

### Topic 2.3: Canada's Climate Challenge in 14 Charts and Tables

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# Canada's Climate Change Challenge

The goal of this session is to get you to think about key aspects of Canada's (and the world's) climate change challenge through 14 graphs and tables. By the end of this session, you should have a sense of:

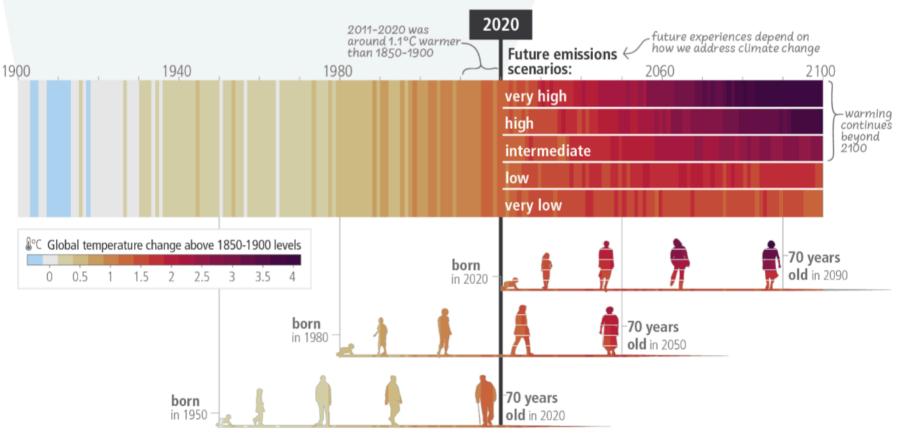
- the basic problem of climate change;
- the scale of the climate mitigation challenge;
- the basics of emissions-reduction pathways;
- Canada's emissions inventory;
- Canada's emissions projections;

Let's get started.

### We'll all live in a warming world

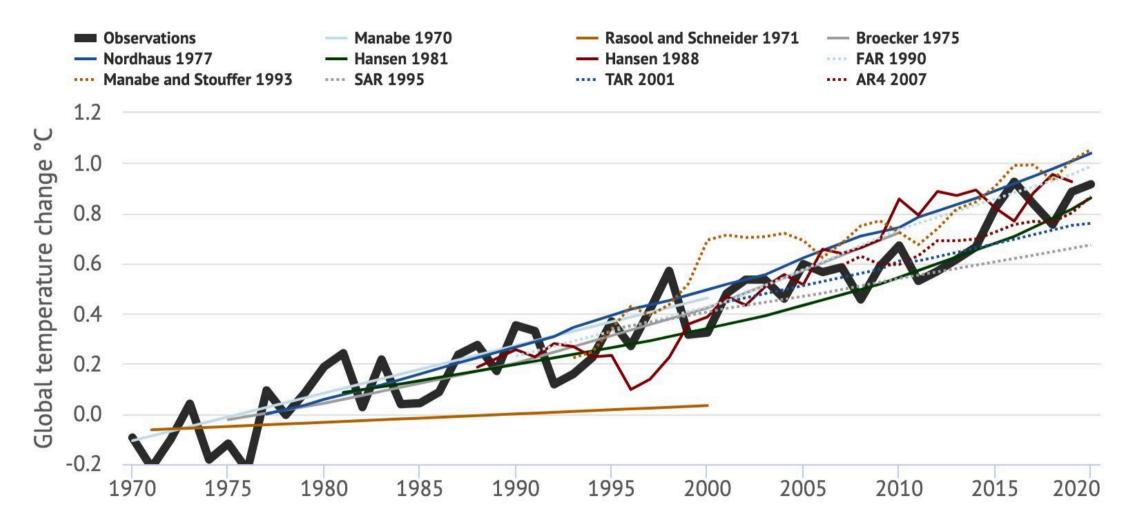


c) The extent to which current and future generations will experience a hotter and different world depends on choices now and in the near-term



