Climate Crisis and *Net-Zero* Emission Deceptions

Presentation to Club of Rome (Canada) – January 26, 2022

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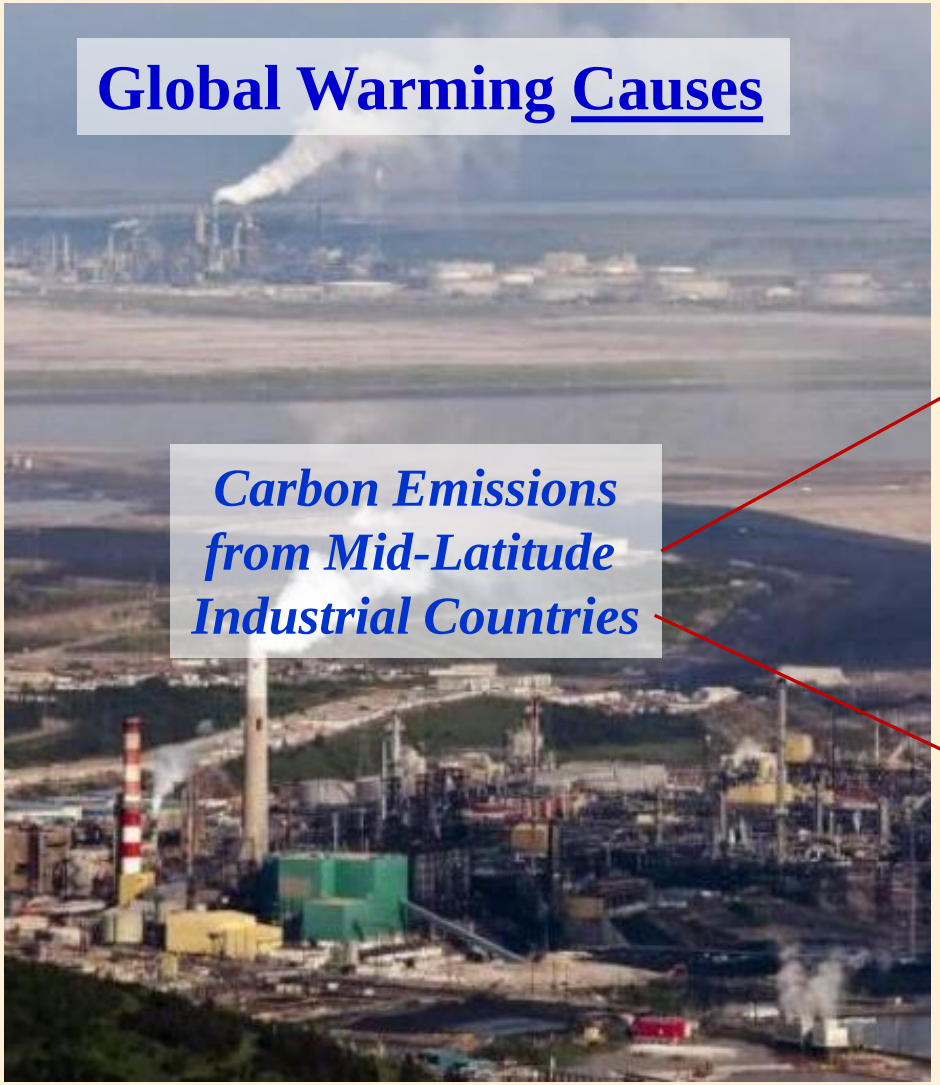
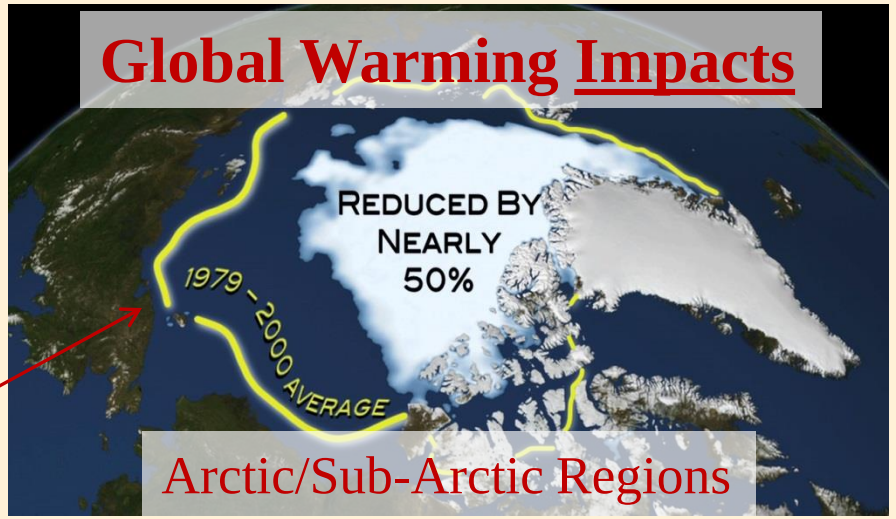




Goals for this presentation:

- Expose a number of myths concerning our climate crisis.

