

ECONOMIC VIEWPOINT

What Is Greenflation?

By Marc-Antoine Dumont, Economist

Climate change and the energy transition will transform society. From green products and tougher environmental standards to rising sea levels, these changes are poised to reshape the economic and financial landscape as we know it. They could also lead to greenflation, an imbalance in which demand outstrips supply and drives up prices.¹

In this *Economic Viewpoint*, we'll look at the causes and effects of greenflation as well as some possible solutions. What separates greenflation from other forms of inflation is that it's primarily caused by a limited supply, notably of commodities, as well as a shift in demand composition. This complicates the task of central banks, which are ill-equipped to combat this type of inflation. But governments have more power to ease price pressures. That means sound public and monetary policy can greatly mitigate the risks associated with climate change and decarbonization.

¹ Although there's no official definition of greenflation, we define it as inflation caused by climate change and the energy transition.

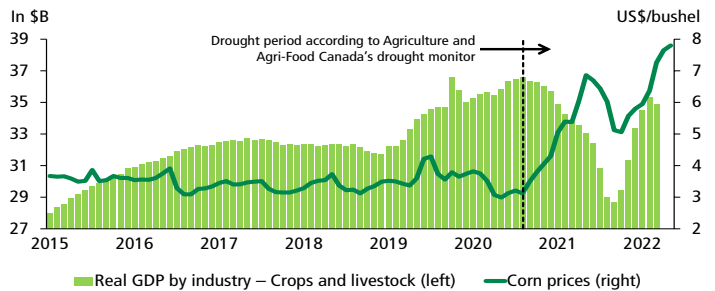
Limited Supply

The first cause of greenflation is pretty straightforward. A storm or other extreme weather event damages or destroys a production facility, reducing supply of a product and driving up its price. Unfortunately, events like these that have devastating economic consequences aren't uncommon. Consider the drought plaguing western Canada since August 2020.² With crop yields there plummeting, real GDP in Canada's agriculture and livestock industry fell 5% between August 2020 and March 2022 (graph 1). Assuming GDP was constant pre-drought, the industry has lost a total of \$63.1 billion—and that's not counting the incalculable human and environmental impact. But that wasn't the only drought in the world at the time. Droughts in Asia and the United States slashed the global supply of a number of agricultural commodities. Corn prices, for example, soared 109% between August 2020 and May 2021.

Unfortunately, extreme weather is destroying supply more regularly. The number of natural disasters is up threefold in the past 50 years (graph 2 on page 2). From wildfires in California

² Approximate dates based on the Agriculture and Agri-Food Canada drought monitor.

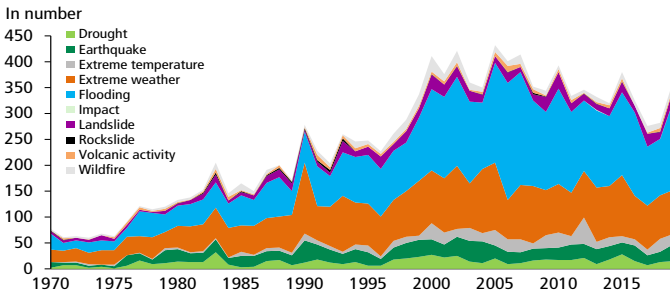
GRAPH 1
Drought in the Canadian prairies has taken a big bite out of agricultural production



Sources: Agriculture and Agri-Food Canada, Datastream and Desjardins, Economic Studies

to floods in Germany, natural disasters are taking an enormous human, environmental and economic toll. And according to the latest [report](#) by the Intergovernmental Panel on Climate Change, the risks and fallout of these events is growing as the planet warms. Commodities will be hard hit as yields of corn, rice, wheat and other crops fall. That means the longer we put off the energy transition, the more costly it will be to combat climate change, which is a key driver of greenflation.