### Climate models have done a good job so far

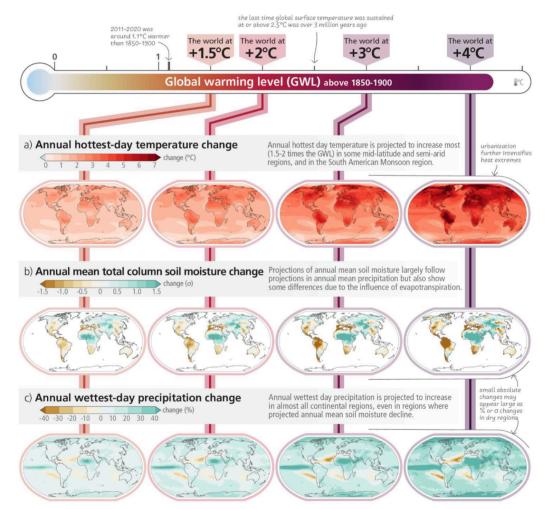




Source: IPCC AR6, WG1, Chapter 1, Figure 1.9 (p. 185) via Zeke Hausfather

### Not just about the heat

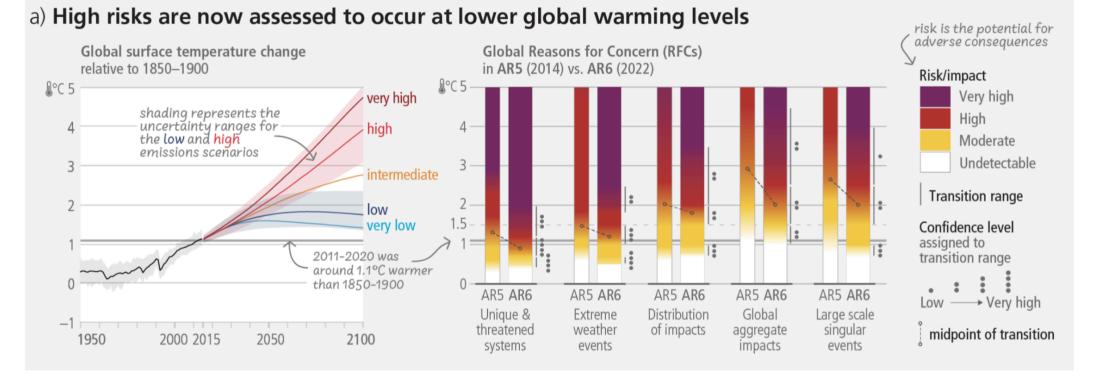
### With every increment of global warming, regional changes in mean climate and extremes become more widespread and pronounced



