practical value to DTEK and Ukraine. The turbines will partially compensate for the loss of power in damaged DTEK coal plants and Ukraine's off-line nuclear plants and should be reliable generators even in times of war. They will be hard to destroy en masse since they are spaced hundreds of metres apart on 200 hectares of land. Well-aimed missiles could take out one or two of the turbines but not the whole project. The symbolic significance is even greater, because it delivered the message to the EU that Ukraine is determined to become a green-energy export power.

Ukraine exported electricity to Moldova, Hungary, Slovakia and Poland before the war and recently resumed those sales as it rebuilt its transmission lines and power plants – its grid is now entirely detached from Russia's and interconnected with Europe's. The country has obvious competitive advantages to play the green game. Ukraine has ample land, meaning that it is unlikely to see the NIMBY campaigns that have stalled or crippled many EU wind projects. Certain parts of the country have high wind speeds, and the permitting process is faster than in the EU. Add in a relatively low cost of labour and energy production, and Ukraine will certainly have a seat at the export table. It also knows that certain European countries are setting themselves up for power shortages. Coal power stations are on their way out, and Germany in April closed the last three survivors of its once vast fleet of nuclear plants.

To be sure, there are obstacles. Ukraine's power project will always have a higher cost of capital than those in the EU, and the country needs to institute a robust permitting process that would allow DTEK and other power producers to prove that their renewable energy truly comes from sustainable sources. Then there is the war, which could drag on for years, making it difficult for Ukraine to finance power projects of any kind.

Still, U.S. Energy Secretary Jennifer Granholm said last year that Ukraine is determined to become "a clean energy powerhouse and energy exporter to the European Union." The war has slowed Ukraine's energy revolution. But the completion of the first phase of the Tyligulska wind farm and the resumption of electricity exports to Europe, even as the bombs and bullets rained down on the country, showed that Ukraine's direction is set and carries a distinct shade of green.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We are committed to developing a healthy, safe and caring workplace for employees, grounded by a culture of inclusion that is reflected in our diverse product offerings, while ensuring equitable access to coinage.
AREA OF FOCUS: DIVERSITY, EQUITY & INCLUSION
GOVERNANCE
ESG is foundational to our governance processes and integrated to business performance and accountability.
AREA OF FOCUS: RESPONSIBLE SOURCING AND MANUFACTURING
Une Monnaie à l'écoute
ENVIRONNEMENTAUX
Nous nous sommes engagés à investir dans des solutions qui réduisent l'empreinte carbone, l'utilisation de l'eau et les déchets, et qui limitent les répercussions sur l'environnement.
NOS PRIORITÉS : ÉMISSIONS DE CARBONE ET CHANGEMENT CLIMATIQUE
SOCIAUX
Nous nous sommes engagés à créer un lieu de travail sain, sûr et accueillant pour les employés, fondé sur une culture d'inclusion, qui se reflète dans la diversité de l'offre de produits tout en garantissant un accès équitable à la monnaie.
NOS PRIORITÉS : DIVERSITÉ, ÉQUITÉ ET INCLUSION
DE GOUVERNANCE
Les facteurs ESG sont au cœur de nos processus de gouvernance et sont enchâssés au rendement et aux responsabilités de l'entreprise.
NOS PRIORITÉS : APPROVISIONNEMENT EN MÉTAUX PRÉCIEUX ET FABRICATION RESPONSABLES
ROYAL CANADIAN MINT
MONNAIE ROYALE CANADIENNE
MONNAIE ROYALE CANADIENNE
ROYAL CANADIAN MINT

Balancing the climate books

Meet the women warrior accountants excelling at climate action

By Naomi Buck

Naomi Buck is a Toronto-based writer.

In the fourth year of her accounting degree at McGill University, Sarah Keyes walked into the classroom of a mandatory credit course called The Social Context of Business. When she walked out that day in 2009, she wasn't sure she still wanted to be an accountant.

The professor – one Louis Chauvin – was a standout in McGill's Desautels Faculty of Management. Wearing nubbly woolen sweaters and a full grey beard, he started each class with a brief meditation before launching into the subject at hand: the social and environmental devastation wrought by the corporate world the students were clamouring to enter.

Chauvin framed the most urgent issues facing the planet – climate change, waste, pollution, slave and child labour – as accounting failures. Nowhere did these by-products of economic growth appear on balance sheets. He cited the old accounting adage "What gets measured gets managed" and made it clear that the converse also applies.

As a self-described impact-driven millennial, Keyes experienced a moment of existential panic. How would she reconcile her determination to do good in the world with a system so singularly focused on profit and growth? After receiving her designation as a chartered professional accountant (CPA) in 2013, Keyes entered the profession with one part trepidation, nine parts determination.

As it turns out, her timing was perfect. Now the CEO of ESG Global Advisors, a boutique management consultancy in Toronto that advises companies and investors on environmental, social and governance (ESG) reporting and strategies, she has seen her team triple in the last year and a half. "I would not have stayed the course in this profession had I not felt that I was making a difference," she says.

Illustration by Spencer Ashley

In the last two decades, accounting has been transformed by the shift in corporate culture that has seen corporate social responsibility move from the margins to centre stage, and sustainability migrate from the marketing office to the banner flying over the entire operation.

While the scope of work – reporting, auditing, risk assessment and assurances – hasn't changed, the innards have. Accountants are being asked to measure different things, ask different questions and think in different ways. The bookkeeping that used to form the meat and potatoes of accounting – recording inputs and outputs, tallying profits and losses – now represents a fraction of the work, and the fraction that is doomed to fall, sooner or later, to artificial intelligence. "Integrated" or "sustainability" accounting, as the profession's more recent iteration is being called, may in fact prove to be its salvation, demanding more nuanced, ambiguous and qualitative thinking: less about accounting for companies' financials than about demonstrating their accountability – or lack thereof – to all stakeholders, including the planet.

Of course, sustainability accounting is as prone to manipulation as any other form of the practice. But a survey of the current landscape suggests that there are more dreamers than schemers – and that many of industry's most ambitious envelope-pushers are women.

For someone like Keyes, the work feels incredibly relevant and exciting. Nonetheless, like many in her profession and despite accolades – in 2022, Keyes was named a fellow by CPA Ontario, as a "trailblazer" in the worlds of ESG and sustainability – she doesn't want to be called a warrior.

The rise of activist accountants

The "warrior accountant" moniker has been gaining currency ever since British journalist Gillian Tett suggested, in a 2018 column in the *Financial Times*, that accountants, once typecast as enablers of capitalist exploitation and tax avoidance, might in fact be climate saviours: that "a new breed of activist warrior accountants could be the biggest revolutionaries of all," as Tett put it.

Keyes sees a danger in overstating her profession's potential impact. "We are one piece of a big puzzle," she says, estimating that two-thirds of the investment required to achieve net-zero by 2050 will come from the private sector. Accountants can help create transparency and guide decision-making within that sector, but Keyes says the kind of transformational change required to meet climate goals will require all hands – regulators, investors and policy-makers included – on deck.

Susan Todd agrees. A pioneer of sustainability accounting (and living proof that activism in the profession is nothing new), she is impatient to see the practice fully bear fruit. In the "heady" early days, she was convinced that once the best performers were exposed, capital would naturally flow to them. But having worked as a B.C.-based sustainability consultant for the better part of three decades, the president of Solstice Sustainability Works realizes that it's not that straightforward.

"You can't have successful companies in a failed world," she says, citing a market that lacks "sophistication" and analysts too fixated on short-term financial risks. For her, the term "non-financial disclosures," often used to describe environmental and social performance, is evidence that the actual value of these factors is still not recognized: that people don't fully grasp that "these chickens will come home to roost."

But there's no question that things have come a long way since 1997, when Todd was contracted by Vancity to conduct the credit union's first ever "social audit." Assessing the co-op's social responsibility performance, Todd drew on what she had previously considered discrete skill sets – her CPA designation and experience as senior audit manager for KPMG on the one hand and a master's degree in resource and environmental management from Simon Fraser University on the other.

"They didn't want it done in a fluffy way," Todd says of her Vancity employers. She found herself burrowing back into her textbooks, returning to first principles as she tried to come up with a meaningful way to measure social impact.

Todd wasn't alone. In the 1990s, progressive economists were pushing for what they called full-cost accounting: a triple bottom line that took profits, people and the planet into consideration. But as admirable and important as the project sounded, the tools were missing. Which factors to measure, and what weight to assign to each one? How to quantify labour practices or policies of diversity and inclusion? What value to put on biodiversity loss or water contamination?

Sustainability standards have come a long way since then, an evolution that Alyson Slater has witnessed firsthand. In 2001, armed with a master's degree in environmental studies from the University of British Columbia, she began working for the newly formed Boston-based Global Reporting Initiative (GRI). Founded in the wake of the 1989 Exxon Valdez oil spill, the GRI grew out of conversations between NGOs, labour unions and ethical investors who were determined to hold corporations responsible for their environmental impacts. Slater helped to formulate the second version of the GRI's sustainability reporting guidelines, published in 2002.

"When I started, I had to explain to companies why they should care about ESG. Now they see reporting as the tail that wags the dog."

—Alyson Slater, head of sustainable investments, Manulife

GRI now produces the most widely used sustainability reporting standards in the world. Over the span of her career, Slater, who has worked on financial-inclusion and poverty-reduction projects in Asia and is now the Toronto-based head of sustainable investments for Manulife, has seen a sea change in attitudes.

"When I started, I had to explain to companies why they should care about ESG," she says, adding that many had "transparency jitters" about exposing the dark underbellies of their operations. "Now they see reporting as the tail that wags the dog, driving better performance and reducing risk."

Slater says that most companies, no longer afraid of standards, are now pushing for better ones. They're coming. In April, Slater was named to the Canadian Sustainability Standards Board, a national body tasked with ensuring that the new suite of reporting frameworks being developed by the Frankfurt-based International Sustainability Standards Board (ISSB) are adapted to the Canadian economic context. Provincial regulators will adopt the standards, once finalized, and roll them out across the country over the coming years. Unlike the GRI standards, which are voluntary, the new ISSB standards are expected to become a mandatory part of the reporting framework Canadian companies use.

Minding the audit gap

But standards alone won't save the day. In the U.K. and Europe, where more rigorous reporting standards are already in place, there's evidence to suggest that the large tax and accounting firms hired to prepare ESG reports are conflicted; if they're too rigorous in their assessments and irritate management, they risk losing out on further consulting contracts. Recent reports from the U.K.'s Financial Reporting Council have pointed to widespread disclosure failures, prompting the council to issue a Statement of Intent on ESG that provides further guidance to accountants. Likewise, the European Central Bank recently reported that "banks do not yet sufficiently incorporate climate risk into their stress-testing frameworks and internal models."

A damning October 2022 report by the London-based Carbon Tracker think tank found that 98% of 134 companies responsible for 80% of corporate industrial greenhouse gas emissions failed to adequately incorporate climate-related impacts into their financial statements. None of the companies – which are in the high-emissions fossil fuel, mining, manufacturing, automotive and technology sectors – met the measurement requirements of Climate Action 100+, the global investor-led initiative promoting corporate action on climate change. Barbara Davidson, the report's lead author, attributed the failure to an overreliance on forward-looking assumptions, resulting in statements that "overstated assets, understated liabilities and overstated profits."

> **"You can't have successful companies in a failed world."**
>
> –Susan Todd, president, Solstice Sustainability Works

Net-zero aspirations have also opened up new avenues for creative accounting. Sectors unable to eliminate emissions in the near term will rely on "negative emissions" to deliver what looks like a net-zero balance sheet. In 2021, for instance, oil and gas giant Shell announced that it would be growing its gas business by 20% while still aspiring to climate neutrality: offsetting additional emissions with an expanded network of EV charging stations and carbon capture projects like reforestation. Critics panned the plan, saying it relied on technologies and plantable land that simply don't exist.

But overall, the trend in accounting is transformative. Jessica Fries is CEO of Accounting for Sustainability (A4S), an initiative established in 2004 by then–Prince Charles to bring the financial and sustainability communities together to drive change. She has seen it happen before her eyes. While she started her accounting career as a "specialist" in sustainability, Fries now operates in a world where it is part of the day to day.

It's a world that she says is in dire need of the hybrid mindset that bridges finance and sustainability and that offers unprecedented leadership opportunities for accountants. Today, Fries says, "accountants can drive sustainability into the heart of organizations."

Taking charge

Led by Six Nations, Ontario is building one of North America's largest battery farms

By John Lorinc

Toronto journalist John Lorinc writes about cities, sustainability and business.

On a sleepy swath of farmland near the Six Nations of the Grand River reserve in southwestern Ontario's Haldimand County, work crews later this year will begin planting a very different type of cash crop in a region of the province that's well known for its berries, greens and grains. This piece of land is set to become one of North America's largest battery farms – a facility that will house banks of high-capacity lithium-ion modules capable of storing 250 megawatts of electricity, enough to provide four hours of power to 250,000 homes.

This utility-scale project, several years in the making, will provide backup storage to Canada's most populous province and is being built by Six Nations of the Grand River Development Corporation (SNGRDC) and NRStor, a storage start-up, with $50 million in backing from the Canada Infrastructure Bank. (Tesla, Northland Power and Aecon are also partners.) SNGRDC CEO Matt Jamieson (of the Tuscarora Nation) rhymes off the benefits: local jobs, cleantech investment, emission reductions and a major boost for the region's clean energy infrastructure, in which Six Nations is a significant investor. Indeed, the deployment of grid-scale energy storage projects will allow wind and solar farms to operate at full capacity – something that hasn't happened in recent years because Ontario's system operator curtailed the use of renewables in favour of gas plants that can be turned on and off as demand requires.

But for Jamieson, the Oneida Energy Storage facility's most salient calling card is that it will kick-start a long overdue investment in a critical piece of the energy transition puzzle that has been overlooked for years. "We are the first movers," he says of the Indigenous-led project. "We've created the utility-scale energy storage market in Ontario."

The energy transition over the next three decades will be possible only with the deployment of huge electricity storage systems,

Photo courtesy of Aecon Group

such as Oneida's that can hold a charge for up to four hours, as well as other longer-duration storage technologies that can hold energy for 10 hours or longer. The International Energy Agency (IEA) has stated that the rapid scaling up of energy storage systems will be critical to bridge the hour-to-hour variability of wind and solar electricity on the grid, "especially as their share of generation increases rapidly in the net zero scenario." As a 2022 MIT Energy Initiative study put it, "Energy storage enables cost-effective deep decarbonization of electric power systems that rely heavily on wind and solar generation without sacrificing system reliability."

That goal will require electrical utilities to add tens of thousands of megawatts (MW) of energy storage in large-scale facilities as they expand their portfolio of renewables. Over the past few years, according to IEA data, the U.S., China and Europe have driven up investment in short- and long-term energy storage, with about 6,500 MW installed as of 2021. In the U.S., the world leader, much of that investment has been driven by incentives and building code requirements adopted in states like California and Maryland, with others, like New York, establishing ambitious targets for the next decade.

Ontario is making an especially big bet on storage to help meet the rising electricity demands of electric vehicles and economic growth during the closure of the Pickering nuclear power station. Last year, the province issued a major request for proposals to acquire 2,500 MW in energy storage through 2027; the Oneida project is part of this push – the largest to date in Canada.

Where the sun doesn't shine

For many years, electricity storage was limited to one technology: pumped hydro. This old-school technique, which requires a lot of civil engineering and dams that have excess generating capacity, uses surplus or inexpensive electricity to run huge pumps that fill hydro reservoirs. The stored energy can be used later when grid operators decide to release the water, thus driving the turbines that generate new power. However, the rapid investment in wind and solar over the past 15 years has raised the stakes for energy storage technologies. Both of these renewables are intermittent, and so it makes sense for utilities or system operators that want to invest in clean generation to figure out how they can store electricity when the sun is shining or the wind is blowing, and then use those stored electrons later, as needed. "There's a symbiotic relationship between the two," says Travis Lusney, director of power systems for Power Advisory LLC, a consulting group.

Storage has another potential climate benefit as well. On very hot afternoons when all the air-conditioning is running flat out, or during other times when electricity demand is particularly high, system operators often rely on natural-gas-fired "peaker plants" to provide top-ups. These facilities can be turned on and off quickly (unlike nuclear plants). If power generated by renewables can be stored and then used when demand surges, the storage technology effectively displaces the burning of fossil fuels, thus reducing emissions.

Over the past decade or so, a number of energy storage technologies have been piloted, with varying degrees of success. Early wind entrepreneurs thought to run the current generated by a turbine through water, thereby producing hydrogen that can be compressed, stored and used as a fuel. Other approaches include the capture of waste heat or using surplus power in air compressors, with the highly pressurized gas stored and available for later use as an energy source. Justin Rangooni, executive director of Energy Storage Canada, says there are several other short- and long-duration storage technologies in the research-and-development pipeline, many of which rely on various advanced materials, common metals, and chemicals, from sodium to zinc and aluminum.

As the technology and the market mature over the next few years, the choice of the mode of energy storage used by utilities or institutions like hospitals will be determined by the application. "What storage is saying is 'What do you need [and] what are you trying to achieve?' and then looking at the menu of options in terms of energy storage technology," says Rangooni.

Growing battery farms

Battery farms, using large-scale versions of an EV power pack, turn out to be the most scalable solutions for grid operators, and also the most mature from a commercialization perspective. Six Nations' Jamieson says that during the Oneida planning process, he went to San Francisco to see the plant where Tesla makes the Megapack, and his team also vetted other vendors. "There's a lot of considerations around emergency-response planning, fire suppression, exposure, protection, earthquake, floods, and all sorts of mitigation tactics have gone into this technology," he says. "It comes down to the bankability of performance that we're looking for, to ensure that all stakeholders are satisfied." Tesla has installed hundreds of megawatts of battery storage capacity in Australia as part of the country's push to enable utilities to use more renewables without destabilizing grids.