GRAPH 2
The number of natural disasters is up threefold in the past 50 years

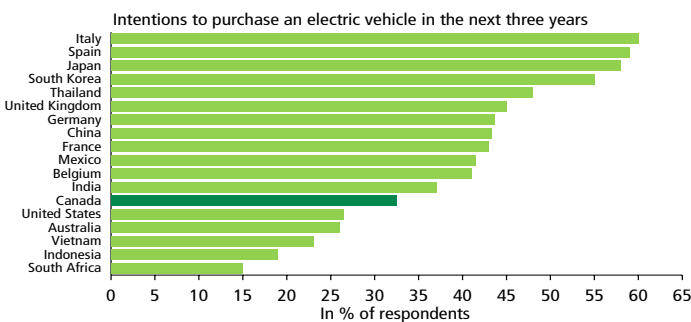


Sources: Our World in Data and Desjardins, Economic Studies

Changing Tastes

Faced with the unavoidable consequences of climate change, more and more people are changing their consumption and travel habits to reduce their carbon footprint. As green technologies become more affordable and governments provide more support, sales of cleaner goods and services such as electric vehicles are rising sharply. According to Dealertrack, sales of electric vehicles surged 34% in Quebec in 2021, while sales of gasoline-powered vehicles fell 4%. We're seeing this shift all around the world. While 32% of Canadians plan to buy an electric vehicle in the next three years, more than half of consumers in Italy, Spain, Japan and South Korea intend to do the same (graph 3). But sales of green products and services still face strong headwinds. Though prices have dropped significantly, they're still a barrier, especially in emerging and developing countries.

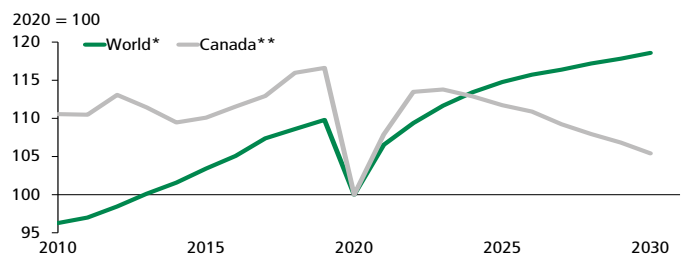
GRAPH 3
Many car buyers are considering an electric vehicle



Sources: Deloitte 2022 Global Automotive Consumer Study and Desjardins, Economic Studies

You'd think that as demand for green products and services goes up, demand for their dirtier alternatives would go down proportionally. However, the reality is more nuanced. To decarbonize transportation, for instance, you'd have to replace polluting vehicles faster than overall demand for vehicles grows. According to the Canada Energy Regulator, final oil demand will fall 10% between 2019 and 2030 because of government measures such as the carbon tax and greater consumer awareness of their carbon footprint (graph 4). But according to the US Energy Information Administration, global demand for oil will increase 14% over the same period. Ultimately, as the world steps up its decarbonization efforts and emerging and developing countries become wealthier, global oil demand should decline this century. But for now, demand remains strong for both clean and polluting goods and services.

GRAPH 4
Demand for refined petroleum products will weaken in Canada, but will continue to grow globally



* Based on the US Energy Information Administration's baseline scenario;
** Based on the Canada Energy Regulator's current policy scenario.
Sources: US Energy Information Administration, Canada Energy Regulator and Desjardins, Economic Studies

Supply Challenges

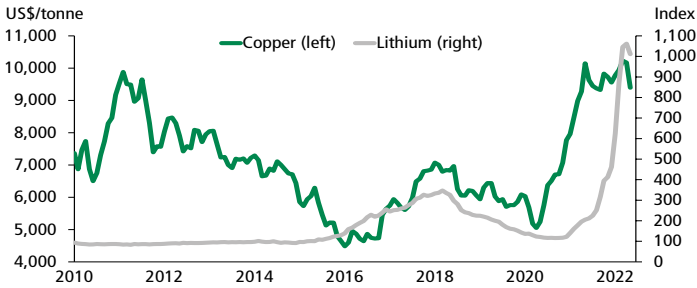
Supply and demand are already out of balance in some sectors. This is especially the case with lithium, a metal used to make batteries.³ The price of lithium is up by more than 600% since the pandemic began (graph 5 on page 3). Supply can't keep up with demand, especially for electric vehicles. And it's not just lithium. Demand for many other metals needed for the energy transition is set to rise sharply despite limited supply (graph 6 on page 3).⁴

New mines will be needed to satisfy the growing appetite for metals. But the International Energy Agency (IEA) estimates that it takes about 16 years from the time a deposit is found to the start of operations. Producers also face declining ore quality, putting upward pressure on production costs as more energy is

³ For more information, please see: [Quebec's Electric Battery Industry: The Challenge Will Be to Keep the Momentum Going](#), Desjardins, Economic Studies, Perspective, March 23, 2022, 4 p.

