International Implications of Applying the Cost of Carbon

Comments on the cost of carbon and why we should be paying attention

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Outline

- What is happening in the rest of the world
- What is happening in the US
- How is it likely to affect US Manufacturers?

What is happening in the rest of the world

Why Should I Worry about Climate Change?

My manufacturing is in the US and we have Donald Trump and lots and lots of Natural Gas and NG prices are really low for the foreseeable future…

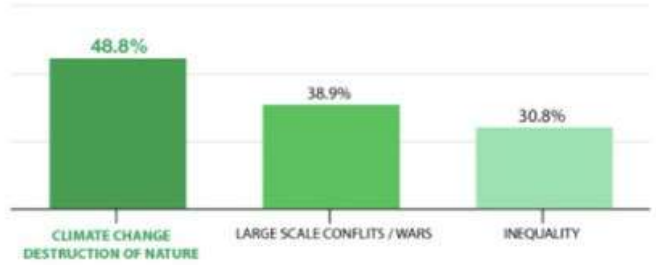
GLOBAL ECONOMIC OUTLOOK

Young people...

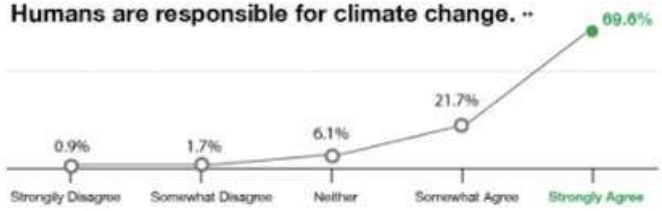
Think **climate change** and the **destruction of nature** is the most critical issue.

Over **90%** of young people agree or strongly agree that **Humans are responsible for climate change.**

Most serious global issues. *



Humans are responsible for climate change. **



*24'270 and ** 23'737 respondents

Global Shapers Annual Survey. #shaperssurvey

STANDING Tall OPERATIONS

The Francis Effect

Studies by Yale University and others have found that approximately one third of US Catholics say the Pope's views on Climate Change influenced their views.

2030 EU Climate Package

In October 2014, the Member States of the EU reached an agreement about a new climate package for 2030. EU government leaders have committed themselves to the following goals:

- Reducing greenhouse gas emissions by at least 40%;
- Increasing the share of renewable energy to at least 27%;
- Reducing the total energy use in the EU with at least 27%.

The objective to reduce the EU's greenhouse gas emissions by at least 40% in 2030 was submitted in March 2015 as the EU's pledge in the run up to the negotiations on a new global climate agreement at the international climate summit in Paris in 2015.

From the EU Climate Change web page

The EU Emissions Trading System has proved that putting a price on carbon and trading in it can work. Emissions from installations in the system are falling as intended – by slightly over 8% compared to the beginning of phase 3 (see 2016 figures).
In 2020, emissions from sectors covered by the system will be 21% lower than in 2005.
In 2030, under the revised system they will be 43% lower.

German greenhouse gas emission reduction sector targets 2030
(Climate Action Plan 2050, agreement from 11 November 2016)

Data: Federal German government

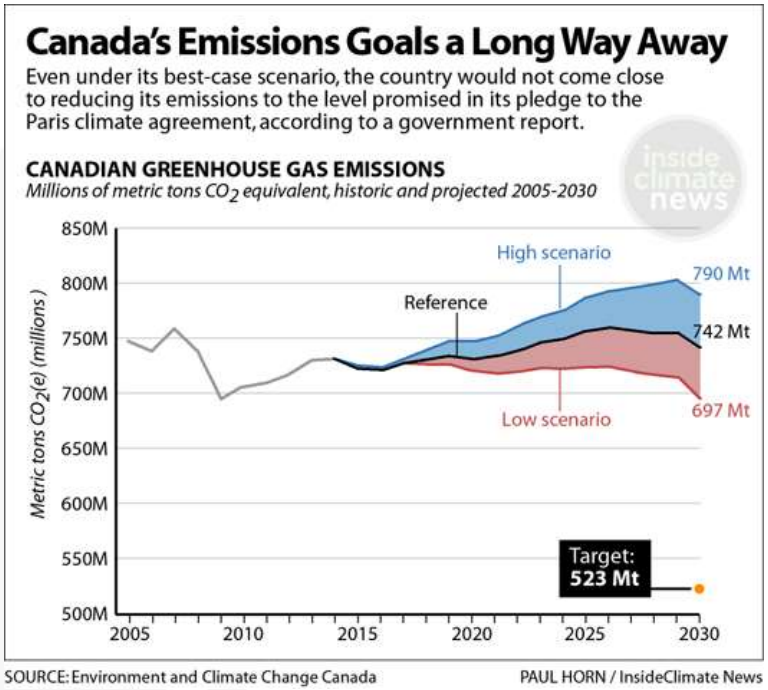
Sector	*1990**	*2014**	*2030**	*2030 (reduct., comp. to 1990)*
Energy	466	358	175-183	61-62%
Buildings	209	119	70-72	66-67%
Transport	163	160	95-98	40-42%
Industry	283	181	140-143	49-51%
Agriculture	88	72	58-61	31-34%
Other	39	12	5	87%
Total	**1248**	**902**	**543-562**	**55-56%**