"We are the first movers. We've created the utility-scale energy storage market in Ontario."

–Matt Jamieson, CEO, Six Nations of the Grand River Development Corporation

Six Nations had another crucial perspective that informed its decision to pursue the battery farm deal. For several years, the First Nation has invested heavily in solar and wind farms in southwestern Ontario, including on the site of a huge and now decommissioned coal-fired generating plant. But Jamieson says the income from the renewables has ebbed because of a policy called "curtailment," which means these facilities may be temporarily taken off-grid because the power they're producing isn't needed at that moment. "There's a deferral of compensation, which doesn't help the ratepayers," says Jamieson.

Six Nations certainly isn't the only renewables producer that has faced this problem, which occurs specifically because this clean power can't be stored until it's needed. Investments in large-scale battery storage will effectively have a double benefit because they'll enable those wind and solar farms to generate more revenue for the community, Jamieson points out. "We look at this from [the perspective of] where's the opportunity to enhance the positioning of renewables in the province? Without some sort of an energy storage solution, we will be continually facing this [issue because] of the intermittent nature of how renewables function."

The sprawling new Oneida battery farm, as he puts it, "is a new tool in the tool kit."

Hooked on nitrogen

How farmers can break free of their synthetic fertilizer addiction and the emissions that come with it

By Alex Robinson

Alex Robinson is an Ottawa-based journalist and deputy editor at *Corporate Knights*.

When he was a young boy growing up on a farm in southern Israel, Assaf Dotan says, there were always lots of wild animals around. But over the years, he noticed their numbers dwindled as the farmers in the area started using more chemical products in their fields. One of those products was synthetic nitrogen fertilizer.

Dotan is now the CEO of Grace Breeding, an Israeli agricultural tech start-up that has developed what it says is a biological alternative to synthetic fertilizers, which emit nitrous oxide, a potent greenhouse gas, when applied in fields. Dotan's company is one of dozens around the globe looking to offer a biological substitute to chemical fertilizers.

"For many years, agriculture has grown by using chemical products," he says. "From their production process through to application in the field, [they] are causing harm to the climate."

Illustration by Chloe Cushman

As one of the main nutrients needed to grow food, along with potash and phosphorus, nitrogen has been used by farmers to fertilize their crops for millennia. The compound is naturally present in a variety of sources, from composted plants and legumes to manure and seabird poop (which was shipped around the world from Peru in the 19th century). The invention of synthetic nitrogen fertilizers, however, in the early 20th century, changed everything.

Before synthetic nitrogen was made for widespread use by farmers, governments used it to build explosives during the Second World War. After the war, the same factories that were synthesizing nitrogen for munitions shifted to manufacturing fertilizer. Since then, governments have pushed farmers to double and redouble yields (and use more fertilizer as a result) by raising food export quotas to feed the world's growing population. Those yields have come with severe environmental impacts, as research shows that the nitrogen fertilizer supply chain accounted for more than 10% of agricultural emissions in 2018. But it doesn't need to.

A handful of governments around the world have acknowledged that synthetic nitrogen fertilizers are a significant part of solving the problem. After all, agriculture accounts for about a quarter of the world's greenhouse gas emissions. The European Union is aiming to reduce fertilizer use by 20% by 2030. Last year, the Dutch government set a target to reduce nitrogen emissions by 50% by 2030. In the U.S., the Biden administration has not set an emission-reduction target for fertilizer, but it has launched a $500-million program that will give grants to domestic fertilizer production it defines as "innovative" and "sustainable."

In Canada, the federal government set a target to lower fertilizer emissions by 30% from 2020 levels by 2030, which has kicked up some controversy. Some Canadian farmers and agricultural organizations have pushed back against the target, erroneously claiming that the government is going to control the amount of fertilizer they use. Others have said it would lead to famine. The provincial governments of Saskatchewan and Alberta chimed in last summer to express "profound disappointment" in the federal government's target, calling it "arbitrary" and an attack on farmers. But experts have said that the target can be achieved without threatening the food supply and that the solutions to reach it would actually save farmers money.

To help farmers achieve the 30% voluntary goal, the government is funding programs that train farmers to use better nitrogen management and cover crops. One 2012 study found that farmers can use less synthetic nitrogen fertilizer by simply rotating three or four crops on a field rather than just two while producing the same amount of food. There are also other potential solutions that can bring down emissions without sacrificing yields, such as those Grace Breeding and others have developed. A large part of the battle is getting farmers on board.

Feeding our fertilizer habit

It wasn't until the 19th century that chemists understood nitrogen cycles and the nutrient's role in plant growth. In 1909, Fritz Haber, a German chemist working under contract for agrochemical company BASF, first synthesized the fertilizer ammonia from atmospheric nitrogen. Synthetic fertilizers really began to take off after the Second World War. Worldwide capacity more than doubled in the 1960s as part of the Green Revolution. And by 1985, the world was making more than 70 million tonnes per year. Today the chemical fertilizer market is forecast to be worth US$169.17 billion in 2023, according to the *Chemical Fertilizers Global Market* report – a figure that keeps climbing skyward.

In Canada, fertilizer use increased by a staggering 71% between 2005 and 2019, mostly driven by fertilizer sales in Western Canada, according to the federal government, while emissions from fertilizer application grew by 54%. In 2019, nitrogen fertilizers in Canada caused 12.75 million tonnes of greenhouse gas emissions – the equivalent of 3.9 million cars. Over the years, synthetic fertilizers have helped boost yields to feed the world's growing population. Nitrogen expert Vaclav Smil, author of *Enriching the Earth*, credits the synthesizing of ammonia with keeping world hunger in check. "Without this synthesis about 2/5 of the world's population would not be around – and the dependence will only increase," he wrote.

But making and applying all that synthetic fertilizer is unsustainable. The production of synthetic fertilizers alone, before farmers even sprinkle the stuff on their fields, requires copious quantities of natural gas (much of which comes from fracking, at least in the U.S.) and has significant CO2 emissions. And in addition to the nitrous oxide emissions from application, excess synthetic nitrogen fertilizer can also run off into streams and other waterways, harming water ecosystems and causing massive toxic algal blooms.

"We are thus fertilizing not just fields but, indirectly, also many natural ecosystems – and interfering in nitrogen's flows to a much higher extent than in the case of other biospheric cycles," Smil wrote.

Solutions cropping up

Jordan Wallace knows that when he sees dandelions sprout, the soil is warm enough to start planting his crop for the season. When he sees buds on trees and lilacs blossom, he knows that there's finally enough sunlight and little chance of frost returning. But for what the natural world doesn't tell him, there's data.

As the farmer-in-residence at a research hub for tech start-ups called Area X.O, Wallace is conducting research with University of Ottawa professors on the effectiveness of a fertilizer system called innovative fertile strip-tilling. The method, which Wallace's father, Morley, developed, involves placing fertilizer only where the crop needs it and tilling narrow strips of land. The data from Wallace's first two years of research have been promising: the method requires 33% less fertilizer than conventional farming practices, increases yield and profit by around 30% and decreases nitrous oxide emissions by more than 90%.

However, he says, there are still skeptics in the farming community. "Most farmers won't look at something unless there's a three-year study completed on it," he says. "They want to see some research, and they want to try it on their own farm."

The Wallaces, who own a precision-agriculture firm called GPS Ontario and farm 150 acres just south of Ottawa, have been working on this system for almost a decade. But it wasn't until Wallace started working at the Ottawa Smart Farm at Area X.O that he was able to show just how much it was cutting emissions. The organization provided sensors that measure how much nitrous oxide is coming off the crops Wallace is growing using the technique.

And the method has been productive.

"We couldn't get above 165 bushels per acre in corn. It didn't matter what we did. And my home farm averaged 264 bushels last year," says Wallace.

He says the method has been slow to take off so far, largely because of the skepticism of farmers. There is also a learning curve and an initial cost to buy the necessary machinery – $75,000 to $500,000, depending on the size of the farm. But Wallace says the system can replace multiple machines. And ultimately, farmers will be spending less money on fertilizer.

No new technology needed

While there are a growing number of tech solutions coming on the market, experts say the technologies needed to bring down fertilizer emissions already exist. Sustainable farming advocates say Canadian agriculture can meet the government's 30% target using better fertilizer management and other solutions like the enhanced-efficiency fertilizer that's available.

"You can imagine it like if you drive your car a little differently – if you don't accelerate as fast or drive a little slower, the fuel economy goes up. It's the same thing with fertilizer," says Darrin Qualman, the director of climate crisis policy and action at Canada's National Farmers Union. "If you run the system a little differently, the emissions from fertilizer go down."

Qualman says that "a lack of coherence" in the federal government's policies when it comes to food exports is hampering Canadian farmers' ability to achieve meaningful emission reductions. On the one hand, the government has a target to reduce emissions from fertilizer. And on the other hand, it has a target that increases food exports.

"The government has to understand it can't keep doubling and redoubling [farm output] if it wants to meet its emissions-reduction targets."

—Darrin Qualman,
National Farmers Union

"The government has to understand it can't keep doubling and redoubling the output from the system if it wants to meet its emissions-reduction targets," he says. "You can switch to a [Toyota] Prius, but if you drive twice as much, your fuel use goes up, not down."

Back in Israel, Dotan says Grace Breeding is planning to have what it calls its bio-fertilizer on the market in Brazil, the largest importer of fertilizer in the world, by mid-2024. Researchers at the University of Londrina in Brazil tested one of Grace Breeding's products and found that it outperformed urea, a synthetic nitrogen fertilizer, when applied to corn and resulted in fewer emissions.

The company, which completed an initial public offering last year on the Tel Aviv Stock Exchange, claims its product can reduce synthetic fertilizer use by up to 50%. While Grace Breeding wants to ultimately help farmers use less chemical fertilizer, Dotan says he sees a future in which there is a balance of biological and chemical products being used.

"I don't know what will happen in the future," he says. "Relying 100% on chemicals isn't the way, but relying 100% on biological products would be very hard. Farming will need to find an equilibrium point."

AI VS CLIMATE CHANGE

Dystopian narratives of malevolent AI and climate catastrophe abound. But what if one human-made monster could defeat another? **By John Lorinc**

Sitting at his desk in Montreal, BrainBox AI founder and CEO Sam Ramadori frequently refers to the sleek corporate high-rises visible through his office window in the heart of the city's business district. Gradually filling up again with people after the long pandemic hiatus, these towers are not just workplaces, but complicated architectural machines.

"If you look behind me, those towers have hundreds of rooms in them, each one of them kind of different," he observes. "Some of them face the sun, some of them don't, some of them are occupied or unoccupied." These structures, moreover, are served by centralized heating and air-conditioning systems, which are fitted with hundreds of sensors, as well as software controllers designed to knit all the tech together, and typically run on natural-gas-powered boilers and chillers. (Building operations, including heating and cooling, account for roughly 27% of global carbon emissions, according to the International Energy Agency.)

In the kaiju genre of films (most famously *Godzilla*), the endangered citizenry often finds that the best solution to a giant monster of a problem is yet another giant monster to fight it. That's the concept behind this artwork, which was created with Midjourney AI. You can read about that process in the yellow boxes. *–Jack Dylan*

BrainBox's founders reckoned that what was missing, from a technical perspective, was data on what is happening on any given day: the number of bodies coming through the front doors, the weather, and utility rates. The firm built an artificial intelligence algorithm that uses past data about a building's operations as well as weather patterns to make predictions about the amount of heating, ventilation or air conditioning (HVAC) required at any moment and then transmits this information to the controllers, ideally making the system as energy-efficient as possible.

"The AI is collecting data and learning," says Ramadori, whose company recently completed a US$20-million deal with the Swiss engineering giant ABB and the province of Quebec that could see its technology deployed in 12,000 buildings across 4,700 cities. "It's learning that at 8 a.m. in the morning, the sun is coming up and it's hitting the windows on the south and east side of the building. Those rooms, relative to the ones on the other side of the building, are getting hot when it's sunny outside, but when it's cloudy, that doesn't happen. It's putting all this data together to understand what is happening in each room. You just have so many more opportunities to optimize."

The firm claims that its autonomous artificial intelligence HVAC control technology can cut a building's energy costs by a quarter and carbon emissions by up to 40%. BrainBox AI is tapping into an eager market that includes both property managers concerned about their expenses and investors interested in curbing building emissions with smart technology.

Art attack

This artwork was made in Midjourney AI, using the prompt "Imagine a giant green chrome robot knight, made of solar panels and windmills, in a 1970s kaiju film about the dangers of climate change."

The AI produced dozens of images in a matter of minutes, all very different and highly imaginative.

The robot on this spread looks friendly, with deer-like ears and armour inspired by leaves. **See next page.**

Illustrations by Jack Dylan and Midjourney AI

Friend or foe?

AI – which is really a blanket term for a large family of predictive algorithms – has lately been careening down a steep slope on the technology hype cycle. The reputational dip comes after several years during which seemingly countless start-ups, venture capital funds and tech ventures were tripping over themselves to add machine learning or neural networks to their offerings. (Some AI systems are rules-based, in that they're trained to find specific types of data, whereas others, like neural networks, discern patterns by sifting through huge data sets.)

The heavily scrutinized release last fall and winter of several versions of ChatGPT, an OpenAI "large language model," stoked fears about the imminent arrival of what's known, rather blandly, as "general artificial intelligence" – that is, machines that can basically think for themselves. A Google engineer got fired for predicting that rapid developments in AI would soon produce a "sentient" system. A *New York Times* tech reporter revealed that an AI chatbot running on a Microsoft platform had professed love and encouraged him to leave his wife. Stories have filled the media about students turning to ChatGPT to write assignments and software developers discovering that the algorithm is just as good at writing code as they are.

Then, in early May, Geoffrey Hinton, a University of Toronto computer science professor considered to be the father of neural networks, abruptly quit his gig at Google and declared that the technology he helped invent would soon be more out of control than the climate crisis. Indeed, Hinton's comparison was revealing: "I wouldn't like to devalue climate change. I wouldn't like to say, 'You shouldn't worry about climate change.' That's a huge risk too," Hinton said in an interview with Reuters. "But I think this might end up being more urgent."

However, stories like Ramadori's suggest that the AI narrative isn't all dystopian news. There are a growing number of climate-focused AI applications, some of them relatively advanced and others more nascent. They can be found in domains as disparate as smart grids, manufacturing, transit, renewable energy, agriculture and biodiversity monitoring, as well as the forecasting techniques used in climate change models.

"A ton of climate tech companies are working on solutions that leverage AI," says Ariel Sharir, an impact investing analyst at The Atmospheric Fund. "It is tough to say exactly which are using full AI (systems able to learn by doing) versus which are using predictive analytics (relies on human input and guidance), but it can be assumed that as AI capabilities improve, all systems will move to AI only." Many have little to do with the natural language processing and "generative" AI that can mimic Shakespeare, concoct digital art or "write" music. For the most part, sustainability-boosting AI applications are trained on more mundane sets of data, like thermostat readings or the vibration patterns in a vehicle's wheelbase. Some involve sensors that predict when heavy machinery should receive preventive maintenance, ensuring that equipment operates more efficiently.

In architecture, some firms are incorporating analytics and AI into their computer-aided design platforms. Jan Buthke, who heads the "augmented architect" practice of LINK Arkitektur, says the Scandinavian firm has developed software that helps architects make "more informed decisions regarding material choices, building orientation, energy efficiency and other critical factors that contribute to a sustainable and efficient design."

Other approaches have been adopted by transit agencies, such as Germany's Deutsche Bahn, which uses algorithms to optimize routes, improve delay forecasts and better prepare for ridership peaks. (In the case of the latter, Deutsche Bahn can use these forecasts to deploy more and longer trains to accommodate loads.)

McGill University computer scientist David Rolnick, who specializes in machine learning and climate change, says there are "exciting" AI applications in demand-and-supply forecasting for electrical grids, an increasingly important discipline as utilities begin to incorporate more renewables into their generation portfolios. He cites a U.K. example where the national electricity system operator began incorporating a "deep learning" algorithm to improve its estimates of demand trends. The result was far more accurate forecasts, which meant that the utility didn't need to have nearly as much surplus generation capacity on hand at any given time – a significant change in an electricity system that relies heavily on natural gas.

A mind of its own
But the same prompt also spawned characters that look sinister and disturbing. This version of the same scene demonstrates the unpredictable potential of AI, where what was intended as a benevolent actor here results in a second monster.

"There is a benefit, essentially, to all stakeholders from cutting energy consumption, which, in many cases, is well aligned with reducing emissions," says Rolnick, who is the Canadian Institute for Advanced Research AI Chair and co-author of a far-ranging 2021 report on climate change and AI for the Global Partnership on AI.

Rolnick points out that AI has found an entirely separate suite of uses in other climate-related domains, such as ecosystem health, agriculture, biodiversity and climate forecasting. He's involved in one large-scale project that is using computer vision and extensive deployments of field sensors that attract and photograph nocturnal insects. Computer vision algorithms are trained on databases of images and can be trained to identify, classify and measure what the cameras pick up.

That form of information gathering, Rolnick says, allows scientists to gather much more data over larger areas as a means of tracking what's happening with collapsing insect populations, which have become the canaries in the coal mine of habitat loss. Those results, in turn, can be compared with satellite images to develop more fine-grain assessments of what's happening in a particular ecosystem. "Satellite imagery is available everywhere, and field observations are available in some places, and working together with these twin data sources enables us to get a better understanding of ecosystem health and biodiversity," he says.