- Expose the *futility* of and *deceptions* in our present federal Climate Plan, "*A Healthy Environment and a Healthy Economy*" (Dec. 2020).
  https://www.canada.ca/en/services/environment/weather/climatechange/climate-plan/climate-plan-overview/healthy-environment-healthy-economy.html

  - Futility of carbon sequestration methods proposed for offsetting carbon emissions (in the short term).
  - Deceptions inherent in "*Net-zero Carbon Emissions by 2050*" which most countries have adopted (COP-26).

- Explain the importance of *Positive Feedbacks* and the climate *Tipping Point*.

- **Discussion**: How to persuade our federal government to end subsidies to fossil fuels, and provide incentives for renewable energy projects, while mandating *real* emission reductions.*

* *Because there really are NO other options!*

Climate Crisis MYTHS

1. That the 'climate crisis' is ~~over-stated~~ under-conservative (by the IPCC), is ~~*alarmist*~~. Untrue!
2. That planting millions of trees will offset carbon emissions while also drawing down atmospheric CO_2. Untrue!
3. That Direct Atmospheric Carbon Capture (DAC) will significantly offset carbon emissions. Untrue!
4. That Carbon Capture and Storage at industrial sources (CCS) can significantly curtail carbon emissions. & CCuS Untrue!
5. That agricultural methods are a significant source of carbon emissions. Untrue!
6. That youth should stay in school, stop all climate rallies, and allow global leaders do their job fighting climate change. Untrue!
7. '**Net-zero emissions** by 2050' is interpreted by many as "**carbon neutral by 2050**". Untrue!

   - these climate plans are a blatant form of '*greenwashing*'.

   ➔ **Near-zero emissions** by 2050

- Newspaper headlines?

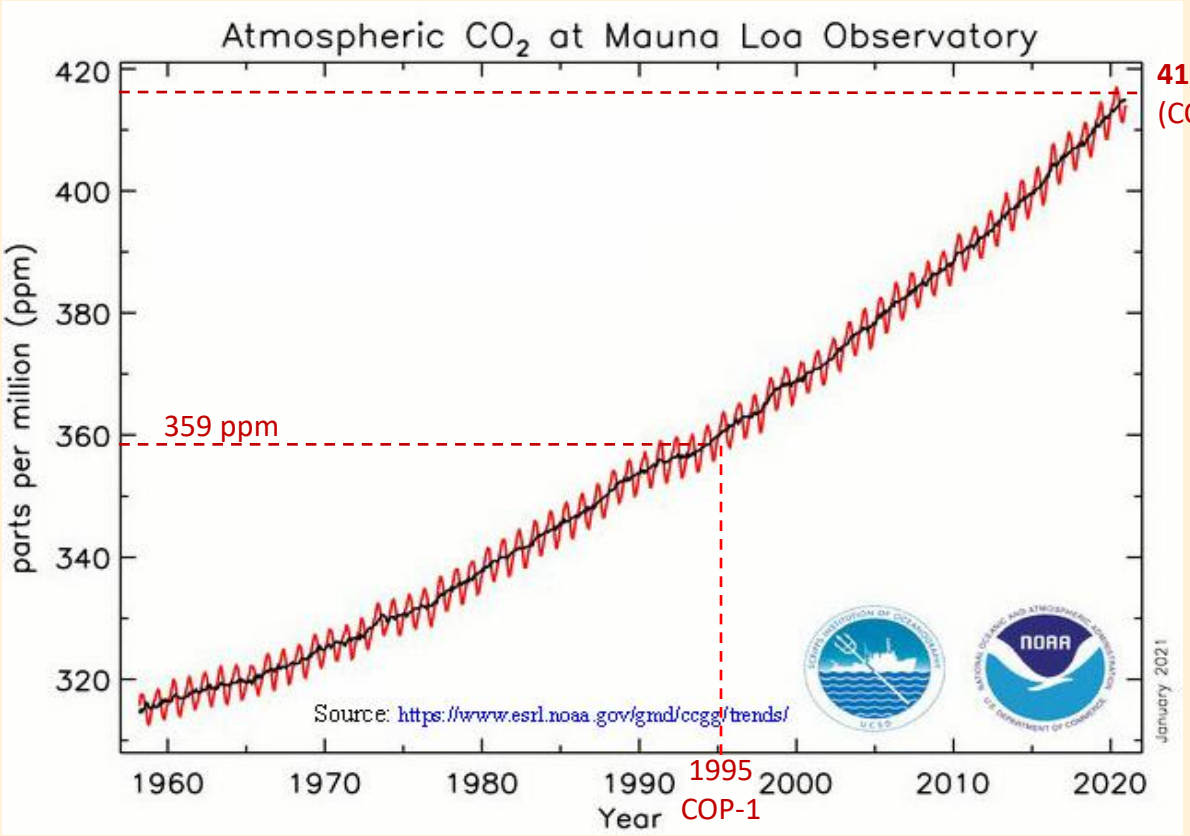
Climate depression real - spreading fast among youth