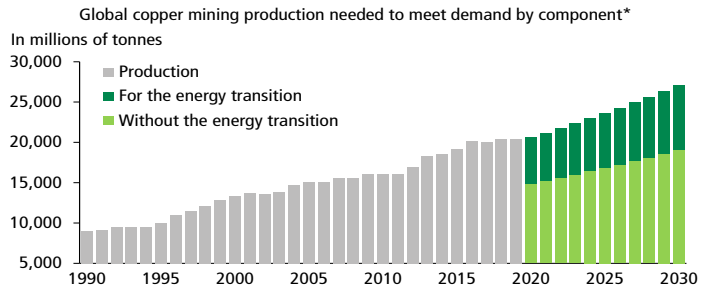
⁴ For more information, please see: [Green Technologies and Metals](#), Desjardins, Economic Studies, Economic Viewpoint, May 6, 2021, 5 p.

GRAPH 5
Lithium and copper prices are already under pressure due to limited supply



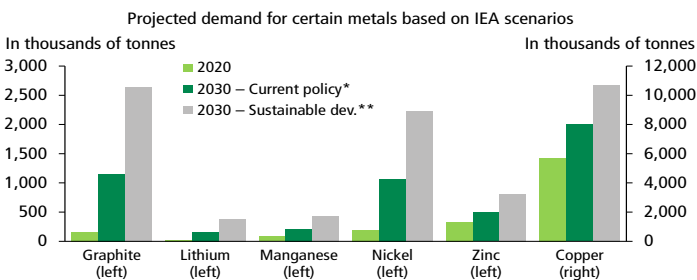
Sources: Datastream, Bloomberg and Desjardins, Economic Studies

GRAPH 7
Much will need to be done to increase the supply of copper



IEA: International Energy Agency
* Based on the IEA's current policy scenario.
Sources: US Geological Survey, IEA and Desjardins, Economic Studies

GRAPH 6
Meeting growing demand for metals will be a challenge



IEA: International Energy Agency; * Scenario based on current policy and policies under development; ** Scenario in which all current net emission reduction commitments are fully met and significant efforts are made to reduce emissions in the near term.
Sources: IEA and Desjardins, Economic Studies

required. Take copper, for example. The IEA says the quality of Chilean copper is down an average of 30% in the past 15 years. And despite strong demand, global production has been flat since 2016 due to depleted mine reserves and years of under-investment. To achieve the IEA's net zero by 2050 scenario,⁵ copper mining would need to grow 31% by 2030 to meet demand (graph 7).

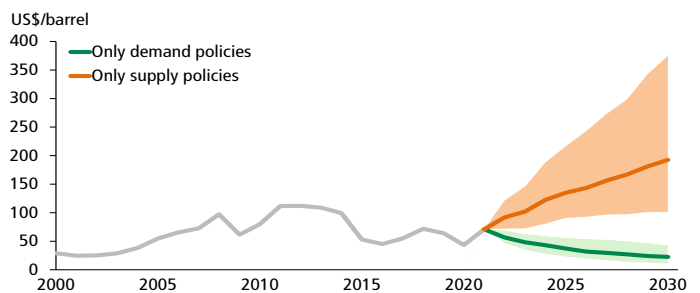
Changing environmental regulations and wavering public support for new mine development complicate the process and can add additional cost. Uncertainty around future demand and regulation can hamper supply by making producers and investors think twice about new projects. It takes many years and billions of dollars to develop a new mine, so they need a modicum of predictability.

While some challenges are upstream in long, complex, modern supply chains, others are downstream in areas such as machining, assembly and logistics. Rolling out wind or solar energy or

electric vehicles on a massive scale requires industrial production capacity and technologies that aren't yet optimized. Production costs therefore remain elevated. If it takes years to fill these gaps in the value chain, supply could be slow to meet demand, providing the necessary conditions for greenflation.

As we mentioned earlier, government measures and growing demand for green products should eventually reduce consumption of oil and other fossil fuels. However, sustainable investment incentives and stronger environmental regulations could restrict supply. According to the [International Monetary Fund](#) (IMF), crude oil prices would soar by about 170% between 2022 and 2030 if measures focused solely on restricting supply (graph 8). In this hypothetical scenario, domestic restrictions, tighter environmental regulations and limited access to capital would be the biggest barriers to meeting demand. Although more theoretical than practical, this hypothetical shows the importance of keeping supply and demand in balance to prevent inflationary pressures.