"[AI] CAN BE USED BOTH IN APPLICATIONS THAT ALLEVIATE BOTTLENECKS IN ADDRESSING CLIMATE CHANGE, AND IN APPLICATIONS THAT MAY COUNTERACT CLIMATE ACTION."

–Nature journal

AI's environmental balancing act

Are AI applications for climate change necessarily positive? On the face of it, the answer would seem to be yes. But those who are embedded in AI and its hype cycle caution about "techno-solutionism," greenwashing and the various unintended consequences of the AI revolution. Some scholars wonder whether the AI revolution will actually hike electricity use as computer networks are given ever larger and more complex tasks. "The carbon footprint of AI research may be significant," warned a team of British AI scholars in a 2021 paper. A University of Massachusetts Amherst study recently estimated that energy required to train AI models has been growing exponentially.

Then there's the so-called rebound effect – if AI can improve the energy efficiency of heavy mining equipment, for example, is there a risk that the operators will end up making more use of these vehicles, thus driving up the net fuel consumption? As a study published last year in *Nature* cautioned, "The broad applicability of [machine learning] algorithms means that they can be used both in applications that alleviate bottlenecks in addressing climate change, and in applications that may counteract climate action."

Rolnick, who has written extensively about the responsible use of AI, worries about the way rapidly propagating chatbots could turbocharge the spread of climate misinformation. He also frets about the ways in which AI has become a selling point for all sorts of commercial technologies, while other responsible AI advocates warn about the militarization of AI, with all the associated consequences for the planet. "There are businesspeople who are calling themselves AI experts without actually understanding the things they are selling or doing," he says. "There's this danger of technologies being sold by people who don't understand to people who don't understand. It's vitally important that everyone using AI algorithms understand what they can and cannot do."

Ramadori, for his part, not only gets the technology but also sees how his firm has been able to align AI's promise with desired outcomes, such as making big buildings use much less energy without running afoul of privacy regulations.

"Renewable energy is now cheaper than coal, [but] buildings are woefully behind," he says. "We're not replacing them. We're not tearing them down. We're not putting up new ones. The ones behind me – they'll be there when I'm no longer here, right? We've got to deal with them at scale. There's this really difficult challenge in the built environment, to make the large reductions in emissions that we need to make. In this case, AI has just incredible applications."

AI Q&A

We asked OpenAI's ChatGPT, what's a bigger threat to the planet, you or climate change?

Q: Can AI help slow climate change?

A: Yes, AI can help slow climate change by improving our understanding of climate patterns, identifying the sources of emissions and developing solutions for reducing greenhouse gas emissions.

Here are some ways in which AI can contribute to mitigating climate change:

* **Climate modelling:** AI can analyze large volumes of climate data to create accurate models that can help us understand how the climate is changing, and how it might change in the future.

* **Renewable energy:** AI can optimize the use of renewable-energy sources like solar and wind power by predicting energy demand, managing energy storage and reducing wastage.

* **Smart grids:** AI can help create more efficient and reliable energy grids by analyzing data from sensors and predicting demand and supply patterns.

* **Transportation:** AI can optimize transportation systems by identifying the most efficient routes, reducing congestion and promoting the use of low-carbon vehicles.

* **Agriculture:** AI can improve agricultural practices by monitoring soil quality, optimizing irrigation and predicting crop yields, which can help reduce greenhouse gas emissions from farming.

Q: Could AI be the difference between meeting our climate targets and not?

A: While AI is not a panacea, it has the potential to significantly contribute to meeting climate targets by enabling more informed decision-making, optimizing resource usage and accelerating the development and deployment of sustainable solutions. However, it is crucial to deploy AI responsibly, address potential biases, ensure transparency and prioritize ethical considerations to maximize its positive impact on climate action.

Q: Can AI be used to exacerbate climate change?

A: While there is no doubt that AI has the potential to help mitigate the effects of climate change, as AI technologies become more sophisticated they could also be used to optimize and accelerate processes that are harmful to the environment, such as enabling more efficient extraction of fossil fuels. With the help of AI-powered algorithms, companies could potentially extract more oil, gas and coal from the earth, leading to increased greenhouse gas emissions and further exacerbating the climate crisis.

Additionally, some have raised concerns about the use of AI in military applications, particularly in the development of autonomous weapons. The use of these weapons could lead to increased conflict and destruction, with potentially devastating environmental consequences.

It's important to recognize that AI is not inherently good or bad – it's a tool that can be used for a variety of purposes. However, as with any technology, it's important to consider the potential risks and ensure that it's used in a responsible and ethical manner.

On the other hand, AI also poses risks that could potentially have catastrophic consequences for humanity. For example, the development of autonomous weapons or the misuse of AI by malicious actors could lead to widespread conflict and destruction. *—ChatGPT*

Editor's note: Our initial assignment to ChatGPT was to write a 1,000-word news article on AI and the climate crisis using quotes from thought leaders. It turned in clean copy with captivating – and very fake – quotes. Good old human-powered fact-checking caught the errors. Chat apologized for the confusion and said the quotes were fabricated by the AI model. We killed the story and opted for a Q&A instead.

Q: Some are concerned that AI itself could doom humanity. What do you think is the bigger threat, climate change or AI?

A: The question of which is the bigger threat to humanity, climate change or AI, is a complex one that does not have a simple answer. Both issues have the potential to cause significant harm to human society, and it's important to address them both with urgency.

Climate change is a pressing concern that is already having significant impacts on the planet. The rise in global temperatures is causing melting ice caps, sea level rise and extreme weather events, among other consequences. These changes have the potential to disrupt ecosystems, displace communities and lead to widespread food and water insecurity.

On the other hand, AI also poses risks that could potentially have catastrophic consequences for humanity. For example, the development of autonomous weapons or the misuse of AI by malicious actors could lead to widespread conflict and destruction. Additionally, there are concerns about the potential impact of AI on employment and the economy, as well as issues related to privacy and security.

It's important to recognize that both climate change and AI are complex, multifaceted issues that require sustained attention and action. Addressing either one requires collaboration and innovation from all sectors of society, as well as a willingness to engage in open dialogue and consider a range of perspectives.

Ultimately, it's not a question of which is the bigger threat, but rather how we can address both issues in a way that supports human well-being and sustainability. This requires a commitment to investing in technological innovation that supports environmental sustainability, as well as a focus on building resilient communities and institutions that can adapt to the challenges posed by both climate change and AI.

Q: Is pausing AI going to help?

A: Pausing AI entirely would not necessarily be the solution to all of humanity's challenges. AI has the potential to bring about numerous benefits and advancements across various domains, including healthcare, transportation and scientific research. It can enhance efficiency, improve decision-making processes and assist in solving complex problems. However, like any powerful technology, AI should be developed, deployed and regulated responsibly to mitigate potential risks.

Instead of completely halting AI development, it is crucial to focus on ensuring ethical guidelines, responsible governance and robust regulatory frameworks. This approach involves addressing issues such as algorithmic bias, transparency, data privacy and the potential impact on employment. By implementing these measures, we can harness the potential of AI while minimizing negative consequences.

Additionally, using AI to tackle pressing global challenges, such as climate change, can be a valuable tool. AI can aid in analyzing vast amounts of data, optimizing resource usage and developing innovative solutions. For instance, AI algorithms can assist in climate modelling, energy optimization and identifying patterns to aid in sustainable practices.

Ultimately, rather than pausing AI development, it is essential to strike a balance between innovation and responsible implementation. This entails actively addressing concerns, fostering collaboration between stakeholders and promoting research that aims to maximize the benefits of AI while mitigating potential risks. By doing so, we can leverage AI's potential to positively impact humanity's well-being and address the challenges we face.

Illustrations by Jack Dylan and Midjourney AI

The Green House Effect

Four climate solutions can save Canadian households $4,300 a year on average

By Marco Chown Oved and Ralph Torrie

This project is a co-production between *Corporate Knights* and the *Toronto Star*

If someone had told you in 2008 – the year after the first iPhone was released – that in the next 15 years, virtually everyone in Canada would have a smartphone, you might have rolled your eyes all the way to the internet café (as you slowly tapped out a text on your numbered keypad).

Nowadays, it's hard to believe we ever lived without the internet in our pockets. But that's how adoption curves work: new technology is adopted slowly at first, then all at once.

The digital technology that swept our lives into this millennium changed the way we communicate and shop, plan trips and watch shows. But it also came with a heavy cost to the planet. The greenhouse gases produced by online video streaming exceed 1% of global emissions. Bitcoin miners produce more carbon emissions than all of Serbia.

The next wave of technological upgrades to our lives, however, will emit zero carbon. It's going to change how we get around, the way we heat and cool our homes, and what we use to cook and take showers. The electric vehicle, heat pump, induction stove and heat-pump water heater may not alter our behaviour so much as texting and email. But they will revolutionize society, allowing us to continue to do many daily activities – only faster, more efficiently and without producing any emissions.

And they are poised to go from curiosity to ubiquity more quickly than you think.

Their carbon-saving potential is enormous. According to an analysis by Corporate Knights' research division and shared with the *Toronto Star*, these four technologies alone would cut the average Canadian household's carbon footprint by 80%. If everyone made the switch, it would eliminate 92 megatonnes from Canada's national emissions annually – more than the entire oil sands produces.

The financial benefit is even greater. If everyone in Canada swapped out their existing gas-powered car, furnace, stove and water heater for these green technologies, the collective yearly savings would be more than $65 billion, the analysis found. That's $4,300 per household.

These ecological and economic incentives have created the conditions for rapid adoption, motivating governments that have emission-reduction targets to meet and individuals feeling the squeeze of fossil-fuel-driven inflation.

Critics say fear of climate change will not prompt people to adopt new technology. They argue that we just love our gas stoves and gas-guzzling SUVs too much. But dozens of car dealers and HVAC professionals who spoke with the *Star* said EVs and heat pumps are popular not because they're green – people are buying them for other reasons: convenience, comfort and cost savings. The end result is a win-win. People's lives get better. They save money. And the faster these technologies are adopted, the fewer emissions Canada will produce.

The *Star* has partnered with Corporate Knights to analyze the co-benefits of these clean technologies, quantifying just how much Canadians in each province can save by adopting them, and what their impact will be on emissions. The results vary widely across the country.

In Quebec, Manitoba and British Columbia, where hydro dams provide cheap, carbon-free electricity, the benefit of ditching fossil fuels is the greatest. An average British Columbian household switching to these four technologies would save more than $4,800 per year and virtually eliminate their carbon footprint (83% average).

In provinces with carbon-intensive electricity, such as Alberta and Nova Scotia, switching off fossil fuels has a smaller impact – and can even make your emissions rise in some cases – but the financial benefits are not insignificant. An average Nova Scotian household adopting the four green technologies would save $5,200 per year and shrink their emissions by five tonnes (or 64%).

Switching now is also future-proofed. As the carbon tax rises, the cost savings grow – reaching an additional $790 per year on average for every Canadian household in 2030. And as the electrical grids in these provinces decarbonize, the already low emissions will piggyback them right down to zero.

In the U.S., those figures will shift state-to-state as well. But in New York, households switching to these four technologies would save an average of US$2,133 per year while reducing their carbon footprints by 7.3 tonnes.

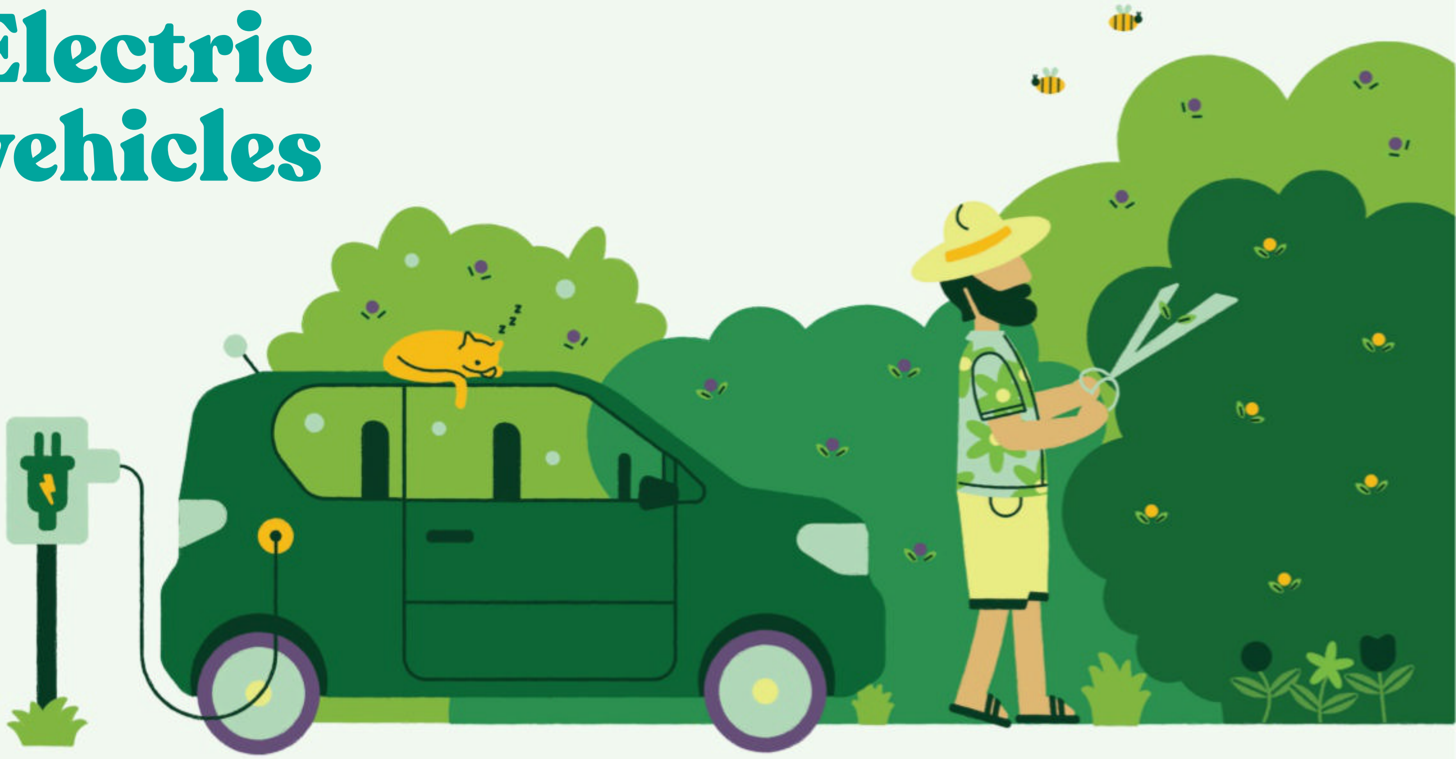
We've reached out to early adopters in Canada to find out about the benefits and challenges of these technologies and have created online calculators so you can figure out the estimated cost and emissions savings associated with each technology depending on where you live. While no one would say these four pieces of green technology are a panacea for solving climate change, they're a big start. And they're something individuals can do without waiting for the government to act (though the incentives and rebates help).

Each EV, water heater, heat pump and induction stove on its own may not make a big difference for the warming planet, but they will save a family hundreds, if not thousands, of dollars a year. And as North Americans switch away from burning fossil fuels and electrify their lives, the cumulative power of individual action is undeniable.

The average Nova Scotian swapping out their car, furnace, stove and water heater would save $5,200 per year.

Illustrations by Carmen Jabier

Electric vehicles



"I'm sure we've saved thousands of dollars in fuel and maintenance."

–David Hollingworth

David Hollingworth is an active skier, someone who heads up to Whistler from his home in North Vancouver for a day on the slopes whenever the powder is fresh. But unlike many of his neighbours, he straps his skis to the top of his EV – a Nissan Leaf – for the trip into the mountains and leaves his family's gas-powered car – a Honda CRV – at home. "It's just a no-brainer, the cost savings," he says. While it costs more than $100 to gas up the CRV, Hollingworth estimates that an overnight charge for the Leaf runs him only about $2.

In the eight years since he bought his EV, Hollingworth says, he's grown more enamoured with it. The electric car serves his family's day-to-day needs so well they've cancelled the insurance on their gas-powered car except for a few months in the winter when they go on longer ski trips.

"I don't keep a log of the expenses for both vehicles, but it's just obvious. I'm sure that we've saved thousands of dollars in fuel and maintenance [with the EV]," he says. "Even driving the CRV a lot less, it seems to cost us at least $1,000 in repairs every year. And the Nissan Leaf, it's basically maintenance-free."

Fuel and maintenance savings are often cited as the top benefits by EV owners. In B.C. – which has the highest gasoline prices in the country and some of the lowest electricity prices – those savings are $2,450 per year on average, according to the Corporate Knights analysis.

The savings assume charging at home using average electricity prices. Of course, many EV owners minimize their costs by charging overnight when electricity is cheaper and searching out free charging, still widely available.

While EVs have a reputation for being expensive, this is changing quickly. Many of the early high-end models are now making way for entry-level EVs priced far lower than the average cost of a new car in Canada, which hit $58,478 at the end of last year.

A survey of Toronto car dealerships last year turned up four EV models with a listing price below $40,000 and nine more between $40,000 and $45,000. These prices don't include the $5,000 federal EV purchase subsidy, which is topped up by certain provinces, ranging from $2,500 in Newfoundland and Labrador to $7,000 in Quebec. (Ontario cancelled its EV purchase rebate in 2018 when Doug Ford's Progressive Conservatives came into power.)