### As we learn more, we get more worried



### Risks are increasing with every increment of warming

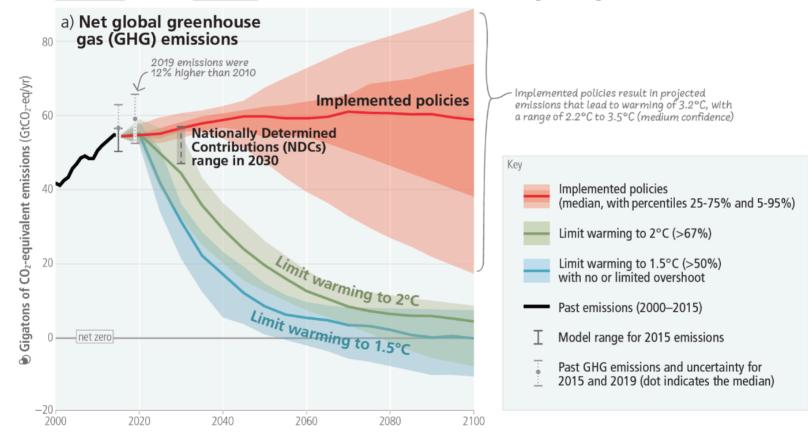


### We're not on track



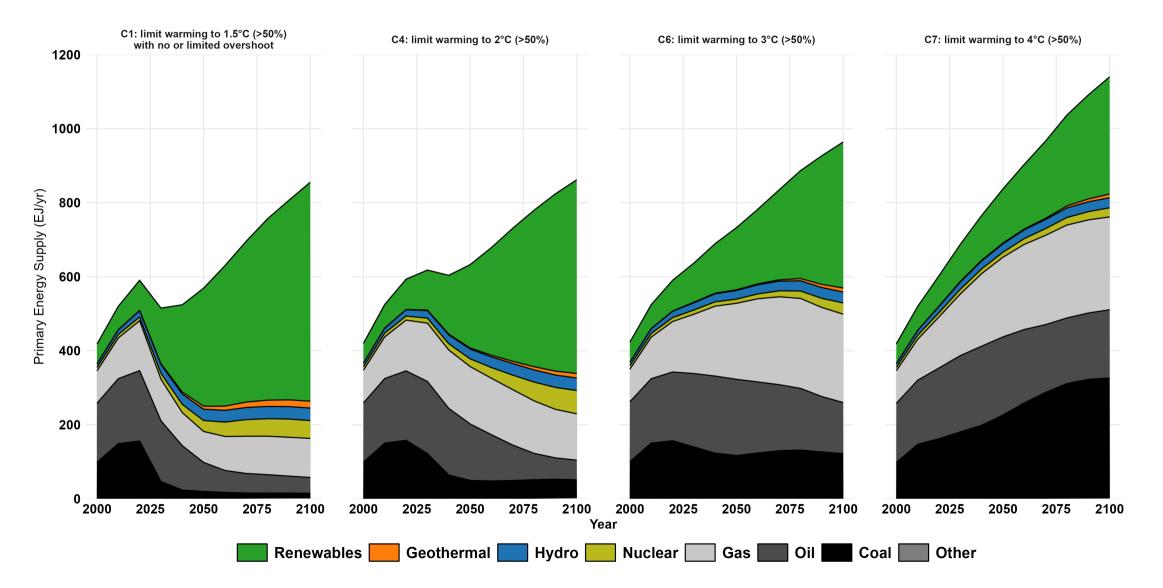
# Limiting warming to **1.5°C** and **2°C** involves rapid, deep and in most cases immediate greenhouse gas emission reductions

Net zero CO<sub>2</sub> and net zero GHG emissions can be achieved through strong reductions across all sectors



## The required energy system transition is dramatic

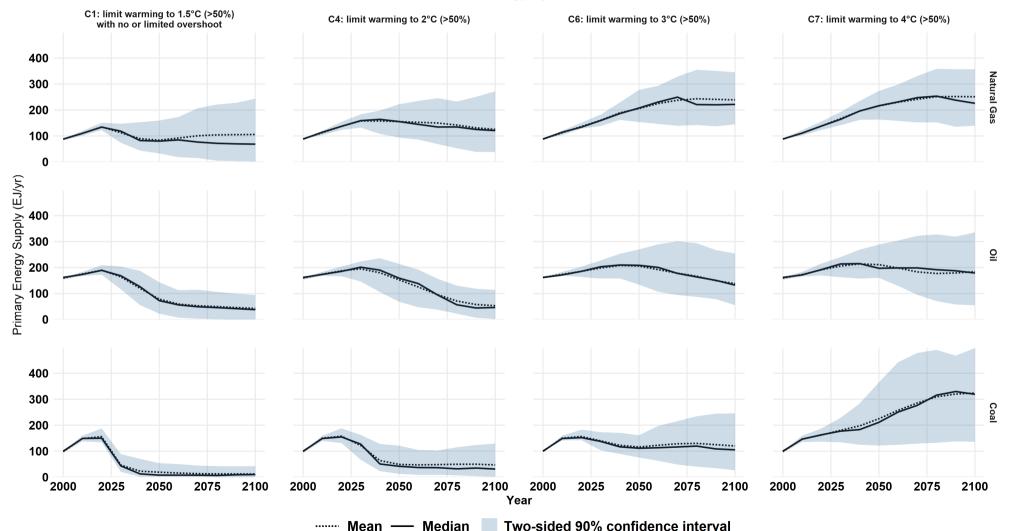




### Acting on climate change means burning fewer fossil fuels



Mean, median, and 90% confidence interval of estimated fossil energy by source, IPCC AR6 SSP2 model runs