A School Strike for Climate protest in Sydney, Australia, May 2021. Photograph: Richard Milnes/Rex/Shutterstock

Psychologist's global Survey - of 10,000 young people aged 16-25:

- *77% said "the future is frightening"*
- *63% "feel anxious".*
- *68% "feel sad"*
- *39% "feel hesitant to have children".*

Why not stop all the youth protests, and let global leaders decide on how to fight the Climate Crisis?



Jan.25 2021 - <416

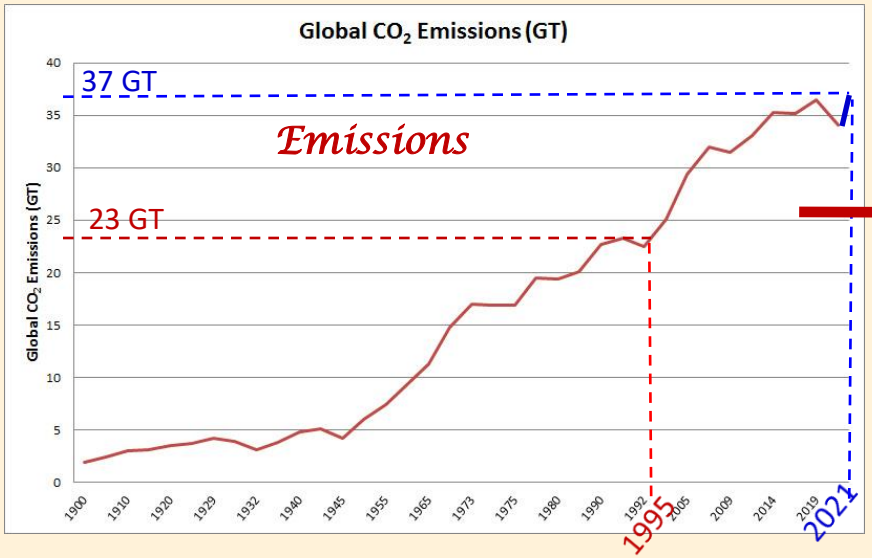
Jan.25 2022 - 419

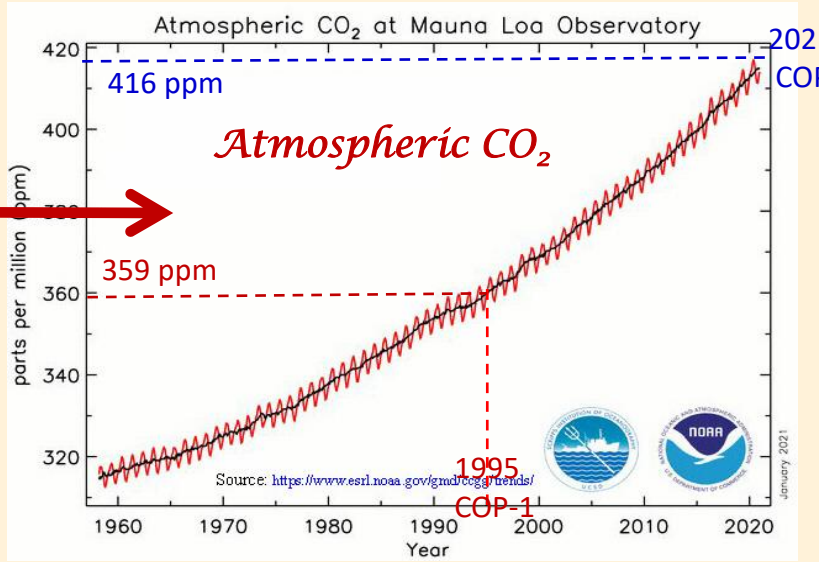
- *Started by David Keeling of the Scripps Institution of Oceanography in March 1958.*

From 1995 (COP-1) to 2021 (COP-26), there have been 26 UN-sponsored meetings, and 26 packages of agreements on emission reductions, etc.

All agreements to date have been broken. *Atmospheric CO_2 has increased by 2.2 ppm per year.*

REMINDER: Global warming today is the result of emissions over the past 50-100 years. If all emissions ended today, the global climate would continue to warm for many decades (because of CO_2 residence time).