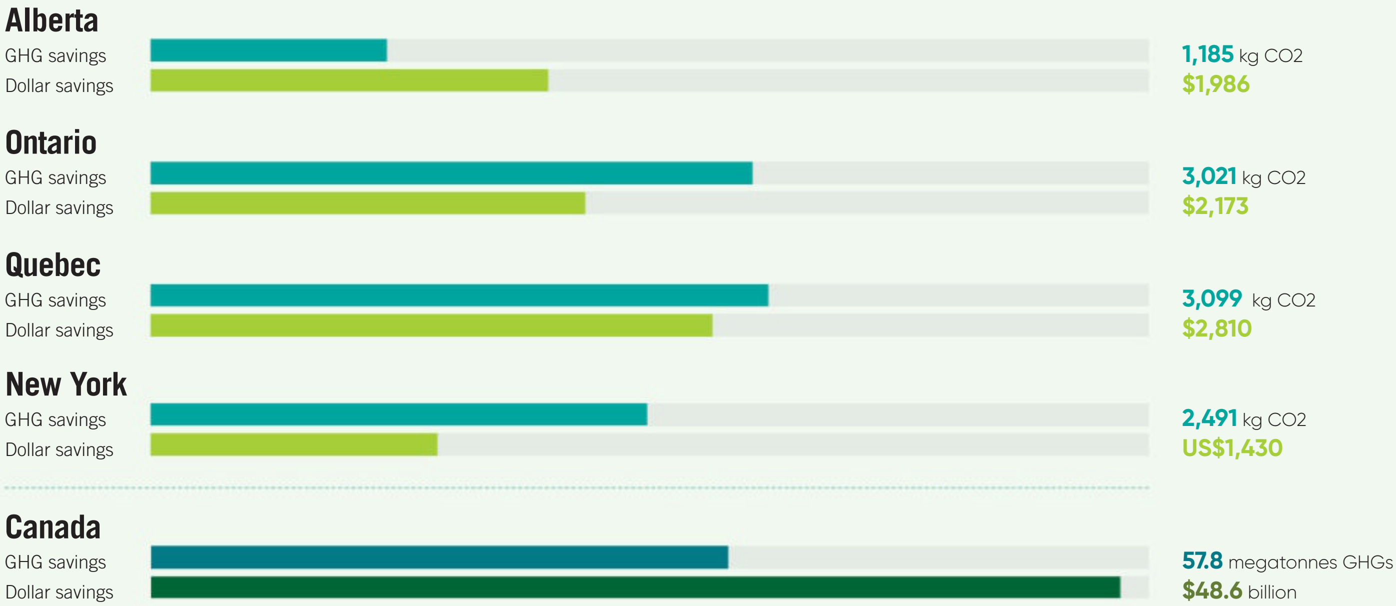
In B.C. and Quebec, the purchase subsidies are coupled with a sales mandate, requiring dealerships to have EVs available for purchase. (The federal government announced a nationwide sales mandate last December.) This combination has fuelled the fastest uptake of EVs in the country. Last year, EVs made up 16% of all new car sales in B.C. and 12% in Quebec.

Ontario lags behind. Only 6.5% of new car sales in the province were EVs last year. Since automakers send their EVs to the provinces that have sales mandates, Ontarians have to wait for months or even years on Canada's longest EV wait lists.

In addition to savings, EVs also boast souped-up climate impacts. Even in provinces with electricity generated from fossil fuels, EVs dramatically reduce emissions because they're so efficient. In an EV, up to 91% of the energy in the battery goes directly to turning the wheels,

Switching to EVs

Average household savings



while in a gas-powered car, 84% of the energy in the gas tank is lost to heat and friction.

So in Alberta and Saskatchewan, where most electricity is generated by burning coal and natural gas, an average family would reduce their carbon emissions by 1.2 tonnes by switching to an EV, the Corporate Knights analysis found.

In Quebec, Manitoba and B.C., where most electricity comes from hydro dams, an EV would reduce a family's carbon emissions by far more: 3.1 tonnes per year.

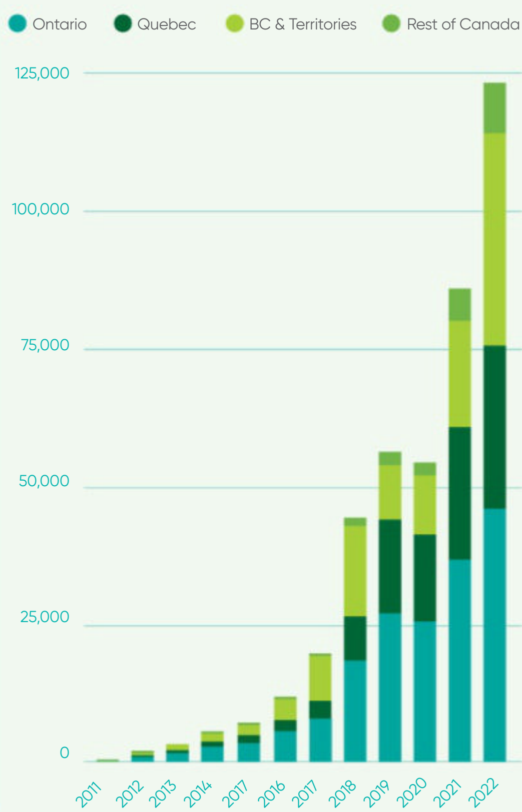
Nationwide, if everyone switched to an EV, it would reduce Canada's carbon emissions by 57.8 megatonnes, or about 8.6% of all emissions. This assumes we maintain our current electrical generation sources. But if the federal government succeeds in getting our electrical grids to net-zero by 2035, EV adoption would reduce emissions by 67 megatonnes, or 10%.

On each trip up to Whistler in his Leaf, Hollingworth has to make a 20-minute stop in Squamish for a quick charge. He uses the opportunity to stretch and admire the mountains, taking pleasure, he says, in knowing he's doing his part to protect them from climate change. "There is some type of endorphin or dopamine that happens when you know you just saved a bunch of carbon emissions."

He says he thinks everyone will soon be driving EVs, not only to reduce emissions, but because they're so much cheaper and more convenient to operate. "We're in a transition period now. People will roll their eyes in the future when they look at how we lived today."

EV sales rev up across Canada

Electric vehicle sales surge in Ontario and B.C.



In B.C., switching to an EV would save you on average $2,450 per year.

Graph (top) source: Corporate Knights
Graph (bottom) source: Statistics Canada

Heat pumps

"We're saving a lot of money. We're really happy with that."

–Brian Gifford

Shortly after Brian Gifford retired and moved back to Halifax, he knew he had to do something about the oil furnace in his basement, which was costing him $2,500 to run each winter. Not knowing that he had any choice but to continue to use oil, he added insulation to his basement, walls and attic – and saw his heating bills go down to $1,700.

Five years later, he was told his firebox had a crack and the furnace would have to be replaced, so he looked at switching to natural gas – newly available in the Maritimes – or buying an electric heat pump. "Both environmentally and financially, heat pumps made a whole lot more sense," he says. Installed in 2015, the heat pump has reduced his annual heating bill to $700 – about a quarter of what it used to be. "The heat pump is a huge, huge benefit, especially in places like the Maritimes, where heating costs are relatively high because we use oil," he says. "We're saving a lot of money. We're really happy with that."

For decades, heat pumps weren't powerful enough to heat through Canadian winters. But a new generation of cold-climate heat pumps now available have been shown to work in the deep cold of Whitehorse. They also do double duty, running in reverse to provide air conditioning in the summer.

Much like the EV, the heat pump electrifies something that's traditionally powered with fossil fuels. And like an EV, switching to a heat pump to heat your home saves money and reduces emissions – even on a dirty grid, like Nova Scotia's – because the technology is so much more efficient.

While the newest natural gas furnaces operate at 98% efficiency, heat pumps are 220 to 320% efficient in Canadian conditions. This means that in a furnace, one unit of energy in natural gas produces 0.98 units of heat in your home. But with a heat pump, one unit of energy in electricity produces 2.2 to 3.2 units of heat. This works because heat pumps use ambient heat in the air and concentrate it, gaining a multiplier effect on the energy used to power the process.

As a result, heat pumps promise cost savings not only for people who switch from natural gas and oil furnaces, but for those switching from electric baseboards, because they will use far less electricity to produce the same amount of heat.

The Corporate Knights research division calculated that for a typical single-family detached house in Nova Scotia, switching from an oil furnace to a heat pump would save $1,750 in annual heating costs. They would save even more switching from baseboard heating: $2,773 per year.

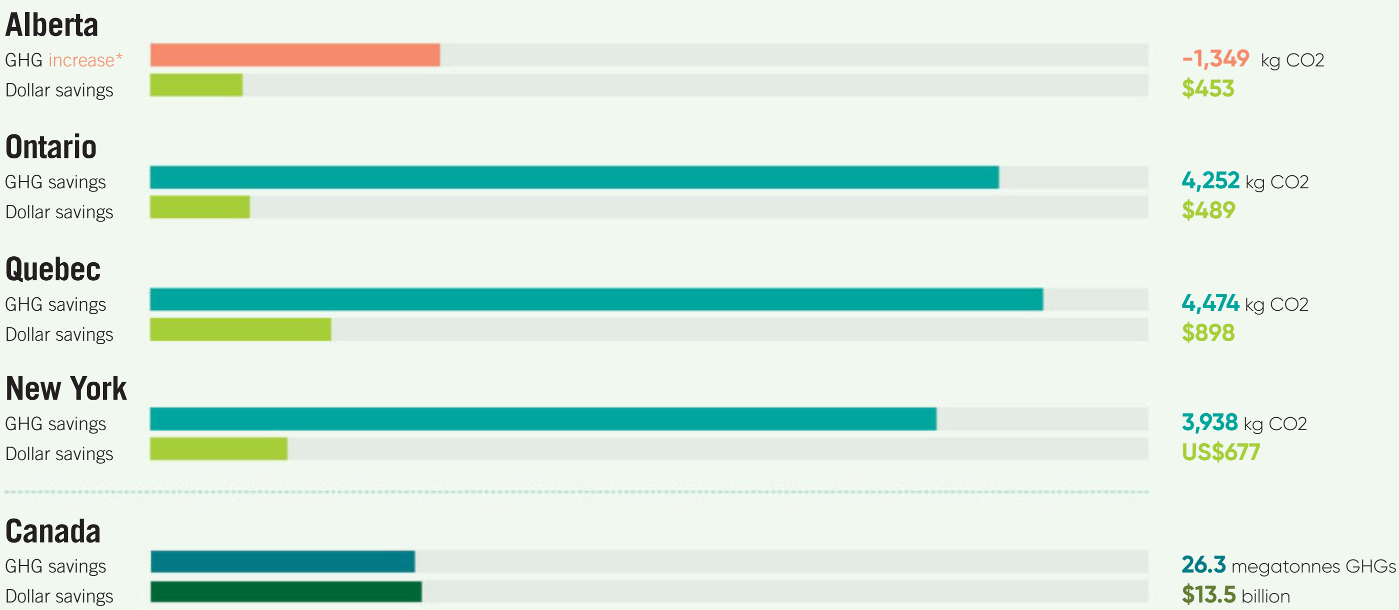
The price to install a heat pump can vary from around $4,500 for a hybrid (one that works with your existing furnace) to upwards of $20,000 for a top-of-the-line centrally ducted model. Federal government rebates of up to $5,000 and zero-interest loans of $40,000, both offered through Ottawa's Greener Homes Initiative, can significantly reduce how much you pay out of pocket at the outset. It can even eliminate the cost: if you're switching from oil to a heat pump, there's a special federal program that will cover up to $10,000.

Provincial rebates stack on top of the federal ones, offering an additional $5,000 in Ontario and Nova Scotia and up to $20,000 in Quebec, reducing upfront costs even further.

Since the federal subsidies were introduced in 2021, heat pump adoption has shot up, surpassing sales of natural gas furnaces in Canada for the first time, according to wholesale shipment information tracked by the Heating, Refrigeration and Air Conditioning Institute of Canada.

Switching to heat pumps

Savings for typical single detached house



Because of their efficiency, heat pumps use far less energy to heat than furnaces, but just how big their impact is on carbon emissions is mostly determined by how the electricity is generated. In Nova Scotia, where the majority of electricity comes from coal and oil, switching from an oil furnace to a heat pump will reduce a typical household's emissions by 1.2 tonnes. In provinces with lots of carbon-free renewable electricity, the greenhouse gas reductions are even greater. In Ontario, for example, a household making the switch to a heat pump would reduce their emissions by 4.2 tonnes and save $489 a year at today's gas prices – savings that will nearly double by 2030 as the carbon price increases.

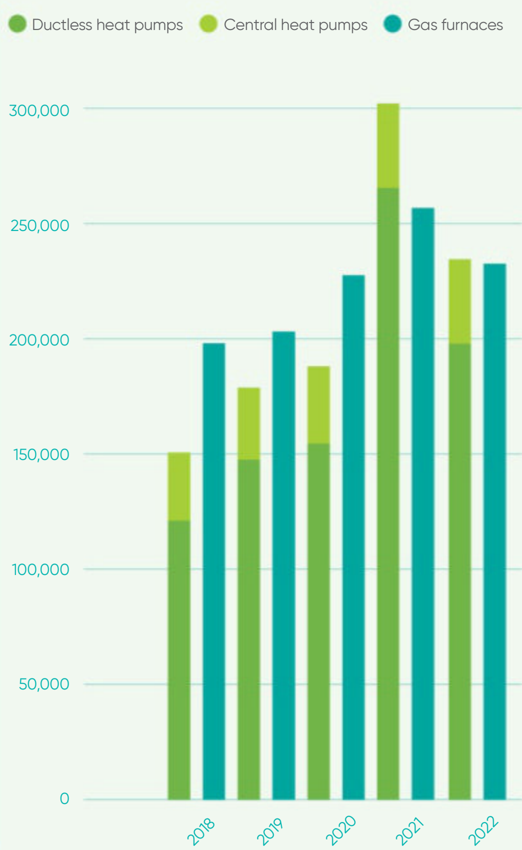
Canada-wide, if everyone switched to heat pumps, it would produce annual savings of $13.5 billion and emission reductions of 26.3 megatonnes, equal to 4% of Canada's total GHG emissions, according to the Corporate Knights analysis.

For a peek at the future, look no further than Sweden, where heat pumps have almost entirely replaced oil for residential heat. Since 1990, heat pumps have been responsible for reducing carbon emissions from heating by 95%, according to Martin Forsén, the president of the European Heat Pump Association, who gave a recent presentation in Toronto. The adoption of heat pumps has gone so well in his Scandinavian country that he sees their global dominance as an inevitability. "I don't think it's a question of if. It's just a question of when," he says.

That's a sentiment Gifford shares. Heating by burning fossil fuels in your basement will soon be a thing of the past. "It's a necessary change and I'm looking forward to it," he says. "It can't happen soon enough."

Heat pump sales on the rise

Ductless heat pumps are particularly popular



*Because the electrical grid is so carbon-intensive in Alberta, there are no emissions savings from electrifying heat/water heating/cooking at the current time. But the grid is decarbonizing quickly, and this will soon no longer be the case.

In Ontario, switching to a heat pump would save your household $489 a year.

Graph (top) source: Corporate Knights
Graph (bottom) source: Heating, Refrigeration and Air Conditioning Institute of Canada

Water heaters & induction stoves

"It's not just one thing or the other. You can . . . lower your bills. But it's also better for the environment."

–Anya Barkan

Anya Barkan's water heater was 15 years old and "a piece of garbage" when she called her rental company and asked for it to be replaced. After some back and forth that left her frustrated, she decided to break free from the rental contract she had inherited when she bought her home and get a heat-pump water heater. "It just made sense. We wanted to stop that monthly fee and get something that is much more energy-efficient and also not reliant on natural gas," she says.

Breaking the contract proved much harder than getting the heat-pump water heater. But ever since, Barkan says, she has been happy – and not only because she no longer pays the monthly rental fee. "It's like shooting two birds with one stone. It's not just one thing or the other. You can make your house more efficient and lower your bills. But also, it's better for the environment in terms of fighting climate change."

Water heaters don't have a huge impact on gas bills on their own. But like gas stoves, they are often one of the few links to the natural gas system in a home. If swapping these two gas appliances for electric means being able to cut your gas line, it supercharges the savings because it eliminates the fixed monthly charge for natural gas, which comes to $325 a year in Ontario.

The Corporate Knights research found that swapping out the gas water heater for one that operates with a heat pump would save an Ontario family $124 per year. Similarly for an induction stove: the annual savings in Ontario for switching from a gas stove are only $5, but if switching allows you to cut your gas line, those combined savings jump to $454 a year.

But it's not just economics. There are other reasons people are looking to get rid of their gas stoves. Worries about air quality in the home surfaced earlier this year after an official with the U.S. Consumer Product Safety Commission said the agency was considering banning new gas stoves amid research that links them to childhood asthma.