Data: Byers et. al. 2022. AR6 Scenarios Database hosted by the International Institute for Applied Systems Analysis (IIASA). doi: 10.5281/zenodo.5886912 | url: data.ene.iiasa.ac.at/ar6/. Graph by Andrew Leach

## The world isn't going to use as much oil as you think



#### Table 3.1 >Global liquids demand and supply by scenario (mb/d)

		STEPS				APS		NZE			
	2023	2030	2035	2050	2030	2035	2050	2030	2035	2050	
Road transport	42.7	43.3	40.2	34.8	40.5	34.1	16.8	31.9	20.1	2.3	
Aviation and shipping	11.6	13.0	13.5	14.5	11.0	10.1	7.5	9.3	7.0	1.8	
Industry and petrochemicals	20.0	23.3	24.6	25.3	21.4	20.9	17.5	19.7	18.2	13.1	
Buildings and power	11.4	9.0	7.7	6.1	8.1	6.1	3.6	6.6	3.6	0.4	
Other sectors	13.3	13.1	13.1	12.5	11.8	10.9	8.4	10.8	8.9	5.3	
World oil demand	99.1	101.7	99.1	93.1	92.8	82.0	53.7	78.3	57.8	23.0	

Source: IEA World Energy Outlook, 2024

### The real action is in natural gas

#### **Table 3.2** > Global gas demand, production and trade by scenario

		STEPS			APS			NZE		
	2023	2030	2035	2050	2030	2035	2050	2030	2035	2050
Natural gas demand (bcm)	4 186	4 4 3 0	4 4 2 2	4 377	4 003	3 493	2 466	3 617	2 257	882
Power	1 642	1 657	1 602	1 513	1 519	1 258	786	1 537	773	136
Industry	936	1 037	1 080	1 136	941	888	674	852	711	338
Buildings	809	877	868	855	780	649	418	570	307	1
Transport	151	183	191	191	143	116	56	113	67	7
Inputs to low-emissions hydrogen	-	5	13	31	25	66	219	64	120	246
Other	647	671	668	651	593	510	302	482	279	156
of which: equipped with CCUS	14	29	43	74	69	134	356	144	247	463
Natural gas production (bcm)	4 218	4 4 3 0	4 422	4 377	4 003	3 493	2 466	3 617	2 257	882
Conventional gas	2 908	2 982	2 996	3 076	2 818	2 560	1 969	2 526	1 800	635
Unconventional gas	1 310	1 449	1 425	1 301	1 185	932	497	1 091	457	247

Source: IEA World Energy Outlook, 2024

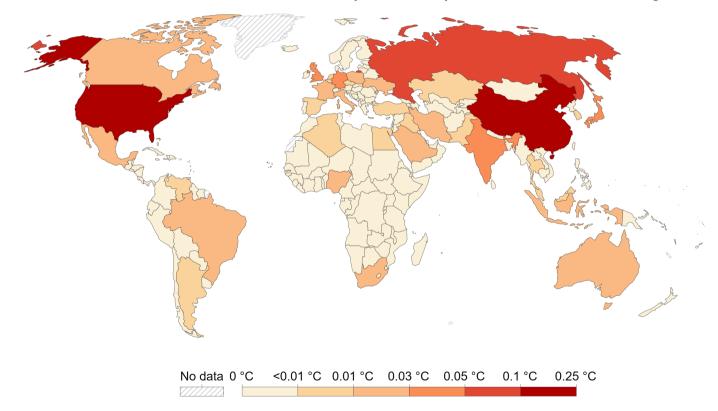
### Canada is a material part of the problem



Contribution to global mean surface temperature rise from fossil sources, 2021



The global mean surface temperature change as a result of a country or region's cumulative emissions of carbon dioxide, methane, and nitrous oxide. This is for fossil fuel and industry emissions only – it does not include land use or agriculture.