Emissions: 1995 – 23 GT
2021 - 37 GT
Increase: 14 GT = +61%

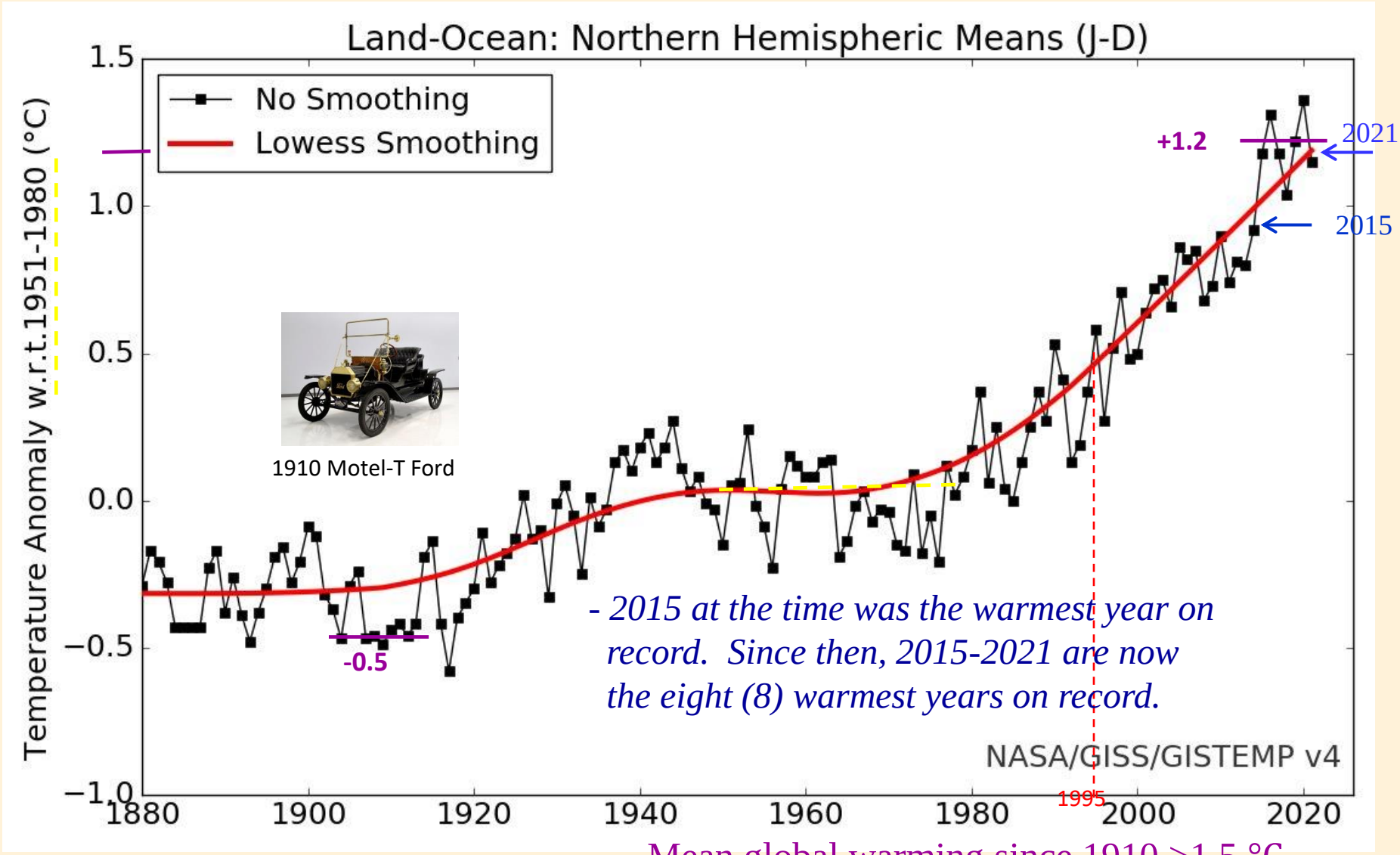
Global emissions depend on honesty of govts and industry

Atmos. CO_2: 1995 – 359 ppm
2021 – 416 ppm
Increase: 57 ppm = +15 %

Nature does not lie!

FALLACY: *"Net-zero emissions by 2050" is being interpreted by media and the public as 'zero emissions' by 2050 (carbon-neutral).*

Industry can interpret 'Net-zero' as no additional emissions beyond 37 GT by 2050.



- 1.1 °C warming since 1850, IPCC suggest holding warming to 1.5 °C.

- Mean global warming since 1910 >1.5 °C so that holding to '1.5 °C' has already failed.
- Next, try to hold it to 2°C warming.