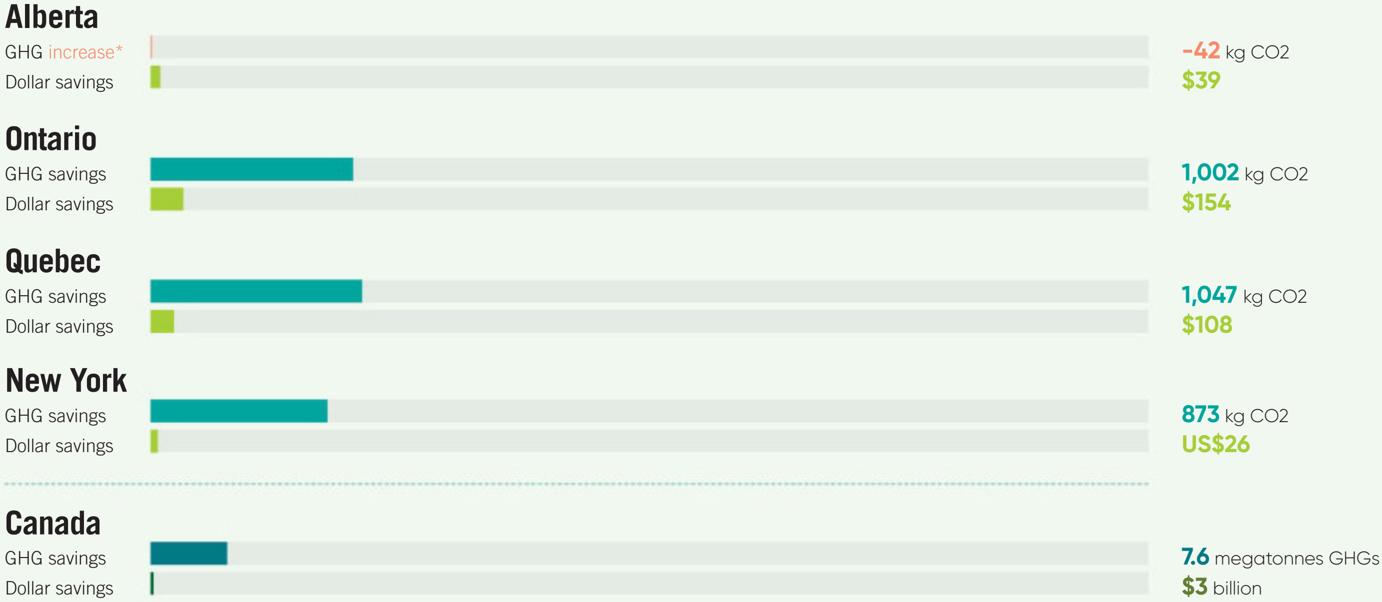
While the ensuing uproar prompted the head of the agency to walk back talk of a ban, the health hazards are real. Health Canada's residential indoor air-quality guidelines estimate that 25% of houses with gas stoves exceed the exposure limit for nitrogen dioxide, one of the toxic compounds released when a gas stove is turned on and "for brief periods of time after cooking," even with "moderate ventilation."

Meanwhile, some professional chefs recommend switching to induction stoves for performance reasons alone, saying they're faster to heat up, more responsive, not as hot to work over and easier to clean.

Soon, people moving into new houses and apartments could have no choice but to go without gas appliances. Dozens of cities across the United States, recently joined by Vancouver, have banned natural gas hookups in new developments. New York State just passed a

Switching to water heaters & induction stoves

Average household savings



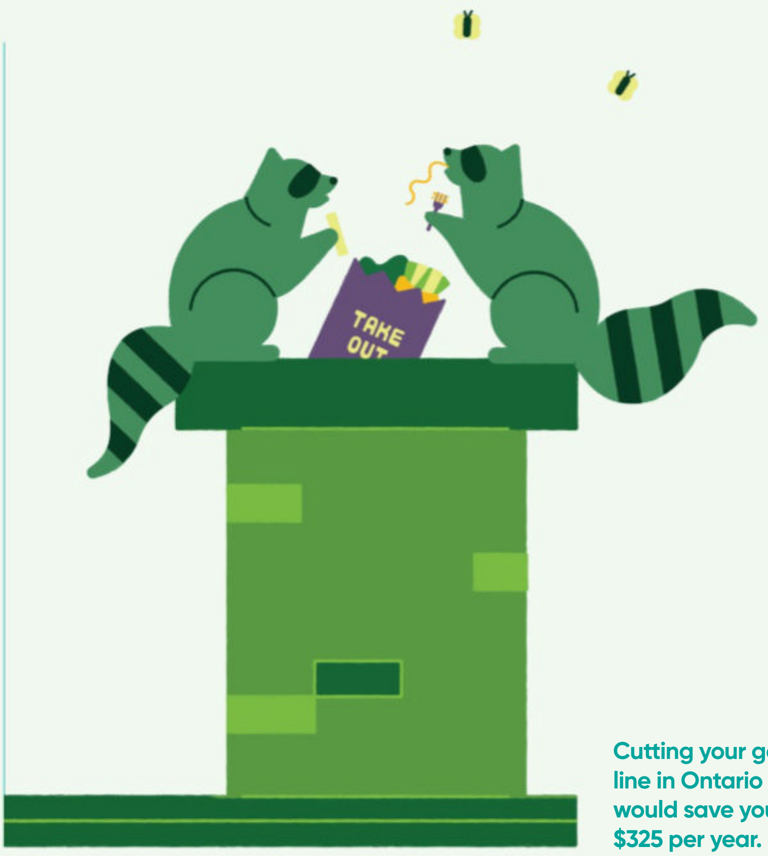
similar ban statewide, and Toronto and Montreal city councils are considering similar measures.

Even though they burn little gas, the climate impact of eliminating these gas-burning appliances isn't negligible. Switching from a gas stove to induction will reduce an average Ontario household's indoor emissions of greenhouse gas by 370 kilograms. Swapping a gas water heater for a heat pump version saves 640 kilos.

If everyone in Canada made these changes, the collective impact would reduce emissions by 7.6 megatonnes, more than 1% of all emissions in the country. It's what analysts refer to as the light-bulb effect. When incandescent light bulbs were replaced by LEDs, the difference in electricity consumption was tiny for a lamp or light fixture. But multiplied across households, apartment buildings, university campuses and sport stadiums, the cumulative impact was enormous.

That's where we're at right now with climate change. The solutions are all readily available. The wind turbines and solar panels that will provide clean electricity are being adopted much faster than anyone predicted. Now it's time to electrify and use that clean electricity to eliminate carbon emissions.

"It's not just your individual action that will change the world," says Barkan. "We need to go at it together."



Cutting your gas line in Ontario would save you $325 per year.

Graph source: Corporate Knights

These corporate citizens are a cut above

Two decades into the Best 50, the top Canadian companies continue to evolve and invest in a cleaner future

By Rick Spence

Rick Spence is a business journalist and senior editor at *Corporate Knights*.

Just as more than 95% of climate scientists accept the truth of climate change, most corporate leaders recognize that their role in society has changed. Businesses know they have to go beyond reducing the incidental damage they do to the planet and actively join in building more just and prosperous communities. Especially if they want to succeed long-term.

In the past few years, energy economics have flipped to the point where renewables are cheaper than fossil fuels. Companies have also discovered that happy, healthy employees, customers and communities create healthier markets – and happier shareholders.

More than ever, Canadian companies are getting this message. Since 2002, Corporate Knights' ranking of Canada's Best 50 Corporate Citizens has been tracing public and private companies as well as Crown corporations with more than $1 billion in revenues. Our researchers probe 25 key performance indicators (KPIs) to assess how firms manage their resources, employees and finances in comparison to their peer group, with 50% of each company's score tied to the percentage of their revenue and investments that qualify as sustainable. For the Best 50, that percentage keeps climbing.

Tellingly, the 2023 list is dominated by renewable-energy players high in sustainable revenue. Topping the Best 50 this year (up from second place in 2022 and 20th in 2021) is a pure-play clean energy company: Innergex Renewable Energy. The Longueuil, Quebec–based renewable-power producer operates 40 hydroelectric facilities, 35 wind farms, 11 solar farms

Best 50 companies earn on average 46.3% of their revenue from sustainable sources, nearly 10 times that of the average large Canadian company.

and one energy-storage facility in Canada, the U.S., France and now Chile. It has 11 more projects in the works (see page 52 for profile). In fact, Innergex is the only pure-play renewable-energy company on the Best 50 (giving it 100% sustainable revenue). The company has also continually improved on its disclosure of environmental indicators, which helped it climb to the top of the ranking.

In second place this year (up from third in 2022 and 14th in 2021) is Brookfield Renewable Partners, the renewable-energy platform of Brookfield Corporation, the former Brascan empire (which got its start providing electricity in Brazil). With a market cap of $20.2 billion, more than seven times Innergex's $2.7 billion, Brookfield Renewable produces 25,400 megawatts of electricity through hydro, wind and solar facilities in Canada, the U.S., Colombia, Brazil, Europe and Asia. The company's latest annual report says it's also focusing on investing in "emerging transition asset classes" such as carbon capture and storage, recycling and biogas, "where our initial investment positions us for potential future large-scale decarbonization investment."

In third place is Hydro-Québec, which was the top company in 2022, 2021 and 2018. While the company largely maintained its sustainable revenue from last year, competition is growing fiercer as more renewable-energy companies jump ahead.

The "most improved" company on the list is Canadian National Railway. It climbed from 35th place to seventh this year thanks to a notable increase in investments mainly aimed at rail network safety and integrity, as well as track infrastructure network resiliency and information technology initiatives. These investments totalled $2.5 billion, or 85% of CN's total investments, in 2021.

Best 50 vs. the rest

How do Canada's Best 50 Corporate Citizens stack up against other large Canadian companies?

	Indicator	2023 Best 50	2022 Best 50	2023 average*	2022 average*
1	CEO–average worker pay ratio	108:1	74:1	94:1	160:1
2	Board gender diversity	39.3%	36.7%	31.3%	23.3%
3	Executive gender diversity	26.8%	26.6%	21.4%	13.1%
4	Board racial diversity	11.7%	8.8%	12.1%	8.2%
5	Executive racial diversity	10.6%	12.0%	11.0%	6.6%
6	Cash taxes paid (% of EBITDA)	9.2%	11.6%	8.4%	8.9%
7	Sustainable revenue (% total revenue)	46.3%	36.8%	5.1%	6.2%
8	Sustainable investment (% total investment)	49.7%	33.8%	6.4%	12.7%
9	Carbon productivity ($ sales/tonnes GHGs)	$331,652	$1,517,909	$1,350,984	$641,183
10	Sustainability pay link	39/50	46/50	94/236	111/284
11	Energy productivity ($ sales/GJ energy used)	$139,725	$216,105	$6,291,828	$192,776
12	Water productivity ($ sales/water withdrawn)	$38,246	$90,819	$57,097	$83,391
13	Waste productivity ($ sales/total non-recycled waste generated)	$3,707,012	$105,187,764	$51,965,803	$47,484,934

Illustration by Matthew Billington

*Large Canadian companies (with more than $1 billion in annual revenue) excluding the Best 50

Methodology

All companies are scored on applicable metrics relative to their peers, with 50% of the weight assigned to sustainable revenue and sustainable investment. Nine of the 25 indicators have fixed weights; the rest are assigned weights according to each industry's relative impact in relation to the overall economy.

Sustainable revenue: % of total revenue derived from products and services categorized as "sustainable" under the Corporate Knights Sustainable Economy Taxonomy

Sustainable investment: % of total investments in assets categorized as "sustainable" under the Corporate Knights Sustainable Economy Taxonomy

Board/executive gender diversity: % of non-male board members and executives

Board/executive racial diversity: % of racially diverse board members and executives

Sustainability pay link: Link between senior executives' variable compensation and sustainability-themed performance targets

Taxes paid: Based on company's ratio of cash taxes paid to profit over past five years

Paid sick leave: 10 or more paid sick-leave days per year

Pension fund status: A series of calculations assessing the generosity/viability of defined contribution/defined benefit plans

Energy/carbon/waste/waste productivity: $ revenue per unit (gigajoule/tonne/cubic metre/tonne of waste) of non-renewable energy consumption, direct/indirect CO2e, freshwater withdrawal, non-recycled waste produced

VOC/NOx/SOx/PM productivity: $ revenue per tonne of VOC, NOx, SOx and particulate matter emissions

CEO–average worker pay: How much more CEO gets paid (expressed as multiple compared to average worker)

Supplier score: Sustainability score of a company's largest supplier by spend

Financial sanctions: Total fines, penalties and settlements as % of revenue

Fatalities: Fatalities per total employee count

Injuries: Lost-time injuries per 200,000 work hours

Turnover: Number of departures divided by the average total employees

Complete results and methodology details can be viewed at corporateknights.com.

Companies have discovered that happy, healthy employees, customers and communities create healthier markets.

Edmonton engineering firm Stantec scored highest on the Best 50 when it came to the percentage of its executives' variable pay linked to sustainability targets. With 26,000 employees and 350 offices on six continents, CEO Gord Johnston says the fast-growing company has been focused on building better communities for more than a decade. Initially, "community" meant including parks or public artworks in urban projects or adding water parks to water treatment plants. But over time it came to encompass designing buildings for mental health, promoting accessibility standards far beyond those of local building codes, and partnering with Indigenous communities to stimulate economic development. Johnston says that "we scaled community" to include not just cities, but whole countries, the world and the climate.

How does your company or employer compare to the Best 50?
Here are a few indicators to consider. The average percentage of sustainable revenues achieved by 2023 Best 50 companies is 46.3%, up from 36.8% in 2022, and nearly 10 times the 5% earned by the average large Canadian company (ALCC). They're sinking more investment money into the green economy, too: the percentage of total investment dollars put toward sustainable investments is just shy of 50% for this year's Best 50, up from 33.8% in 2022 – and eight times greater than the ALCC's 6%. Some 78% of Best 50 companies link executive pay to sustainability goals, versus just 40% of other companies.

On the diversity front, the numbers are still far from where they need to be, but the average Best 50 firm has achieved executive gender diversity of 26.8%, versus 21% for the ALCC. The boards of directors of

Top 10 International Corporate Citizens

The leading companies that have a subsidiary in Canada with at least $1 billion in revenue.

	Companies	Country	Score
1	Schneider Electric SE	France	75.5%
2	Alphabet Inc	United States	66.6%
3	Unilever PLC	United Kingdom	62.4%
4	HP Inc	United States	62.2%
5	SAP SE	Germany	62.1%
6	Cisco Systems Inc	United States	59.0%
7	Rexel SA	France	56.7%
8	Telefonaktiebolaget LM Ericsson	Sweden	54.0%
9	Siemens AG	Germany	53.1%
10	Apple Inc	United States	52.7%

Canada's Top International Corporate Citizens earn the highest scores on the Corporate Knights' 2023 Global 100 Most Sustainable Companies in the World list.

Ranking

2023	2022	Companies	CK peer group	$ sales/ tonne CO2e	% taxes paid	CEO–average worker pay ratio	% non-male board directors	% sustain-able revenue	Final score
1	2	Innergex Renewable Energy Inc	Power generation	$97,815	1.7%	17:1	30.0%	100.0%	A+
2	3	Brookfield Renewable Partners LP	Power generation	$21,806	4.2%		25.0%	99.3%	A-
3	1	Hydro-Québec	Power generation	$31,644	13.6%		68.8%	94.5%	A-
4	10	Société de Transport de Montréal	Transit & ground transportation	$14,937	0.0%		50.0%	85.3%	A-
5	13	Stantec Inc	Engineering construction	$214,212	11.6%	50:1	33.3%	53.0%	A-
6	6	WSP Global Inc	Engineering construction	$177,370	10.4%	85:1	37.5%	51.5%	B+
7	35	Canadian National Railway Co	Freight transport, all modes	$2,224	10.0%	106:1	45.5%	40.5%	B+
8	17	Canadian Pacific Railway Ltd	Freight transport, all modes	$2,149	12.8%	201:1	45.5%	44.0%	B+
9	12	Northland Power Inc	Power generation	$1,388	5.0%	27:1	44.4%	86.8%	B+
10	7	Telus Corp	Telecom providers	$54,239	9.2%	297:1	40.0%	62.3%	B
11	15	Vancouver City Savings Credit Union	Banks	$1,322,291	3.5%	8:1	66.7%	26.0%	B
12	14	Co-Operators	Insurance companies	$756,829	27.6%	20:1	36.4%	22.6%	B
13	18	Énergir	Natural gas transmission & distribution	$30,794	0.4%	9:1	33.3%	30.9%	B
14		Saskatchewan Telecommunications Holding	Telecom providers		7.1%	10:1	36.4%	57.8%	B
15	11	EPCOR Utilities	Power transmission & distribution	$8,298	1.5%	32:1	36.4%	42.2%	B
16	39	Alectra Inc	Power transmission & distribution	$404,143	2.0%	7:1	28.6%	36.6%	B-
17		Greenlane Renewables Inc	Power generation		0.0%		42.9%	100.0%	B-
18	8	Cascades Inc	Packaging	$4,198	3.1%	201:1	50.0%	91.5%	B-
19	9	Toronto Hydro Corp	Power transmission & distribution	$118,289	4.4%	8:1	36.4%	37.0%	B-
20	4	BCE Inc	Telecom providers	$68,365	7.9%	125:1	35.7%	48.4%	B-
21	23	Boralex Inc	Power generation	$19,896	1.4%	15:1	36.4%	96.9%	B-
22	24	Cogeco Communications Inc	Telecom providers	$95,151	6.3%	35:1	50.0%	32.3%	B-
23	27	British Columbia Hydro and Power Authority	Power generation		8.5%		58.3%	92.4%	C+
24	41	Gildan Activewear Inc	Textiles & clothing mfg	$7,843	1.9%	961:1	30.0%	38.5%	C+
25	22	Royal Canadian Mint	Metal products mfg	$469,381	11.4%		63.6%	46.7%	C+
26	16	Transcontinental Inc	Plastic & rubber products mfg	$11,415	14.8%	83:1	35.7%	22.1%	C+
27	19	Hydro One Ltd	Power transmission & distribution	$19,034	1.6%	10:1	36.4%	34.8%	C+
28	20	EcoSynthetix Inc	Basic inorganic chemicals & synthetics				40.0%	100.0%	C+
29		Rogers Communications Inc	Telecom providers	$88,076	8.0%	337:1	33.3%	45.0%	C+
30	26	Celestica Inc	Semiconductor & electronic components mfg	$83,519	11.0%	306:1	20.0%	62.6%	C+
31	37	Iamgold Corp	Metal & coal mining	$1,929	15.2%	72:1	37.5%	1.0%	C+
32	33	Teck Resources Ltd	Metal & coal mining	$3,689	13.5%	86:1	25.0%	6.8%	C+
33	5	Kruger Products LP	Packaging	$3,464	1.7%	14:1	20.0%	55.2%	C+
34	29	TransAlta Renewables Inc	Power generation	$180	0.8%		37.5%	75.1%	C+
35		GFL Environmental Inc	Personal & business services	$1,117	0.6%	440:1	12.5%	100.0%	C
36		Manitoba Hydro-Electric Board	Power generation	$23,054	11.7%	5:1	33.3%	79.4%	C
37		Canada Post Corp	Freight transport, all modes	$45,110	6.4%	10:1	50.0%	0.2%	C
38	42	Agnico Eagle Mines Ltd	Metal & coal mining	$5,529	17.7%	112:1	33.3%	1.3%	C
39	36	Desjardins Group	Banks	$2,204,076	22.3%	41:1	44.4%	3.6%	C
40	21	Sun Life Financial Inc	Insurance companies	$622,072	14.9%	107:1	55.6%	4.2%	C
41	25	IGM Financial Inc	Asset management	$7,162,176	16.6%	36:1	33.3%	6.9%	C
42		Canadian Utilities Ltd	Power transmission & distribution	$2,886	3.0%	20:1	36.4%	24.6%	C
43	31	Bank of Montreal	Banks	$224,613	19.8%	78:1	46.2%	4.0%	C
44		Canadian Tire Corporation Ltd	Retail, except grocery & auto	$169,655	13.9%	116:1	18.8%	1.6%	C
45		West Fraser Timber Co Ltd	Forest products	$3,626	19.4%		41.7%	50.0%	C-
46	40	Algonquin Power & Utilities Corp	Power generation	$936	1.0%	59:1	44.4%	24.1%	C-
47	45	Manulife Financial Corp	Insurance companies	$173,260	19.9%	132:1	50.0%	3.0%	C-
48	49	NFI Group Inc	Car & truck mfg, including parts		26.3%	44:1	40.0%	32.0%	C-
49	48	BGIS	Real estate & leasing	$149,899	2.7%	13:1		2.5%	C-
50	50	Paper Excellence Canada Holdings Corp	Forest products	$1,784	19.0%		0.0%	58.9%	C-