GRAPH 8
Supply and demand policies have opposite effects on the price of Brent



Sources: International Monetary Fund and Desjardins, Economic Studies

⁵ [Roadmap](#) to net zero by 2050. It's therefore not a baseline scenario.

Investment: A Double-Edged Sword

Investment can be used to improve infrastructure and supply capacity and develop green technologies, which can lower prices in the long run. We're already seeing this with lithium-ion batteries. They've come down in price 90% in the last decade, and according to [BloombergNEF](#) prices could fall another 45% by 2030 (graph 9). But it takes labour and materials to build new electric vehicle plants and charging stations, which could drive up demand for inputs and put upward pressure on their prices in the short term. Under the IEA net zero by 2050 scenario, we'd need to quadruple investment by 2030 (graph 10). And that kind of increase could have short-term inflationary effects on the inputs needed for the green transition.

translate R&D into efficiency gains to bring down costs and prices faster. Both the [Bank of Canada](#) (BoC) and the ECB have cited the challenges of modelling how investment will affect the economy and financial markets during the energy transition.

A Challenge for Monetary Policy

When inflation is running high, central banks usually raise interest rates to bring it back to target, which in Canada is 2%. This classic strategy works in a typical scenario in which demand outstrips supply. That's because raising interest rates slows consumption and investment, cooling demand. But with greenflation, you have an asymmetric supply shock and a shift in demand composition that affects some sectors like rare metals and renewable energy more than others. In such cases, price fluctuations vary by industry and supply becomes more constrained than demand. But rate hikes restore balance by reducing demand rather than boosting supply. That means central banks' main monetary policy tool would be less effective.

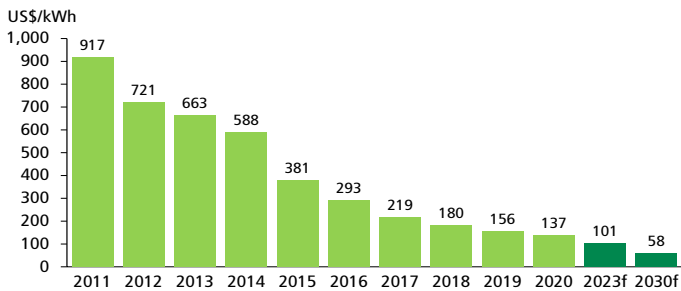
Another possibility would be for central bankers to base their monetary policy on core inflation, which strips out food and energy prices—the components most at risk of greenflation. With this strategy, headline inflation would run slightly above target, allowing for less restrictive monetary policy. GDP and unemployment would in turn take a smaller hit. The Federal Reserve Bank of Kansas City conducted a [study](#) on the best monetary policy for persistent asymmetric shocks. It showed that letting inflation hover just above target promotes the reallocation of resources across industries. This transfer of labour and capital to lagging industries helps close the supply gap faster, easing inflationary pressures. But this strategy isn't without risk. A higher tolerance for elevated inflation over the long run could damage the credibility of central banks and cause long-term inflation expectations to become unanchored, possibly triggering a wage-price spiral.⁶ A more dovish response from central bankers also increases the likelihood that greenflation in a few sectors will spread to the larger economy, requiring even more restrictive monetary policy. Conversely, aggressive rate hikes when inflation is localized can plunge the economy into recession. Sound monetary policy is therefore critical albeit challenging.

The Importance of a Well-Coordinated Transition

BoC [scenarios](#) project the impact of various energy transitions in which global warming is kept to 2°C. In each of these scenarios, inflation falls below baseline scenario inflation because the revenues from the carbon pricing mechanism used to model the transition are returned to households and offset most of the negative effects. But in the scenario with a more aggressive transition beginning in 2030, inflation doesn't fall as much

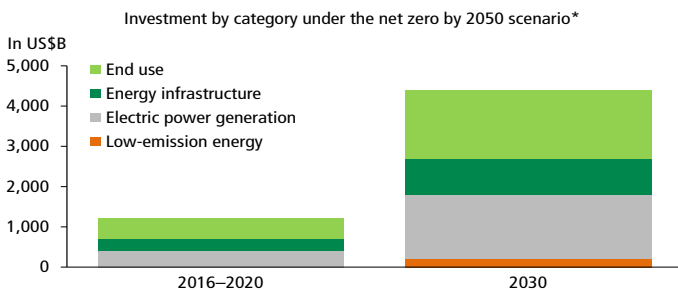
⁶ For more about the risks of above-target inflation, please see: [Central Banks Are Clearly No Longer Comfortable with High Inflation](#), Desjardins, Economic Studies, *Economic Viewpoint*, April 26, 2022, 6 p.