Lytton, BC Wildfire, 30 June 2021 and Merritt, BC floods, Nov. 2021

All-time record temps. Canada:
June 27 - 47.5 °C
28 - 46.6 °C
29 - 49.5 °C
Previous record - Midale, SK
July 5, 1937 – 45 °C

Google-Earth image o

g Wildfire, June 30, 2021

Merritt, BC following flooding, Nov. 2021

WILDFIRES – Alberta, California, Australia, Greece, ……

One way out of Ft. McMurray, May 2016

California, 2019

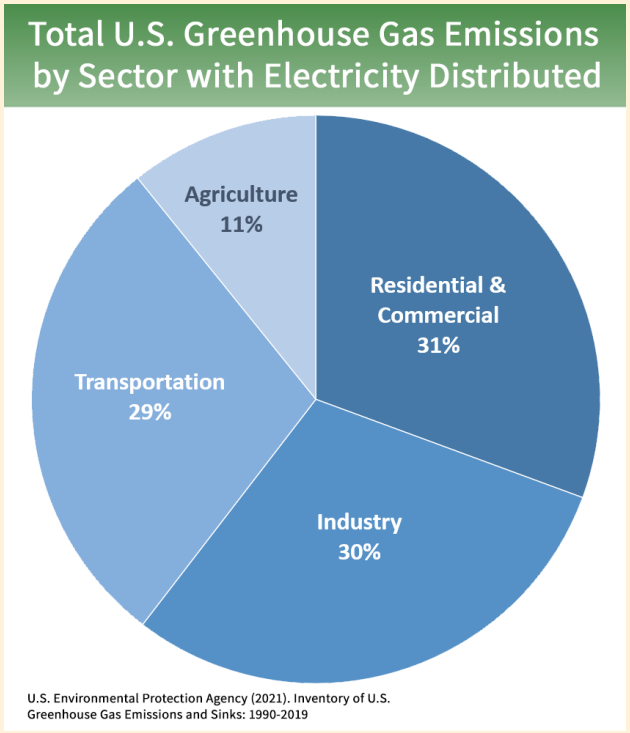
All resulting from *global warming*!

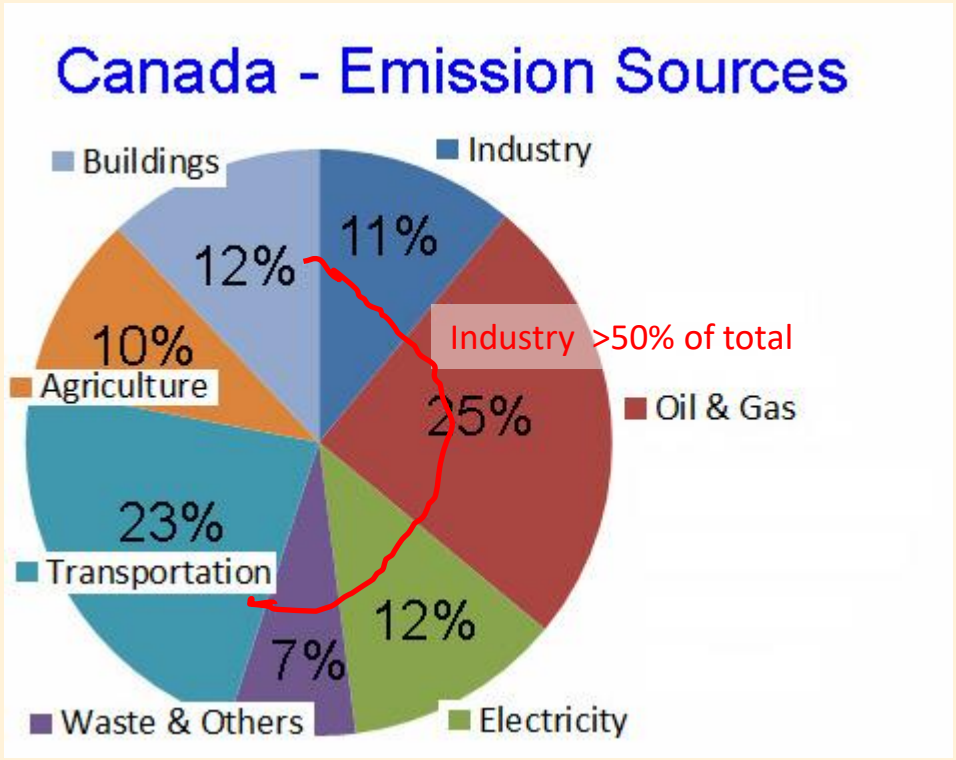
Australia, 2019-20

Greece, August 2021

U.S. and Canada *Carbon Emission* sources at present

Carbon Emissions – refer mainly to CO_2 emitted from burning fossil fuels
– *oil, gas, coal, wood* (plastics, etc.)





- The 'pies' make it appear that industry is less responsible for emissions.
- Net-zero refers to a balance between the *amount of GHGs emitted* and the *amount removed* from the atmosphere after a given baseline year (2008 – 740 MT)

PROBLEM: How emissions are estimated by different countries, different industries

CLIMATE CRISIS

Existing atmospheric CO_2 (419 ppm) + CH_4, N_2O

Global emissions in 2021 were **36 GT** (gigatonnes) = **36,000,000,000 tonnes**.