For the complete Best 50 Corporate Citizens scores across all key performance indicators, including details on which companies have signed on to global climate commitments, **visit our website: corporateknights.com.**

The best of the Best 50: Meet 8 KPI leaders

Highest growth in sustainable revenue:
Société de Transport de Montréal
The transit company's sustainable revenue climbed from 70.6% to 85.3% thanks to increased revenue from electric buses and the metro system.

Most sustainable investments:
Canadian Pacific Railway Ltd
CP invested $6 billion into the maintenance, expansion and acquisition of rail network and infrastructure. It also invested in the installation of a solar farm at its headquarters.

Most gender-diverse board:
Hydro-Québec
Unchanged from last year, 68.8% of Hydro-Québec's board members are women, including the chair of the board.

Most racially diverse board:
Vancouver City Savings Credit Union
55.6% of Vancity's board members are racially diverse, up from 44.4% last year.

Lowest gap in CEO–average worker pay:
The Manitoba Hydro-Electric Board
With a ratio of 5.4:1, Manitoba Hydro had the smallest gap between CEO pay and average employee pay.

Highest % taxes paid:
Co-operators
Co-operators paid 27.6% of its operating income in taxes over the 2017 to 2021 period, virtually unchanged from its 27.8% in the previous period.

Highest sustainability pay link:
Stantec
34.8% of the variable compensation of the engineering firm's CEO was tied to sustainability-related performance targets, including emission reduction, diversity and inclusion, and employee health and safety.

Highest carbon productivity:
IGM Financial Inc
The wealth and asset management company generated $7,162,176 in revenue per tonne of Scope 1 and 2 emissions, down slightly from $9,827,286 in the previous year.

Since 2002, Best 50 companies have outperformed the S&P/TSX Composite Index by 128%.

Best 50 companies have a gender diversity rate of 39.3%, versus 31% for the ALCC. Companies are even further behind when it comes to hiring racially diverse leadership. Though board racial diversity among Best 50 companies improved slightly from 8.8% last year to 11.7% this year, executive racial diversity dropped from 12% to 10.6% this year.

Best 50 bring home higher returns

Overall, the data consistently show that shares of the Best 50 outperform their "less-best" industry peers. Corporate Knights researchers compared the stock performance of the public companies on the 2023 Best 50 versus that of the S&P/TSX Composite Index. Since 2002 (the year we published our first Best 50 list), Best 50 companies have rewarded their shareholders with 128% higher returns than the overall composite index. It's evidence that the "triple bottom line" (profit, people and planet) doesn't compromise the single bottom line – but expands it.

Winding road to sustainability

But for billion-dollar corporations in particular, sustainability is a journey, and progress is rarely predictable. Rogers' (no. 29) recent takeover of Shaw Communications, for instance, has been roundly criticized for reducing competition in Canada's telecom industry. (And Rogers' decision to pay CEO Tony Staffieri $31.5 million during his first year pretty much blows up the company's CEO-to-employee pay gap). Rogers' arch-rival, Telus (no. 10), has been embroiled in a recent labour dispute that left its unions bristling. And Teck Resources (no. 32) has recently been in the news for its controversial plan to splinter off its carbon-heavy coal mines, which have become an ESG liability for investors. Though the Vancouver-headquartered company has installed $1.2 billion worth of water treatment technology in the Elk Valley, "chronic toxicity impacts" persist in Elk Valley waters, according to the B.C. government.

Nonetheless, all three of these companies earned their Best 50 rankings. Teck scored highly in relation to its peers in part because 6.8% of its revenue comes from recycled minerals and minerals needed for the low-carbon transition. Rogers secured the 29th position because 55% of its investments involve improving telecommunications infrastructure, a key component of the energy transition. Rogers also earned points for its energy-efficient data centres and its refurbishing and recycling of used devices. Telus earned 10th spot, as it scored highly against its peers on sustainable revenue and sustainable investment as well as on all four diversity metrics.

No company makes the right decision every time. But two decades into the Best 50, the ranking proves that a large number of Canadian companies are willing to evolve and invest in a cleaner, more equitable future. The real bottom line is that business and the planet constitute a closed ecosystem – in this fragile biosphere the smartest companies know that putting sustainability first is the ultimate key to lasting success.

Top company profile

Innergex Renewable Energy

This Quebec company is betting the wind farm on the world's unquenchable thirst for renewables

By Diane Bérard

Diane Bérard is an independent-solutions journalist based in Quebec.

For years, Quebec Premier François Legault has said that his province's hydropower could make it the "battery of North America." The province, long known for its giant hydro dams and electricity surpluses, has signed deals to sell its cheap and clean electricity to New York City and parts of New England. But as the electrification of everything from cars to home heating gets underway, surpluses are becoming a thing of the past, and some are questioning whether hydro dams alone can meet the province's domestic demands for electricity in the future.

Now the Quebec government has announced that wind energy will become a larger piece of the province's energy puzzle – as it will for the rest of the planet. One Longueuil-based company, betting big on wind and solar, is well positioned to fill the rising demand, at home and abroad. And that company has risen to the top of Corporate Knights' 2023 ranking of Canada's Best 50 Corporate Citizens.

Three decades of renewable energy

For more than 30 years, Innergex Renewable Energy has developed, owned and operated clean electricity facilities in Quebec. The company was founded in 1990 after the provincial government called for private sector bids to develop small hydro-generation facilities. A decade later, Innergex began scouting out locations for wind turbines in the Gaspé region, partnering with TransCanada Corporation (now TC Energy) on its first wind energy bid.

Having acquired B.C.'s Alterra Power Corporation in 2018 and Chile's Energía Llaima in 2023, Innergex is now the largest independent renewable-energy company in both Canada and Chile, with expansion plans in the U.S. and France. Today, the $870.5-million company has a gross installed capacity of 4,244 megawatts (MW) of wind, solar and hydro – that's more installed renewable capacity than the entire province of Ontario. And it plans to double that by 2025.

The ambitious energy transition plans of both the U.S. and Canada will require a lot of new clean energy. The U.S. government has committed to reducing greenhouse gas emissions by 50 to 52% by 2030 from 2005 levels, and Canada is aiming for a 40 to 45% reduction. Innergex CEO Michel Letellier plans to take advantage of these greening trade winds.

"There are few gains to be expected from hydroelectricity," says Letellier at his Longueuil office on the South Shore of Montreal. Although a third of its facilities rely on hydroelectricity, Innergex plans for a diversified future. "The best sites for dams are occupied. And we won't get more than 1.5%, maybe 2%, additional output from [existing hydro facilities]. In Quebec, wind power is the most promising."

Decarbonization, energy security and independence will translate into growth for renewable-energy producers, confirms Anne Perreault, senior portfolio manager at Desjardins Global Asset Management. "Investors like that Innergex is diversified [solar, wind, hydro and batteries] and operates in several countries. But they have questions about financing growth. Currently, 84% of the credit line is used. So partnerships will need to be formed."

A solid partner: Hydro-Québec

Since February 2020, Innergex has had a solid partner: Hydro-Québec. The Crown corporation (which topped the Best 50 ranking three of the last four years) paid $661 million in exchange for a 19.9% stake and committed to investing $500 million in joint projects. "The absence of reference shareholders made us too vulnerable to predators. We needed a shareholder who, without necessarily holding a majority stake in the capital of a company, has a stake large enough to influence its decisions," says Letellier. "Every public company wants to maximize shareholder value. However, in our industry, value is not measured per quarter. We look at the long term. Hydro-Québec protects us from stormy weather."

So far, this strategic alliance has resulted in one joint venture: acquiring the 60 MW Curtis Palmer portfolio of run-of-river hydroelectric plants in New York State. "We definitely want to establish other partnerships with Hydro-Québec, both in the U.S. and Quebec," Letellier says.

On both sides of the U.S.-Canada border the future looks bright: governments are adopting policies and tax credits to encourage the rapid deployment of renewable-energy projects. Through the U.S. Inflation Reduction Act and budget measures announced in Canada, governments have trumpeted new incentives for renewables. But tax credits are only part of the equation to transition to renewable energy; transmission lines are critical to move the electricity generated to where it's in demand.

"Our biggest challenge, in Canada and the U.S., is the interconnectedness of projects. All the developers aim for the same locations, creating bottlenecks. We desperately need more pipes," says Letellier, referring to the need for more transition lines. The U.S. Midwest, for example, could be a Klondike for solar and wind power, but the majority of potential customers are in urban areas on the coasts.

No renewable-energy company will reach its targets without greater distribution capacity, Letellier explains. "Who will build those new transmission lines? Public utility companies? Private sector? This complex ownership structure and construction costs explain the lack of lines."

Agreements with 31 Indigenous communities

Also critical to renewable-energy projects are community relationships. Innergex prides itself on its close ties with the communities that live near its projects. Things have changed since the big hydro projects of the 1970s, says Fred Vicaire, CEO of Mi'gmawei Mawiomi Business Corporation, Innergex's Indigenous partner in Mesgi'g Ugju's'n wind farm, in Gaspésie. "For many decades, we were just a box to check for companies to say, 'We can do the project, we consulted with First Nations, and we will give them some royalties.' We don't want royalties from companies installing infrastructure in our territory. We want to own the projects 50/50 and get operating revenue from them."

The Mesgi'g Ugju's'n (MU) wind farm, located on public land in the regional county municipality of Avignon in Quebec's Gaspé Peninsula, is indeed a 50/50 partnership between the three Mi'gmaq communities (Gesgapegiag, Gespeg and Listuguj) and Innergex. The first phase of MU is a 150 MW project. The second phase will add 102 MW.

Innergex has signed agreements with 31 Indigenous communities. "They go beyond financial terms," says Vicaire. "These agreements take into account our way of life, including respect for hunting territories and lands used for traditional medicinal plants, for example."

There are agreements, and there are agreements, cautions the Innergex CEO. "Unfortunately, over the years, too many renewable-energy companies have lacked transparency, negotiating with two different financial models: one designed for First Nations, showing no profitability, and one for the board and shareholders, which was profitable. An unequal relationship dating back to the fur trade era."

"Since the early days, Innergex has believed in the three Ps: people, planet, profit," he adds. "Every company aims for a return, but we've always believed it should be reasonable and never at the expense of the other two Ps."

Partnerships can be challenging, especially when the partners don't have access to the same equity. For the first phase of the MU wind farm, Innergex brought in more equity, says Vicaire. But the second phase "is different," he says. "We have access to the First Nations Finance Authority. It finances projects at rates below prime, as municipalities would for large infrastructure projects."

The green and the greening

Innergex's relationships with Indigenous communities contribute to a strong "S" in the company's ESG ratings. They also helped secure its spot at the top of the Best 50 ranking. As a pure-play renewable-energy business, the company scored top marks on sustainable revenue and sustainable investment, which were both at 100%. It also scored in the top quartile on energy productivity and carbon productivity.

Like Premier Legault, Letellier sees batteries in his future. He says that the next frontier for renewables is energy storage – keeping electricity flowing when the wind doesn't blow and the sun doesn't shine. Becoming an expert in deploying energy-storage technologies is part of Innergex's strategic plan for 2020 to 2025. One battery project is already operational near the Yonne wind farm in France. Two others are under development in the Atacama Desert in northern Chile.

"We need all the help we can get to manage consumption," Letellier says. "And it is clear that one day not so far away, every house will have its battery."

Canada's 50 fastest-growing problem solvers

Our second annual ranking features Canada's most ambitious entrepreneurs who are scaling up quickly to solve big problems

By Rick Spence

Alberta Innovates is the launch partner for the Future 50.

Imagine a world where consumers have access to affordable, locally grown plant-based foods every day. Where we navigate crowded city streets on smaller, nimbler electric vehicles and every truck runs on zero-emission fuel. A world without unnecessary disposable plastic, where cities harvest heat from the earth, and where waste from food, farms and landfills is up-cycled into clean-burning biogas.

Sounds like a climate activist's wish list. But a group of dynamic young Canadian companies are already working on making these solutions an everyday reality.

This is the Future 50, Corporate Knights' second annual ranking of ambitious entrepreneurs who are trying to solve big problems in climate, energy, the environment, transportation, healthcare, waste disposal – even the Canadian diet. In an economy where legacy suppliers have been slow – or outright reluctant – to create significantly greener products and systems, entrepreneurs like these are forcing the issue, taking huge risks to develop greener batteries, smarter buildings, less toxic energy sources and climate-friendly business models.

Covering both public and private companies, most of them recent start-ups, the Future 50 is a daring snapshot of the energy transition. It points not just to where Canadian businesses are making their mark in the climate emergency – but where additional attention and support are also needed.

Fair warning: not all these companies will become stock-market winners and role models. Innovation is a long road, and this list is based on two decidedly short-term metrics.

The Future 50 ranks 25 public companies based on their short-term revenue growth (the rise in 2021 sales over 2020) and private companies based on the capital they've raised. Disruptive start-ups need cash, and their ability to raise funds as needed can be a major indicator of success. So the ranking of private companies is based on the percentage difference between the amount of capital each company raised in its most recent funding round and the amount raised in its previous round.

This is an unusual business metric, as early-stage funding has little to do with long-term market success. But it helps us spot the sectors that are attracting smart money from savvy venture capitalists and institutional investors. Case in point: the no. 1 company on our private list is Evanesce Packaging Solutions, a Vancouver-based innovator in plant-based certified compostable packaging solutions (think straws, fast-food containers and institutional meal trays). Led by experienced financial executive Douglas

"Li-Cycle plays an essential role in creating a domestic supply of battery materials in Canada and Europe to help drive electrification."

—Ajay Kochhar,
co-founder and CEO, Li-Cycle

Li-Cycle

Fastest-growing public company:

Growth rate: 766%

In March, Prime Minister Justin Trudeau toured a recycling plant in Kingston, Ontario, with the president of the European Commission, Ursula von der Leyen. The attraction? They watched lithium-ion batteries of all types and sizes get shredded apart so their scarce, critical materials – especially lithium, nickel and cobalt – can be reused.

The "Kingston Spoke" plant was the first commercial facility of Toronto-based Li-Cycle, whose goal is to make lithium battery production "circular and sustainable" – and 95% efficient. Founded in 2016 by CEO Ajay Kochhar and executive chair Tim Johnston, Li-Cycle now has four plants in North America and will open two more this year, in Germany and Norway. The key output of these facilities is a mix of materials that will be sent to a large plant under construction in Rochester, New York, where they will be used to produce battery-grade materials, recycling the shredded equivalent of 90,000 tonnes of lithium-ion batteries a year.

Like Trudeau and von der Leyen, investors also love Li-Cycle. Through seven rounds of financing – counting a US$375-million loan commitment in March from the U.S. Energy Department – Li-Cycle has now raised more than US$1 billion to fund its vision of a green energy future.

"A circular economy starts with soil. Our motto is 'Dirt to dirt.'"

—Douglas Horne,
CEO, Evanesce

Evanesce

Fastest-growing private company:

Growth rate: 11,282%

Over six years as a Liberal MLA for Coquitlam, B.C., former financial executive Douglas Horne became fascinated by sustainable products. After his political career expired (he lost a federal race in 2015), Horne acquired the rights to a technology to produce moulded food trays from vegetable starch and fibre and founded Evanesce. The product looks like Styrofoam, but it decomposes within 90 days. "A circular economy starts with soil," says Horne. "Our motto is 'Dirt to dirt.'" A much healthier outcome than recycling programs that rarely rescue more than 15% of consumer plastics.