*In million tonnes of CO_2 equivalents.

From the Green Growth Group web page

The Green Growth Group is an informal grouping of like-minded climate ministers from 15 EU Member States (UK, Ireland, Germany, France, Italy, Spain, Belgium, Portugal, Sweden, Denmark, Finland, Slovenia, Estonia, Luxemburg and the Netherlands) and Norway. The Group works together with a view to exploring, promoting and pursuing a cost-effective and growth-enhancing ambitious EU low carbon agenda and an ambitious, constructive and effective EU contribution to the international climate negotiations on a new global climate agreement.

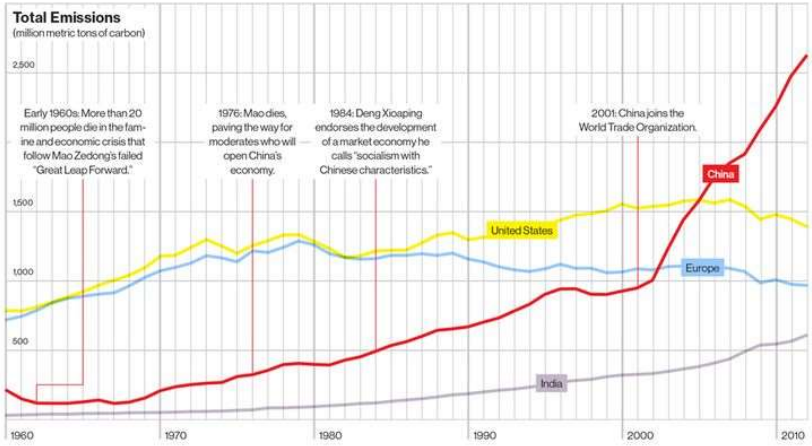
Canada's Climate Change Response



Does not include adjustments from recent Pan-Canadian Framework on Clean Growth and Climate Change

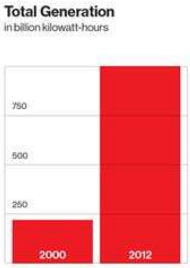
China's Climate Challenge

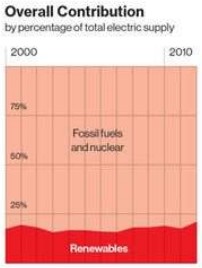
Rapid industrialization and rising standards of living have made China the world's top emitter of carbon dioxide. Preventing a runaway increase will require the country to keep per capita emissions at a relatively low level.



Role of Renewables

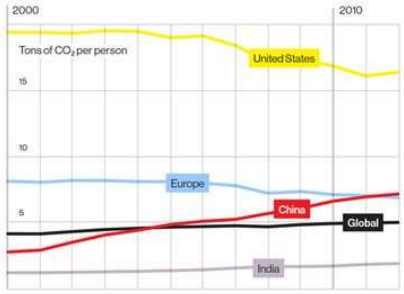
China generates about five times as much solar, wind, and hydroelectric power as it did in 2000. Even so, it has not substantially altered the overall makeup of its electricity supply. Nuclear's share has also held steady, at around 2 percent.





Emissions per Capita

If you divide emissions by the number of people in the country, China's output is now higher than average but still well below that of the United States.



MIT Technology Review

STANDING Tall
OPERATIONS

What is happening in the US?

GOOD QUESTION

What would a carbon tax mean for Washington State—and the earth?

WIN OR LOSE, A BALLOT INITIATIVE IN Washington State that would create a first-in-the-nation carbon tax has the potential to shake up the national debate about how to address climate change.