Sources (of emissions)

S1 – Industrial, Oil/Gas/Coal **(> 50%)**

S2 – Transportation **(25%)**

S3 – Buildings **(12%)**

S4 – Agriculture **(< 10%)**

S5 – Methane release from fracking, *melting permafrost* **(??)**

S6 – *Positive Feedbacks* on the climate

Sinks (mitigation & sequestration)

M1 – Rapid reduction of emissions √

M2 – Renewable Energy (wind, solar, etc.) √

M3 – Electric Vehicles and Carbon Tax √

M1 – M3 require no further explanation.

M4 – Planting millions of trees

Technological Removal:

M5 – Direct air Capture/Storage of CO_2 (DAC)

M6 – Carbon Capture/Storage at Source (CCS)

Unfortunately, industries who would use M5 and M6 all intend to use the captured CO_2 to make more fuel ➔ no net reduction.

M3 - Planting millions of trees

How many years to maturity?

In tropical climates, trees can reach full maturity in 10-20 yrs.

In boreal forest, trees mature in 50-100 yrs.

Climate plans do not take account for trees disappearing through harvesting. Canada lost 44.1M ha of tree cover between 2001 and 2020.

Globally (annual global emissions ~ 36 GT)

- A mature tree absorbs < 50 pounds CO_2 per tree/yr ≈ 0.06 metric tonnes of CO_2.
- Number of (planted) mature trees required to absorb 36,000,000,000 tonnes CO_2 = 36 GT/0.06 = > 600 trillion (mature) trees. (6 trillion trees to absorb 1%)

Present number of trees on Earth ≈ 3 trillion. - will counter <<1% of emissions

M4 – Direct air Capture/Storage of CO_2 (DAC)

https://www.cnn.com/2021/10/20/world/carbon-capture-storage-climate-iceland-intl-cmd/index.html

Orca CO_2 direct air capture plant in Iceland.

- Orca (can) capture up to 4000 tonnes of carbon per year.
- DAC facility in SE Saskatchewan claims 15 tonnes/day ≈ 5,500 tonnes/year

Global emissions in 2021, 36 GT (gigatonnes) = 36,000,000,000 tonnes (36 billion)

- 36,000,000,000 tonnes/10,000 tonnes = **4 million facilities** to remove annual emissions!

Q: How much does it cost to build and operate a DAC facility?

Q: How much CO_2 does the operation release to the atmosphere?

M5 - Carbon Capture/Storage at Source (CCS)

- Sleipner CO2 Storage Facility, offshore Norway: can capture 0.85 million tonnes/yr

- Chaparral/Conestoga Energy, Kansas, supplies 170,000 tonnes of CO2/year.

Global emissions in 2021, 36 GT (gigatonnes) = 36,000,000,000 tonnes (36 billion)

- 36,000,000,000 tonnes/1 million tonnes = 36,000 facilities to remove annual emissions!
- 3600 facilities to remove 10% of annual emissions (if implemented NOW).

SUMMARY

CLIMATE CRISIS

Existing atmospheric CO_2 (419 ppm) + CH_4, N_2O

Global emissions in 2021 were **36 GT** (gigatonnes) = **36,000,000,000 tonnes**.

Sources (of emissions)

S1 – Industrial, Oil/Gas/Coal **(> 50%)**

S2 – Transportation **(25%)**

S3 – Buildings **(12%)**

S4 – Agriculture **(< 10%)**

S5 – Methane release from fracking and *melting permafrost* **(??)**

S6 – *Positive Feedbacks* on the climate

Sinks (for mitigation)

M1 – Rapid reduction of emissions **30%**

M2 – Renewable Energy (wind, solar, etc.) **50%**

- 30% by 2023, >50% by 2030

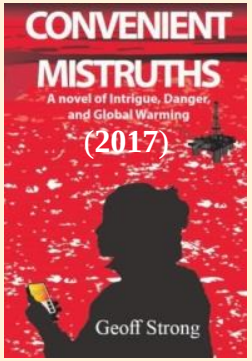
M3 – Electric Vehicles and Carbon Tax **20%**

~~M4 – Planting (100s) millions of trees~~ **<< 1%**

~~M5 – Direct air Capture/Storage CO_2 (DAC)~~ **<<1%**

M6 – Carbon Capture/Storage at Source (CCS) **< 1%**

We pause this discussion for a brief commercial message . . .



- *characters and events are fictional;*
- *the climate science is accurate.*

Critique of Canada's Climate Plan:

Letter to PM Trudeau, Jan. 23, 2021, with email copies to all MPs

QUESTION: "*How do you hope to achieve 'zero emissions' by 2050*?"

REPLY April 9: "*Excess emissions would be offset by tree planting and direct carbon capture;*"
i.e..; through sequestration actions (M4 – M6).
(trees, DAC, CCS)

- Either no one 'did the math',
or they were being deliberately deceptive,
or they simply do not care.