After years of development and three patents, Evanesce is now bringing its products to market in the form of food trays, foam cups and other staples of fast food and food service. Meanwhile, the company has shared technologies with Taiwan-based Minima, which produces cups, plates, cutlery and drinking straws that feel like plastic – but are made from fully compostable, upcycled plant-based biopolymers. Last year, Evanesce sold $3-million worth of straws to clients such as AMC Theatres; Washington, D.C.–based Compass Coffee; and Colorado-based Eco-Products – and the firm now is talking to McDonald's about a deal for 2.5 billion straws.

While Evanesce's starch products cost about 30% more than comparable foam, Horne notes they're "half the price of anything else that's certified compostable. You have to factor in the end-of-life costs."

Illustration by Matthew Billington

Horne, a former member of B.C.'s Legislative Assembly, Evanesce raised $123,000 in start-up capital in 2018 – and a whopping $14 million in 2021.

That growth rate of 11,282% was twice that of the no. 2 company, Surrey, B.C.'s CheckSammy Technologies, which offers business customers proprietary systems for mastering their junk removal, recycling and waste-management challenges. CheckSammy raised $367,000 from investors in 2020, and two years later raised $20.3 million – a jump of 5,431%.

Topping the "public" list is Li-Cycle, which provides end-of-life recycling and resource recovery for lithium-ion batteries. Between 2020 and 2021, the Toronto-based company grew its sales from $1.05 million to $9.1 million – a gain of 766%.

Possibly even more remarkable are the three giant companies on the public list that achieved 2021 revenue numbers in the nine figures: Vancouver healthcare-services provider CloudMD Software ($102 million); Toronto plant-protein producer Global Food and Ingredients ($124 million); and Delta, B.C., greenhouse growers Village Farms International ($339 million). (While greenhouses aren't usually considered energy-efficient, Village Farms heats its Delta facilities with methane from local landfills.)

"We believe that major opportunities remain for an experienced maker of smaller, nimbler EVs."

—Susan Docherty, CEO, ElectraMeccanica

Together, these two lists point the way to an exciting new economy – and a changing future for Canada itself.

Fifteen of the Future 50 companies produce sustainable consumer and business products – including seven companies involved in plant-based foods and three building electric vehicles domestically. Fourteen firms offer sophisticated new specialty business-management services, such as Kontrol Technologies' smart-building controls and NorthStar Earth & Space, which uses space-based sensors to track the sustainability of earth and space resources.

Eleven firms supply complex systems and techniques that allow businesses to better manage their energy use and emissions, including ChargeLab's North American network of charging stations and FigBytes' software platform that helps organizations integrate sustainability, performance and reputation. Eight companies perform engineering or environmental services, such as Carbon Engineering's portfolio of carbon-capture systems.

And two firms offer innovative energy production and distribution systems: Hydrostor, which stores energy as compressed air in underground caverns, and Eavor Technologies, which harvests geothermal heat from the earth for commercial heating applications.

FASTEST-GROWING

Public companies

2023	2022	Companies	Industry	2020 revenue (CDN$ million)	2021 revenue (CDN$ million)	Growth rate
1	3	Li-Cycle Holdings Corp	Commercial services & supplies	$1.1	$9.1	766%
2		CloudMD Software & Services Inc	Healthcare providers & services	$15.0	$102.3	581%
3		Steer Technologies Inc	Road & rail	$3.9	$25.4	546%
4		Reliq Health Technologies Inc	Healthcare technology	$1.5	$8.6	485%
5		Kontrol Technologies Corp	Independent power and renewable electricity producers	$12.3	$57.7	367%
6		Sharc International Systems Inc	Electrical equipment	$0.6	$2.7	328%
7		PlantX Life Inc	Food retail	$2.9	$12.0	315%
8		ElectraMeccanica Vehicles Corp	Automobiles	$0.7	$2.7	267%
9	15	Good Natured Products Inc	Chemicals	$16.7	$61.1	266%
10	8	Loop Energy Inc	Electrical equipment	$0.5	$1.4	161%
11	10	Greenlane Renewables Inc	Oil, gas & consumable fuels	$22.5	$55.4	146%
12	9	Lion Electric Co	Machinery	$29.8	$72.9	145%
13		Planting Hope Co Inc	Food products	$1.3	$2.9	134%
14	12	Vicinity Motor Corp	Machinery	$18.6	$42.0	126%
15	13	Clear Blue Technologies International Inc	Independent power and renewable electricity producers	$8.0	$16.3	103%
16		Global Food and Ingredients Ltd	Food products	$61.6	$124.4	102%
17	14	PyroGenesis Canada Inc	Commercial services & supplies	$17.8	$31.1	75%
18	6	Organto Foods Inc	Food products	$11.4	$19.5	70%
19	17	Village Farms International Inc	Food products	$216.5	$338.6	56%
20		Vision Marine Technologies Inc	Leisure products	$2.4	$3.5	45%
21	18	Guru Organic Energy Corp	Beverages	$22.1	$30.2	37%
22	20	Dundee Sustainable Technologies Inc	Metals & mining	$3.2	$4.3	35%
23	21	Legend Power Systems Inc	Electronic equipment, instruments & components	$2.0	$2.7	34%
24	22	EcoSynthetix Inc	Chemicals	$17.4	$22.9	32%
25	23	Vitreous Glass Inc	Construction materials	$9.4	$12.1	29%

Perhaps most intriguingly, the Future 50 could signal a reordering of business leadership in Canada. Where 20th-century business centred on Montreal and Toronto, the Future 50 leans west. British Columbia – mainly, the Vancouver region – accounts for 21 companies on this year's Future 50. Ontario comes second with 15, while Quebec has 10, Alberta three and Nova Scotia one.

Not all these companies will be successes. Consider the Very Good Food Company, a Vancouver producer and distributor of plant-based burgers and other green groceries. Very Good appeared on last year's Future 50 and would have made this year's list, too, with 2021 sales of $12 million. Just last November, Very Good added 3,000 new distribution points in Canada and the U.S. But the company had prioritized growth over efficiency and profitability; it shut down in February, out of cash and out of time.

Business success doesn't come from avoiding setbacks but from managing them well. New to the Future 50 this year, ElectraMeccanica, a B.C.-based manufacturer of sporty, one-person electric cars, recalled 429 of its three-wheel "Solo" models in February, due to both performance (occasional losses of power) and regulatory issues. Now CEO Susan Docherty is plotting to disrupt the four-wheel world: "We believe that major opportunities remain for an experienced maker of smaller, nimbler EVs with eye-catching design and personalized features."

If optimism rules the Future 50, it should be well placed. The energy transition is now one of the biggest megatrends in business. In January, BloombergNEF reported that global clean-energy investment hit US$1 trillion in 2022, matching, for the first time, industry's total investment in fossil fuels. The Canadian Venture Capital and Private Equity Association says that venture funds invested a record $1 billion in cleantech last year, up 52% from 2021. And now, the 2023 federal budget promises $20 billion in new funding for clean power and green infrastructure.

Capital is out there. As this list proves, the opportunities are boundless. The future of the Future 50 is the future of Canada.

How did we find the Future 50?

Corporate Knights used two different but complementary criteria to determine which companies made the Future 50. We drew from 4,513 publicly listed and 4,163 privately owned companies headquartered in Canada and determined the ones that earn most of their revenues from clean energy themes (including energy efficiency), according to the Corporate Knights Sustainable Economy Taxonomy. The public companies were then ranked according to their one-year revenue growth rates (2021 sales over 2020 sales). For privately held companies, we tapped the S&P Capital IQ database, with data on recent fundraising rounds, and sorted them based on the percentage growth of capital they raised from the two most recent years of fundraising rounds over the 2018 - 2023 period. This enabled us to identify qualifying companies that are still "pre-revenue" – giving us early access to new ventures. From this, we pulled out the top 25 private and 25 public companies that earn the majority of their revenue from sustainable sources to select our Future 50.

FASTEST-GROWING

Private companies

2023	2022	Companies	Industry	Previous investments (CDN$ million)	Most recent investments (CDN$ million)	Growth rate
1		Evanesce Packaging Solutions Inc	Paper & plastic packaging products & materials	$0.1 (2018)	$14 (2021)	**11,282%**
2		CheckSammy Technologies Inc	Environmental & facilities services	$0.3 (2020)	$20.3 (2022)	**5,431%**
3		Green Matters Technologies Inc	Industrial machinery & supplies & components	$0 (2019)	$3.4 (2021)	**3,688%**
4	3	Hydrostor Inc	Heavy electrical equipment	$10 (2021)	$354.6 (2022)	**3,447%**
5		MacCormick Inc	Research & consulting services	$0.1 (2019)	$6.6 (2020)	**3,293%**
6	6	E-Zn Inc (e-Zinc)	Electrical components & equipment	$2.3 (2021)	$38.6 (2022)	**1,581%**
7	5	Oneka Technologies Inc	Industrial machinery & supplies & components	$0.3 (2019)	$5.5 (2021)	**1,329%**
8		Audette Analytics Inc	Application software	$1 (2021)	$13 (2022)	**1,205%**
9	7	CarbiCrete Inc	Environmental & facilities services	$2 (2020)	$22.4 (2022)	**1,024%**
10		Hydrogen Technology & Energy Corp	Industrial machinery & supplies & components	$20 (2020)	$217 (2021)	**985%**
11		Mangrove Lithium	Commodity chemicals	$2.1 (2019)	$16.4 (2021)	**682%**
12	8	Carbon Engineering Ltd	Industrial machinery & supplies & components	$14.4 (2018)	$98.9 (2019)	**584%**
13	10	Ionomr Innovations Inc	Electronic components	$3 (2019)	$18.7 (2022)	**525%**
14	13	Clir Renewables Inc	Application software	$7.1 (2019)	$32.1 (2021)	**353%**
15		FigBytes Inc	Application software	$4.4 (2021)	$19.6 (2022)	**342%**
16	15	GHGSat Inc	Environmental & facilities services	$12.9 (2018)	$56.4 (2020)	**337%**
17		SWTCH Energy Inc	Electric utilities	$3.1 (2020)	$12.7 (2022)	**310%**
18	1	Eavor Technologies Inc	Renewable electricity	$2.7 (2022)	$10.5 (2023)	**288%**
19		Ostara Nutrient Recovery Technologies Inc	Industrial machinery & supplies & components	$25 (2021)	$95.3 (2022)	**281%**
20	21	Summit Nanotech Corp	Construction machinery & heavy transportation equipment	$17.7 (2022)	$67 (2023)	**277%**
21		FTEX Inc	Electronic equipment & instruments	$0.4 (2021)	$1.7 (2022)	**261%**
22	16	Manifest Climate Inc	Application software	$8.3 (2021)	$30 (2022)	**260%**
23		ChargeLab Inc	Electrical components & equipment	$5.4 (2021)	$19.2 (2022)	**254%**
24		NorthStar Earth & Space Inc	Interactive media & services	$13.6 (2021)	$47.5 (2023)	**248%**
25		Outcast Foods Inc	Food products	$3 (2020)	$10 (2021)	**233%**

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End
NOTE

A mushrooming economy

Fungi-based cleantech is springing up around the world

By Emily Baron Cadloff

Illustrations by Jack Dylan with Midjourney AI

Why fungi are the new frontier

From mushroom leather to mycelium insulation, fungi start-ups are part of a booming mushroom economy

By Emily Baron Cadloff

Emily Baron Cadloff is a Halifax-based journalist.

Stephanie Lipp discovered the power – literally – of mushrooms by accident.

Four years ago, she and her partner, Leo Gillis, moved from Ontario to rural Newfoundland with the intention of starting their own mushroom farm to provide fresh local produce to food-insecure communities. The two experimented with using grow bags – plastic bags with air patches that can help plants germinate and root quickly – for the mushrooms. But it wasn't working.

One day, Gillis thought he'd just crumple a bag and run it over with the lawnmower in the couple's backyard, to put the mushroom nutrients into the soil. Instead, the mushroom's root system "almost broke his lawnmower."

The pair had discovered the tensile strength of mushrooms and decided to pivot. Within three months they had their first postage-stamp-sized sample piece of flexible material made out of just the root system of fungi, or mycelium. Two years later, their start-up, MycoFutures North Atlantic, is working on large-scale production of a mushroom fabric akin to leather or suede, but without the same environmental concerns.

Lipp and Gillis soon found themselves part of a quietly booming mushroom clean-tech and wellness economy. "For many . . . mushrooms signify the future," Lipp says.

Sprouting mushroom innovations

From the zombie fungus in *The Last of Us* to Netflix's popular *Fantastic Fungi* doc, mushrooms are getting their moment in the sun. We've seen investors pour money into psychedelic mushroom start-ups recently, looking to harness their therapeutic potential. But non-magic mushrooms are having a moment, too.

Even the federal government is dabbling in part of the conventional mushroom economy. Last spring, as part of the Canadian Agricultural Partnership, the feds announced an investment of up to $340,000 in Mushrooms Canada to "seize new market opportunities."

According to Mushrooms Canada, in 2021 Canada ranked second globally (behind Poland) in the value of fresh- or chilled-mushroom exports. Overall, Canada is the eighth-largest mushroom producer in the world; it exports most of that to the U.S., the fourth-largest mushroom producer globally, where mushroom sales brought in more than US$1 billion last year. In total, the mushroom sector is worth more than US$50 billion.

One of the biggest uses of mushrooms (outside of the fresh-food market) is in the wellness industry. Some estimates show that the functional mushroom (meaning mushrooms that advocates say offer health benefits in addition to their nutritional benefits) market hit US$15.3 billion in 2022 and will top $23 billion by 2030. Mushrooms such as shiitake have anti-inflammatory properties and are frequently used in skincare products.

Then there are the mushroom nutraceuticals, or supplements, where reishi, lion's mane and maitake mushrooms are used to support cognitive health and lower blood sugar levels and inflammation in the body. Food scientists like those at Chinova Bioworks in New Brunswick are making mushroom-based preservatives. Researchers at the University of Manitoba, Stanford University and New York's Columbia University are looking to capitalize on the same strength that Lipp and her partner found when they nearly broke the lawnmower to make building materials that are twice as strong as concrete. The U.K.-based start-up Biohm is already using mycelium root systems to make net-zero building insulation without petrochemicals.

Like Lipp, luxury retailers such as Hermès, Balenciaga, Mercedes-Benz and Stella McCartney are also experimenting with mushroom-based leather. With MycoFutures, Lipp's goal is to make mushrooms accessible

for customers looking for affordable, sustainable, bio-based materials and to inspire consumers to think more about the materials they use. "It's a really valuable lesson for thinking about how we can use our resources more efficiently and in cooperation with what's around us," Lipp says. The chemicals used to tan leather are responsible for polluting waterways around the globe, and many leather suppliers have been linked to deforestation. Pleather is not a great alternative either, as it's just another word for plastic.

MycoFutures is currently in the research and development phase, as Lipp and Gillis find the right balance of moisture in the fabric so that it doesn't get brittle but is still permeable for needles and fabrication into jewellery, handbags and perhaps furniture. Because they use the root system of the mushrooms, Lipp is also experimenting with growing conditions and beds to create bigger sheets of fabric. "We're trying to create a dense mat of biomass," she says.

"For many, mushrooms signify the future."

—Stephanie Lipp, co-founder, MycoFutures North Atlantic

The next task is experimenting with coatings, dyes and longevity, testing how the mycelium will wear and last, against materials like leather. "If I have a wallet, I don't want it for a week," she says. "I want it for a year, two years, five years."

Wake up and smell the shrooms

While a full mushroom-based wardrobe might be a few years away, mushroom coffee is taking over mugs everywhere, right now. California-based MUD\WTR, which makes a coffee alternative, has grown to a national company, with its products sold in all 50 states, and some high-profile funders, including Alumni Ventures. MUD\WTR CEO Shane Heath created the drink mix when he was experimenting with recipes to give him that morning jolt without the jitters. He started with cacao and chai, and then turned to mushrooms.

"I heard about lion's mane and its benefits for the mind, cordyceps and its benefits for physical performance, and chaga and reishi for immune support and stress, so I would start my day by mixing together a mug with all of these amazing ingredients," Heath says via email. Chaga and reishi fungi are both found in forested areas, while cordyceps is a fungus found on insect larvae, like caterpillars. All three mushroom species are purported to have health benefits and have been used in Eastern medicine for centuries.

As more consumers become aware of the many mushrooms available to them, companies like MycoFutures and MUD\WTR have seen increased interest from consumers. Sohaib Qid, CEO of PureShrooms, a Canadian company also creating mushroom coffee, tea and supplements, says there's a broader acceptance of their products and a "growing awareness of the potential benefits these fungi can offer."

However, Qid says, as mushrooms get more popular, there have been changes in terms of supply. "We've noticed a surge in mushroom farms emerging throughout Canada. While this is a positive development for the industry, the pricing for fruiting body mushrooms in the domestic market remains less competitive compared to other sources in the U.S.," he says in an email.

For MUD\WTR, expansion into international markets is on the horizon. "It's an exciting time to be in . . . the mushroom space," says Heath. "A rising tide raises all boats, and an increase in the popularity of mushrooms is a positive thing for everyone."

Moving beyond the autocratic CEO

Business leaders need to transition to more collaborative and communicative methods to be effective in today's fast-moving world

By Shilpa Tiwari

Shilpa Tiwari is the co-founder of Isenzo, a boutique firm that takes a systems approach to ESG.

Always one to march to the beat of his own drum, Elon Musk's iron-fisted reign of Twitter has been one for the ages. Sweeping job cuts, heavily criticized platform changes, and a hostile relationship with the press have defined the tumultuous takeover.