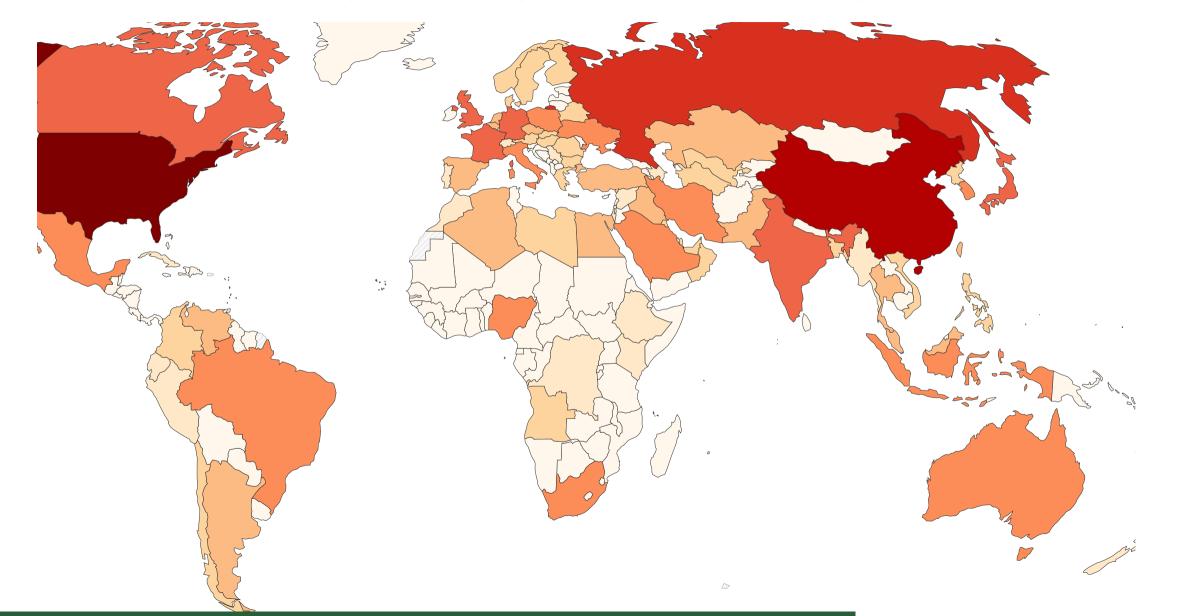


Source: Jones et al. (2023). National contributions to climate change due to historical emissions of carbon dioxide, methane and nitrous oxide. OurWorldInData.org/co2-and-greenhouse-gas-emissions • CC BY