The policy known as I-1631 would, if approved, require companies to pay $15 for every metric ton of carbon dioxide they emit, beginning in 2020. The fee, which would increase over time, would provide the state with around $1 billion in annual revenue, which backers say could be used for solar and wind farms, restoration projects and climate-education programs, among other things. Supporters calculate that the measure would also allow the state to meet its official goal of reducing greenhouse gas emissions 25% by 2035. And perhaps even more significantly, it would jump-start a national debate about how to put a price on carbon, a move many consider central to stemming warming.

"If Washington gets this in place, it's going to provide a different picture of what's possible," says John Larsen, a director at the Rhodium Group, an energy-research firm.

Passage of the tax remains far from certain. Voters in the state rejected a carbon tax in 2016, in part for being too conservative, and polling suggests that this version is a toss-up. While local companies such as Microsoft and Expedia have announced support, several oil-and-gas-industry players have spent tens of millions of dollars opposing it.

But regardless of the outcome, the effort is likely to help shape the emerging national discussion over pricing carbon. A loss would raise questions about the viability of a progressive carbon tax that funds government programs and perhaps lead some activists to change tack. (A more moderate approach to a carbon tax is "revenue neutral," meaning it gives the money back to taxpayers, typically with a tax cut.) On the other hand, a win would give momentum to such measures, particularly in blue states.

While the idea of a federal carbon tax may seem remote, a slew of small developments hint at an emerging debate. A group of GOP elder statesmen and economists are promoting their own carbon-tax proposal. Congressman Carlos Curbelo, a Florida Republican, introduced a carbon-tax bill this year that would fund infrastructure. And the tenor of discussion among fossil-fuel companies, which for decades funded efforts to distort climate science, has changed as they increasingly recognize that measures to address climate change are inevitable in the long run.

Though most Republicans on Capitol Hill remain silent, at least a dozen GOP Senators are interested in a climate-change solution, says Senator Sheldon Whitehouse, a Rhode Island Democrat. "There's a very realistic prospect," he says, of getting all Democrats and "a significant, telling number of Republicans" to move on the issue. Measures like I-1631 may play a major role in determining just what that move looks like. —JUSTIN WORLAND

What killed the Washington Initiative

It wasn't the idea of a carbon tax that killed it.

It was a fight over how to spend the billions of dollars expected to be brought in by the carbon tax.

3 Ways you could spend Washington Carbon Taxes

Spend it on:

1. Renewables
2. State Infrastructure
3. Give it back as Tax Cuts or Rebates

2015 to 2025 Goal

(Lifecycle Energy and GHG Estimates from the perspective of the customer)

$$\frac{\Sigma\left[\text{Alternative cLCA} - \text{Dow Solution cLCA}\right]}{\text{Upstream Supply Chain} + \text{Dow Manufacturing Impact} + \text{Downstream Supply Chain}} = \frac{\text{What the Customer Values}}{\text{Total Resource Invested}}$$

Dow Product Applications Benefits ("Handprint")

Dow's Total Scope 1, 2, & 3 Burdens ("Footprint")

How is it likely to affect US Manufacturers?

Types of Emissions

Scope 1
Fuel combustion
Company vehicles
Fugitive emissions

Scope 2
Purchased electricity, heat and steam

Scope 3
Purchased goods and services
Business travel
Employee commuting
Waste disposal
Use of sold products
Transportation and distribution (up- and downstream)
Investments
Leased assets and franchises

Types of Emissions

Scope 1
License to operate
Economic Impact

Scope 2
Economic Impact

Scope 3
Economic Impact

Types of Mitigations

Emission Trading
Preferred

Carbon Tax
Less Preferred

Reduction Mandate
Less Preferred

So, what's it likely to cost me?

$CH_4 + 2O_2 = CO_2 + 2H_2O$

16 → 44

42 Lbs CH4/MMBTU → 115.5 Lbs CO2/MMBTU CH4
OR 0.05238 MT CO2 / MMBTU CH4

So…

$40/MT CO2e adds about $2.50/MMBTU for NG

$200/MT CO2e adds about $12.50/MMBTU for NG

Summary

Summary

- Momentum has swung heavily in favor of action on Climate Change globally.
- Especially true for Millennials and younger people in the world.
- The U.S. taking some action on Climate Change is just a matter of when.
- Companies need to look at their exposure to this change in policy and prepare accordingly.

Questions?

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