While some Silicon Valley bosses have cheered on his merciless style, Musk's tactics are the antithesis of what is required in the world we live in today. "It all went south," former Twitter CEO Jack Dorsey said recently.

Complex overlapping forces, such as the pandemic, war, migration and energy scarcity, are transforming the world in as yet unknown ways. Today's leaders need to be collaborative, communicative and agile to be effective in this landscape – soft skills are now essential skills to thrive.

But too many of today's corporate leaders continue to cling to leadership practices from a bygone era, leaning into archetypes that are ill suited to addressing the world we live in today – highly networked, and rapidly evolving.

Henry Ford and John Rockefeller were influential figures in shaping modern management of big business in the 1910s. This first wave of corporate leaders operated their companies with an autocratic style, viewing lower-level managers and workers as extensions of their own will.

In today's fast-changing world, the contributions of employees are indispensable, and relying predominantly on top-down decision-making processes results in long delays or inaction. Instead, there is a growing trend toward distributed leadership models that catalyze and empower collective action rather than control and direct it. These people are systems leaders and can drive change.

Systems leadership combines familiar skills such as subject expertise, strategy, program management, coalition-building and collaboration in new and different ways to create systemic transformation that leads to tangible change. It's a leadership model that acknowledges the complexity of modern society and the interconnectedness of various systems. It allows leaders to identify the root causes of problems and work toward sustainable solutions that address multiple issues at once.

Take Kate Bingham, for example. She left her job as a venture capitalist in July 2020 to head the U.K.'s Vaccine Taskforce, realizing quickly that "we had one shot to get it right and no time." Without a playbook to guide her, she ordered vaccines from seven developers instead of the EU's vaccine-buying group, with no certainty that even one of them would work. Bypassing established contracting procedures, she struck "creative" deals, as the government later reported. She was, of course, criticized – but her approach enabled Britain to secure large vaccine supplies and get people vaccinated.

Under Satya Nadella's leadership, Microsoft has undergone a transformation from a traditional software company to a cloud-based technology leader.

One of the hallmarks of Nadella's leadership style is his focus on empowering employees to take risks and innovate. He has emphasized the importance of creating a culture of learning, where employees are encouraged to experiment and learn from failure. This approach has led to the development of innovative products and services, such as Microsoft Teams, which became a vital tool for remote work during the COVID-19 pandemic. Microsoft has achieved record growth and profitability, with the company's stock price increasing more than 500% since Nadella became CEO in 2014.

In the past, business leaders focused solely on serving shareholders and the bottom line.

Since they were often making up the rules for nascent industries that didn't have them, the pioneering bosses relied on decisiveness and self-confidence to plot their course through uncharted waters. And, of course, they had an impact. Ford is credited with developing the modern assembly line and mass-production techniques. He is also known for his commitment to paying his workers a living wage, which he believed would increase their productivity and loyalty to the company. Rockefeller was able to dominate the oil industry and become one of the most powerful men in America. However, his ruthless tactics were controversial and ultimately led to increased government regulation of business practices.

In the 1980s and 1990s, it was General Electric CEO Jack Welch who put his indelible stamp on how to lead. He took the company from one that only sold appliances and light bulbs to a booming multinational corporation with multiple product lines. Business schools were erected teaching the "Welch Way." However, the toxic results-oriented culture he created at GE contributed to its eventual downfall. In recent years, many have questioned Welch's strategy, leadership style and legacy. Was he really a CEO that today's emerging business leaders should emulate?

Today, having a high-performing, profitable company isn't enough. In the boardroom, there's a broader set of concerns that includes sustainability; climate change; equity, diversity and inclusion; and an overall commitment to responsible leadership.

While there is recognition from global corporate leaders that many of the forces we are facing have far-reaching impacts, they

Illustration by Gillian Wilson

continue to be viewed through a predominantly business-oriented lens. The environment, for example, continues to be treated like an external variable that has the potential to affect the bottom line, rather than a resource that has value beyond quarterly reports. The pyramid-style hierarchies with the Welches of the world at the top need to be replaced by leadership models that feature flexible, flatter hierarchies that revolve around shared leadership built on a clear mission and purpose.

Leaders who can navigate complex landscapes with flexibility and creativity are much more likely to succeed than those who cling to outdated models of leadership. Doing this sounds simple and obvious, yet most find it difficult. We are experts at denying or minimizing a new reality: it isn't all that significant, we tell ourselves, or it isn't new, and besides, it won't last very long, and then the comfortable status quo will resume.

In times of heightened uncertainty, "leaders that embrace a consistent application of values stand out," says Narinder Dhami of New Power Labs, a platform to flow capital more equitably. We may not know what lies ahead, but a leader creates trust and a sense of safety by behaving fairly and consistently connecting their actions to values. And because they are confronting new realities, they are also open to pivots and detours if necessary.

"Leaders that embrace a consistent application of values stand out."

—Narinder Dhami, New Power Labs

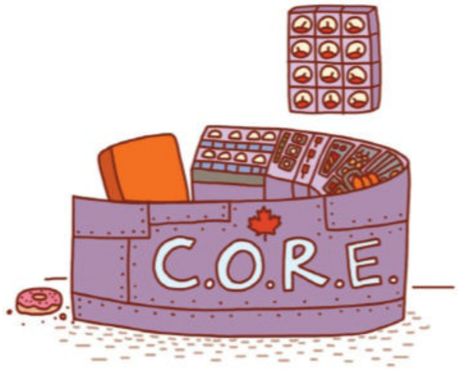
Mike McInerney, a former HR executive in corporate Canada and now co-founder of Rapid Alignment, argues that principle-based leaders "create greater, more trusting and communicative relationships that are required to move organizations forward when they are facing turbulent times."

Traditional models of leadership are no longer sufficient to navigate the rapidly changing world we live in. As such, we must continue to identify and learn from leaders who have moved us through chaos with humanity. Leaders like Jacinda Ardern, the former prime minister of New Zealand, who showed the world that leading with compassion can deliver results. Ardern's leadership style played a critical role in promoting healing and unity after 51 people were killed by a white supremacist at two mosques. Her focus on compassion, inclusivity and decisive action helped to build trust and confidence in her leadership, and her response to the crisis has been widely praised, both domestically and internationally. Her leadership style also highlights the importance of transparency and communication in times of crisis.

Systems leaders apply an unusual combination of skills and attributes. Like many of today's leaders, they are smart, ambitious visionaries, with highly developed management and execution skills. But what sets them apart is how they use their "soft skills," such as compassion and communication, to create inclusive environments where innovation and creativity thrive. These leaders don't try to place complex issues in silos but take a networked approach and play the long game, placing an emphasis on creating trust, because business moves at the speed of trust.

HEROES & ZEROS

By Bernard Simon



Hero: ICIJ

Sadly, business can seldom be relied on to police its own behaviour. We thus have little choice but to fall back on governments, NGOs and, not least, activists and the media to do the job. Yet the record of these outside watchdogs is also decidedly mixed.

At the "hero" end of the spectrum, we tip our hats to the International Consortium of Investigative Journalists (ICIJ), a non-profit network of 280 journalists in more than 100 countries who collaborate on cross-border investigative projects. The ICIJ's mission, as its website puts it, is to convince reporters around the world "to set aside traditional rivalries to uncover corruption, abuses of power and grave harms inflicted on the world's most vulnerable people."

Best known for exposing the offshore holdings of scores of politicians and public officials via the Panama Papers, its latest investigations reveal the flaws in environmental auditing and certification programs supposedly designed to promote sustainable forestry and combat illegal logging. A team of 140 reporters from 27 countries uncovered forest failures from Canada to Taiwan, the U.S. to Turkey.

One branch of the Deforestation Inc. investigation highlighted the failure of European governments to halt imports of Myanmar teak, a richly coloured wood prized for its resistance to sunlight and salt water. Demand from luxury yacht makers has ravaged the teak forests, and the trade has been infiltrated by organized crime and is now riddled with corruption. As a result, several countries have imposed supposedly tight bans on imports of teak from Myanmar. In 2021, as part of a broader crackdown against the military junta in Yangon, the EU also sanctioned Myanma Timber Enterprise, which has a monopoly on the country's teak trade.

Yet the ICIJ investigation revealed that more than 3,000 tonnes of wood entered Europe from Myanmar in 2021, often routed through countries with lax border controls, such as Italy, Greece, Croatia and Poland. To make matters worse, customs authorities and timber industry associations have turned a blind eye to the illegal trade. None of this bodes well for the historic EU law passed in March that bars imports of coffee, wood, beef, cocoa, palm oil and soy tied to deforestation, says the ICIJ: "[analysis of] enforcement data raises questions on authorities' ability to comply with the new requirements."

The report concludes that the global forest-products industry remains largely unregulated despite what "companies tell consumers and investors about the sourcing of their projects and their commitment to helping end the global climate crisis." Without the ICIJ's work, chances are that message would never have been heard.

Zero: CORE

The Canadian Ombudsperson for Responsible Enterprise (CORE) seemed a great idea when it was proposed by the Liberal government in Ottawa in 2018.

The new agency, touted as the first of its kind in the world, would supposedly shine a light on alleged human rights abuses by Canadian companies at their foreign operations. Whether investigating the use of forced labour in China's Xinjiang region, starvation wages at Bangladeshi sweatshops or sickness caused by pollution from mining operations in the Amazon, CORE would bring offenders to heel and help ensure that conditions improved.

Alas, it hasn't turned out that way.

There has been no shortage of complaints to CORE – 26 in all between March 2021 and early 2023, most of them centred on the use of forced labour by garment companies in China. Yet, as a *Globe and Mail* investigation found, the agency had not closed the books on a single case as of April 2023. Of the 26 cases brought to its attention, eight were deemed inadmissible, two were withdrawn, and the admissibility of one was still being reviewed. Not one of the remaining 15 had moved beyond the "initial assessment" stage, according to CORE's latest quarterly report, even though the agency aims to complete that assessment within 90 days. (Besides the Chinese cases, one relates to a company operating in Honduras and another to a company in Bangladesh.)

The agency has been hobbled in a number of ways. The government has backed away from its initial promise to give CORE investigative powers, such as compelling companies to produce relevant documents. Also, CORE has no way of enforcing whatever conclusions its investigations may come to, and its activities remain confined to just three sectors: mining, oil and gas, and garment manufacturing.

An advisory council on responsible business conduct, designed to work in collaboration with CORE, collapsed in mid-2019 when 14 members representing human-rights organizations and labour unions quit on the same day, saying they had lost confidence in the government's commitment to corporate accountability. CORE's latest annual report makes no mention of reviving the panel.

"We're very disappointed right now," Ketty Nivyabandi, secretary-general of Amnesty International Canada, told the *Globe* earlier this year. "This is not what we had advocated for. We're not recommending the office to communities that we engage with."

The agency defended itself in its last annual report by noting that much of its work has "an iceberg effect," with companies often making long-lasting undertakings that remain "under the surface for a period of time" – an assertion strangely at odds with its early promise of transparency.

Illustrations by Joren Cull

It's time for a modern industrial strategy

The three keys to kick-starting Canada's net-zero industrial policy

By Bentley Allan and Derek Eaton

Bentley Allan is transition pathways principal and Derek Eaton is director of industrial policy at The Transition Accelerator.

With Budget 2023's "made-in-Canada plan" released in late March, the federal government has laid out its net-zero industrial policy – a response to the U.S. Inflation Reduction Act (IRA) and the EU's Green Deal Industrial Plan. While Canada has tabled a variety of clean economy policies to support industry since 2016, the latest proposals represent a step toward a true industrial strategy. The plan signals an intention to get strategic and intentional about the way the government coordinates its different programs and instruments.

The made-in-Canada plan seeks to bolster manufacturing at home and secure a place for Canadian firms and products in global supply chains.

Canada's industrial policy has four tiers of tools: carbon pricing and regulations, investment tax credits, public funds (namely, the Canada Growth Fund and the Canada Infrastructure Bank) and targeted investments in priority sectors. Together with the controversial investment credit for carbon capture, utilization and storage from Budget 2022, the government has now earmarked $83 billion to support Canada's net-zero industrial policy.

While there has been a lot of focus on tax credits, these measures, as well as accompanying subsidies, do not constitute an industrial policy. A modern industrial policy must involve a dynamic process of collaboration with the sector that integrates the tools into a clear strategy.

For example, the tax credits receiving much attention in the IRA are supported by excellent work in the U.S. Department of Energy to set clear targets, organize supply chains and work with industries directly to identify and solve challenges in a dynamic way. The U.S. approach benefits from decades of work to develop the institutional mechanisms for coordinating commercialization strategies between the government and industry.

Canada needs to develop a similar approach: targets and sector tables to hash out clear strategies that organize and focus work in the sectors. Without intentional development of such coordination mechanisms, Budget 2023's commendable initiatives will risk falling into the Canadian pattern of spreading innovation supports (research funding and R&D and investment tax credits, for example) too thin.

It is difficult to assess whether the proposed tax credits and other measures – such as subsidies for battery plants – address the needs of Canadian businesses, target activities in which Canada can be globally competitive, and trigger private investment at the speed and scale required. A custom industrial policy approach is needed for each sector, reflecting the unique supply-chain challenges and supply/demand barriers to adoption for each solution.

We have proposed three key elements to kick-start industrial policy in Canada and to build capacity for strategic collaboration in government and among other stakeholders.

Goals: A modern, strategic industrial policy should have goals that are concrete economic objectives (or targets) and that refer to the deployment, production and performance of key technologies – for example, the amount of clean hydrogen produced by a specific future date. Goals and milestones should be indexed to a vision of Canada's place in specific global supply chains.

Public–private partnerships: International best practices in industrial policy underline the key role of robust public–private partnerships in priority sectors, supported by deliberative tables and independent intermediaries. These partnerships would create collaboration clusters at the sector level, which would be used to align strategy, policy and financing.

Government bodies: How can best practices be applied to government institutions in Canada? Institutional innovation is often necessary to build the culture and practice of modern industrial policy with a net-zero focus. Cross-departmental interaction and synergy would be important to set up a new industrial policy process for success. But setting up those processes will take time, and the need to act is urgent, so it is important that government bodies work closely with industry and independent intermediaries to catalyze strategic action now.

Canada, including the federal civil service, has fallen behind in modernizing our institutions for industrial policy. Leadership and coordination will require some resources, but the needs are tiny compared to budgetary resources already announced. To correct this, the federal government needs to take deliberate steps to build the culture and the capacity to effectively and efficiently pursue our most promising opportunities for value-added growth and jobs on the path to net-zero emissions.

Industrial policy is not, however, the sole responsibility of the Government of Canada. Federal leadership and partnership with provinces, territories, industry, Indigenous communities and other stakeholders is required. A well-designed and -executed industrial policy-development process will result in other levels of government and industry sharing responsibility in policy development and implementation. Distributed leadership in a modern industrial policy would help future-proof outcomes against government changes.

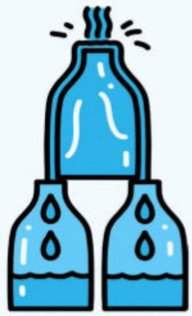
To support this effort, the Transition Accelerator has established the Centre for Net-Zero Industrial Policy. The centre will bring together experts and practitioners to forge the insights and action Canada needs to compete in the new economy.

In contrast to only a few years ago, a strong global consensus has developed around the technologies that can be functional, economic and net-zero, and those that cannot. A net-zero industrial strategy is critical for laying a foundation for broad-based prosperity in the years ahead. Industry, including the Business Council of Canada and other associations and companies, has recognized this.

Now that substantial funds have been committed, Canada needs a process to ensure these resources are used as effectively as possible to build supply chains and mobilize the private capital necessary to compete – a modern, made-in-Canada industrial policy.

Knight Bites

How to slash plastic pollution by 50 to 80% by 2040. The world churns out 430 million tonnes of plastic every year, and plastic consumption is set to double by 2040, then triple by 2060. Ahead of a second round of negotiations on a global plastics treaty in Paris in late May, the UN Environment Programme (UNEP) laid out an action plan for business and government to end the planet's enormous waste habit:



Accelerate reuse and refill markets

Governments and businesses need to collaborate to eliminate unnecessary single-use plastics while developing thriving systems for reusable and refillable products, including deposit-return schemes and new refillable product-delivery models (e.g., modern-day "milkmen" for consumer goods).

Plastic-curbing potential: 30%

Ramp up recycling markets

At least 80% of plastic is landfilled because it costs too much to recycle. Regulators will need to enforce design rules to make plastics more recyclable, and governments should end fossil fuel subsidies for virgin plastic and set mandates for at least 50% recycled content to help level the playing field.

Plastic-curbing potential: 20%

Spur on sustainable alternatives

In cases where reuse isn't an option, UNEP suggests that corporations carefully replace problematic plastic products with alternative materials, such as recycled paper and certified compostable materials, but only if they're backed by life-cycle assessments.

Plastic-curbing potential: 17%

Deal with durables

More than 30% of plastic waste comes from "durable plastic" products that last more than three years. To help keep demand for new plastic-based electronics and goods in check (and boost product durability), governments must enable the right to repair and crack down on planned obsolescence.

Stop microplastics at the source

Tiny microplastic particles account for more than 6% of plastic pollution. A ban on intentionally adding microplastics to products is key, but so is redesigning tires, washing machines, polyesters and other textiles so they shed less, preventing microplastic particles from reaching waterways.

Tackle existing plastic pollution

UNEP says that 22% of plastic waste is mismanaged in dump sites, burned in open pits or dumped in the ocean. To help put an end to this, the report calls for a global ban on exporting plastic waste to countries with low collection rates while also building more collection systems in those regions.

Illustrations by Sam Island