#### Source: Our World in Data

### Canada is a material part of the problem (embeded map)



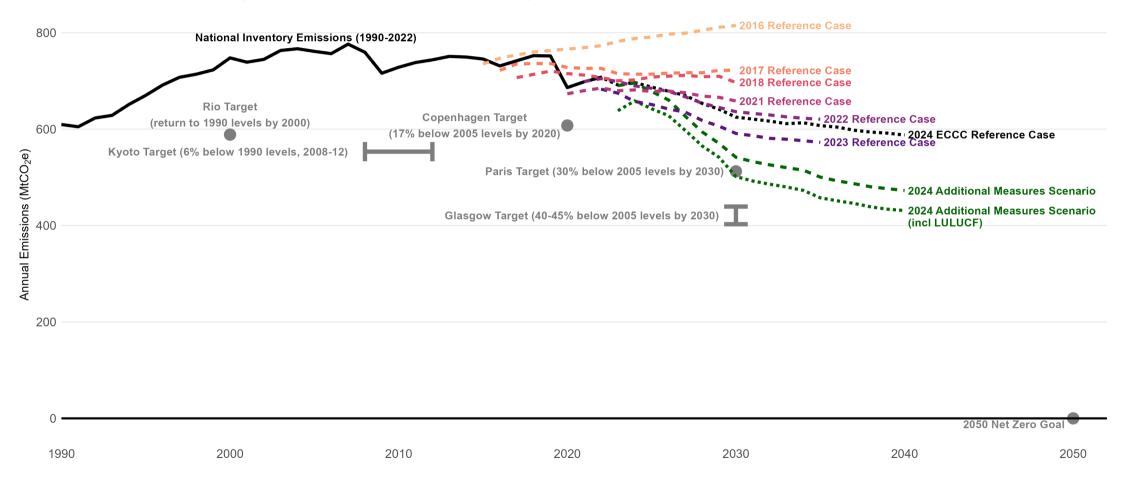


### Canada is not meeting its targets



#### Canada's GHG Emissions, Projections and Future Targets

Source: Environment and Climate Change Canada National Emissions Inventory Report (2024) and Projections (2016-2023). Graph by Andrew Leach.

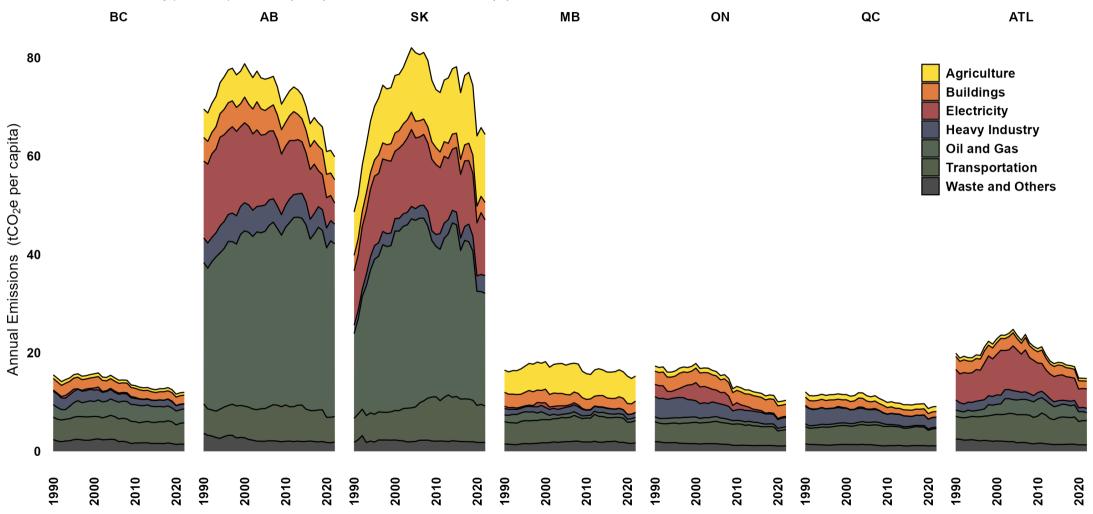


### **Canadian Climate Policy is Challenging**





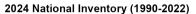
2024 National Inventory (1990-2022) emissions per capita based on Statisitics Canada population estimates