GRAPH 9
The cost of lithium-ion batteries is down dramatically and should continue to fall



f: forecasts
Sources: BloombergNEF and Desjardins, Economic Studies

GRAPH 10
Much more investment is needed to meet energy transition goals



* Scenario in which global warming is kept to 1.5°C and global energy-related CO₂ emissions fall to net zero by 2050.
Sources: International Energy Agency and Desjardins, Economic Studies

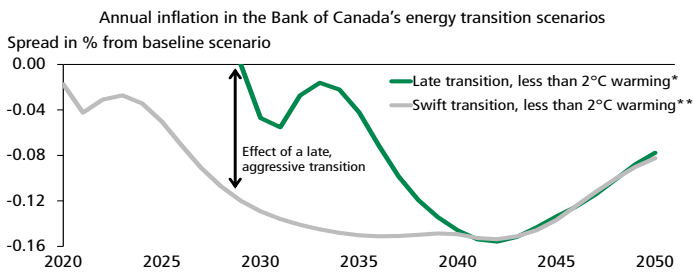
But according to the [European Central Bank](#) (ECB), it's unclear what net effect these two pressures would have. First, investment in polluting industries is expected to decline, partly offsetting the upward effects on demand for inputs. But retrofitting to reduce emissions will require some capital. Second, one of the main goals of the green transition is to quickly

initially (graph 11). Why? A late transition requires more drastic action like a bigger increase in the carbon tax. This introduces more distortions into the market and drives some prices up more sharply. These distortions also push GDP lower. The ECB [study](#) mentioned earlier modelled a disorderly transition to a greener economy. It supports this conclusion, estimating higher inflation and lower GDP than in the alternative and baseline scenarios. A swift, orderly transition would therefore do more to mitigate the risk of greenflation.

A Preventable Problem

Because the challenges inherent in the energy transition are so big and complex, we'll likely see price adjustments in some industries. Certain prices are sure to go up because for the first time ever, the cost of polluting will be included in production costs. But because greenflation is more associated with a poorly coordinated energy transition, it's avoidable. A late transition is more likely to trigger inflation, as the measures taken will introduce more distortions into the market. And the longer we put off the transition, the greater the risk of more frequent and intense extreme weather events. Simultaneously pursuing decarbonization and sound public and monetary policy is therefore key to mitigating the risks associated with climate change and greenflation.

GRAPH 11
An aggressive transition could trigger greenflation



* The transition begins in 2030 and is fast-tracked to offset the additional decade of continuously increasing emissions; ** The world takes action in 2020 to reduce emissions and limit global warming to less than 2°C by 2100.
 Sources: Bank of Canada and Desjardins, Economic Studies

Governments have a key role to play as they have a larger influence over consumption and production. They can encourage investment and innovation by pursuing consistent and predictable environmental policy. And they can promote balanced supply and demand through regulation, tax credits, financial support and natural disaster relief. If not enough green alternatives are available, disincentivizing the purchase of polluting products will only push inflation higher. Maintaining a balanced market therefore helps prevent high greenflation that could turn public opinion against the energy transition. To encourage the decarbonization of the economy, governments will have to set realistic goals, develop clear metrics to measure progress, and take corrective action if goals aren't met.

The Government of Canada stands out internationally for its carbon tax. The tax rate is set until 2030, and revenues are reinvested in the economy. This predictable system is therefore more favourable to investment. What's more, the latest [federal budget](#) allocates \$12.5 billion over five years to combat climate change. In Quebec, the 2030 [Plan for a Green Economy](#) provides \$7.6 billion over five years, including \$7.5 million for the development of a battery recycling plant and a research and development centre. And the [Ontario government](#) has committed nearly \$1 billion to mining the ore needed for the energy transition.