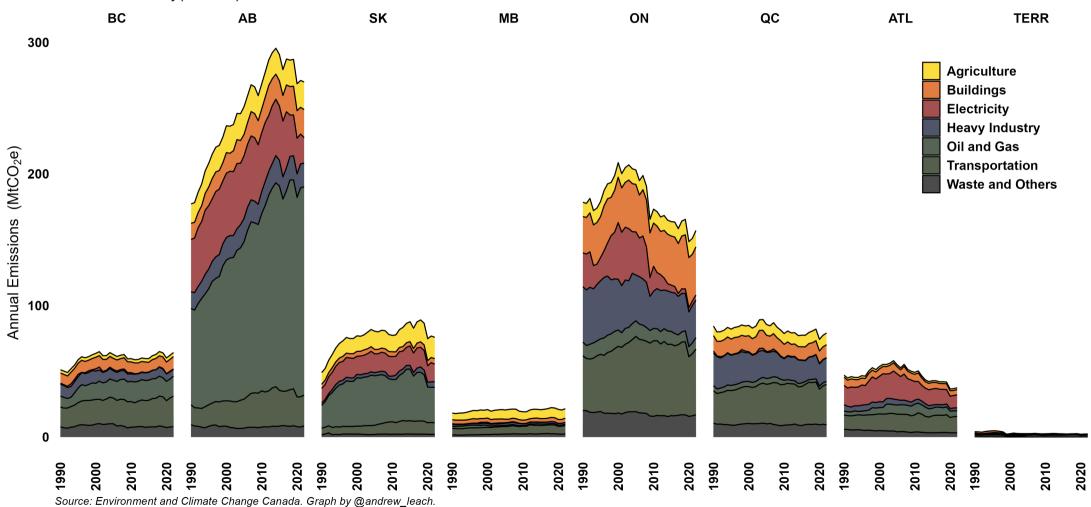


### This Challenge is Close to Home



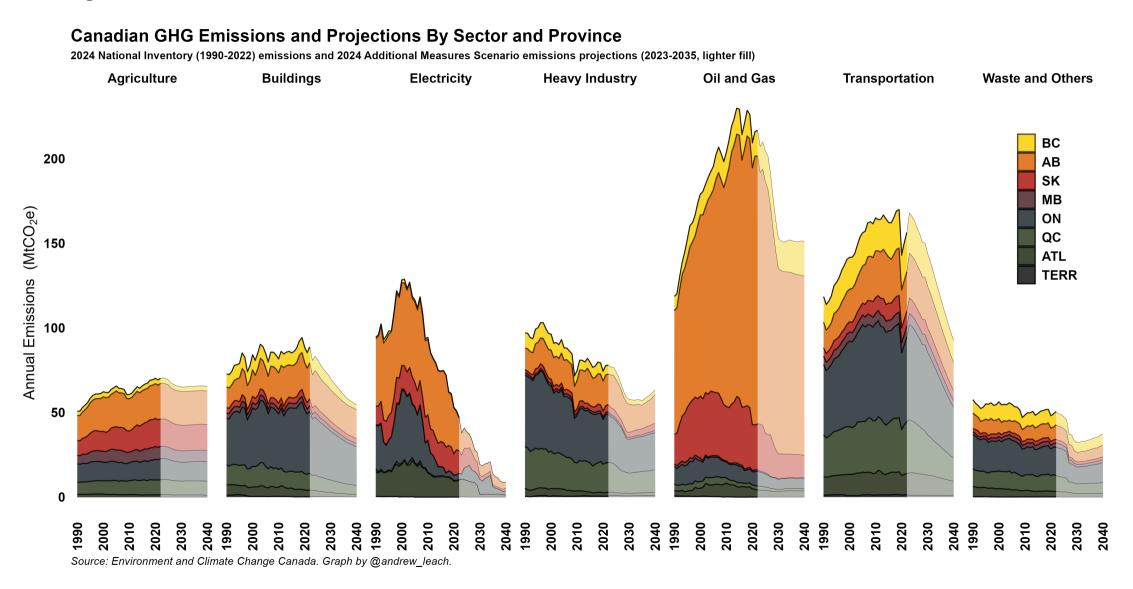






### Policy in Two Sectors Will Decide Canada's Future Emissions





### The IPCC Synthesis Report, Summary for Economics Students