"Net-Zero by 2050" is a dangerous illusion

- Devised by the fossil fuel industry, and supported by most large corporations whose interest is in profit-taking, and by governments too weak to defy the fossil fuel industry.

- Mark Carney, ex-governor of the Bank of England described his $600bn Brookfield Asset Management portfolio as "carbon neutral", despite investments in fossil fuels.
Carney: "The reason we're net-zero is that we have this enormous renewables business."

Disaster looms if big finance is allowed to game the carbon offsetting markets to achieve 'net zero' emissions

Mark Carney, former governor of the Bank of England at the UN climate change conference in 2020. Photograph: Reuters

To Salvage our Climate (and save humankind), we (globally) need to achieve at least a 50% reduction of carbon emissions by 2030, and 80-90% by 2050.

- Electrification of transportation should account for 20% of emission reductions.
- Renewable energy could(?) account for a large proportion of remaining 60-70%.

HOW MUST THIS BE ACHIEVED?

THE (3) most important strategies (for Canada) right now are:

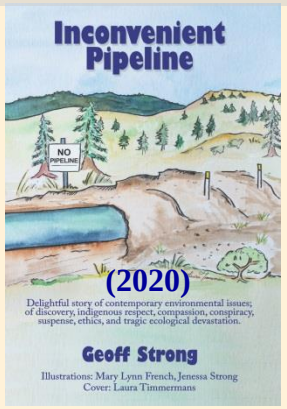
1) Rapid and significant reduction in industrial/home carbon emissions.
   ≥ 50% by 2030 (through renewable energy, not through sequestration technologies) and 60-70% by 2050.

2) Stop fossil fuel subsidies and the TMX pipeline!
   - the pipeline would be better served as a water line

3) Followed by '*sequestration*' techniques
   - to extract carbon from the atmosphere, a process that will take centuries.

Unfortunately, Canada has embraced #3, and is avoiding much of (1 & 2). This plan simply will NOT work!

*. . . and speaking of the pipeline**



* A prequel to *Convenient Mistruths, the setting is 12 years before.*

E6 - *Positive Feedbacks* and the *Tipping Point*

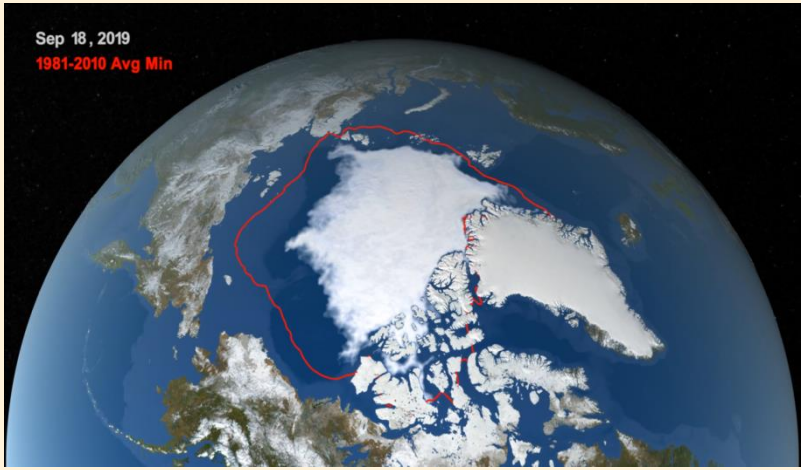
Is a *tipping point* in climate possible, where you would essentially have a runaway climate? [YES]

Under what conditions could it occur?

The answer is contingent on '*positive feedback*' mechanisms. What are these positive feedbacks?

E6 - *Positive Feedbacks* and the *Tipping Point* (cont'd)

- The following (4) are *Positive Feedback* Loops (in climate processes):



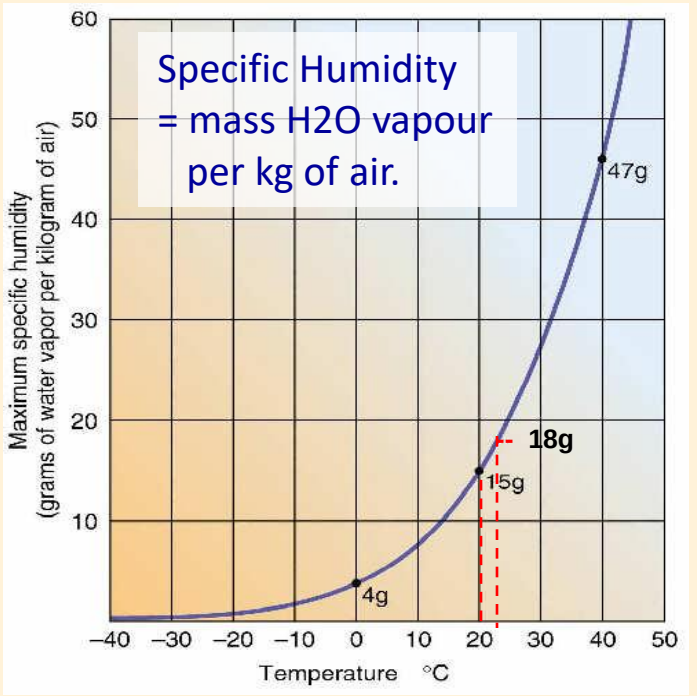
1) Melting ice from Arctic land/sea surfaces:

- ice-covered surfaces reflect 90-95% of insolation;
- open water or bared land allows more absorption of insolation;
- feeds back to more global warming.

2) Increased Global Temperatures

- Mass H_2O vapour in the atmosphere is solely dependent on mean air temperature.

- If the global avg. temp. increases by 2 °C, then H_2O vapour mass increases by ~20%.
- Water vapour is the most potent greenhouse gas.
- Causes an increase in H_2O vapour (and corresponding increase in precipitation), which warms the climate more (as a GHG), allows more vapour, which . . .



E6 - *Positive Feedbacks* and the *Tipping Point* (cont'd)

3) Rainforest Drought

- *including our Canadian boreal forests, especially old growth forests.*

- Brazilian rainforests deforested for farming and plantations;
- No longer holds moisture in;
- Reduces "sky rivers" of moisture flowing out from the Amazon;
- Amazon contains more than 50% of global rainforests - rapidly being depleted.

RESULT:

➔ <u>loss of carbon sink</u> due dying trees, especially equatorial rainforests)
➔ increased potential for forest fires;
➔ <u>releases more CO_2</u> to the atmosphere;
➔ causes an increase in global warming.

E6 - *Positive Feedbacks* and the *Tipping Point* (cont'd)

4) Release of Methane from oil/gas fracking and Melting Permafrost (in Arctic regions)

- peat bogs decompose releasing CO_2 & CH_4
- CH_4 an 82X more potent GHG than CO_2
- since 1800, CO_2 increased 45%, CH_4 by 200%

➔ possible disastrous global warming potential.

Decomposing peat bogs release carbon dioxide (if dry), methane (if wet).

Pond west of Aklavik, NWT, 2015

Melting permafrost layer in NWT, exposing peat bogs

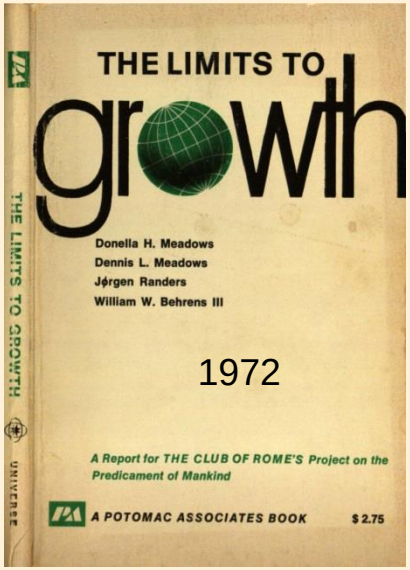
E6 - *Positive Feedbacks* and the *Tipping Point* (cont'd)

- If/When the maximum impact of these positive feedbacks occur simultaneously, we would have a tipping point in our climate.

- From that point on, global warming and climate impacts would accelerate, generally <u>becoming beyond our control</u>.

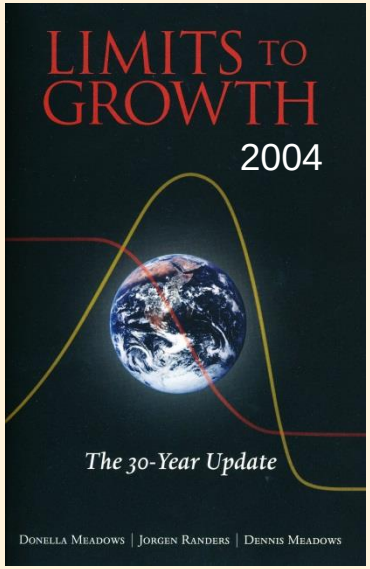
- Latest estimates indicate this could occur with 2 °C warming! (2040?)

All of this can be traced to our unlimited and unsustainable growth - taking resources, not returning anything back to the environment.



If present growth trends continue unchanged, the limits to growth on this planet will be reached sometime within the next 100 years.

- Donella Meadows et al.
"*The Limits to G*rowth", 1972



Why am I still fighting climate change?

1. Canadian climate scientists have not been speaking out to the public.
   https://bulletin.cmos.ca/the-essential-role-of-climate-scientists-in-canadas-climate-plan/
2. Concern for future generations (after 2050), starting with our own grandchildren and Great-grandchildren.

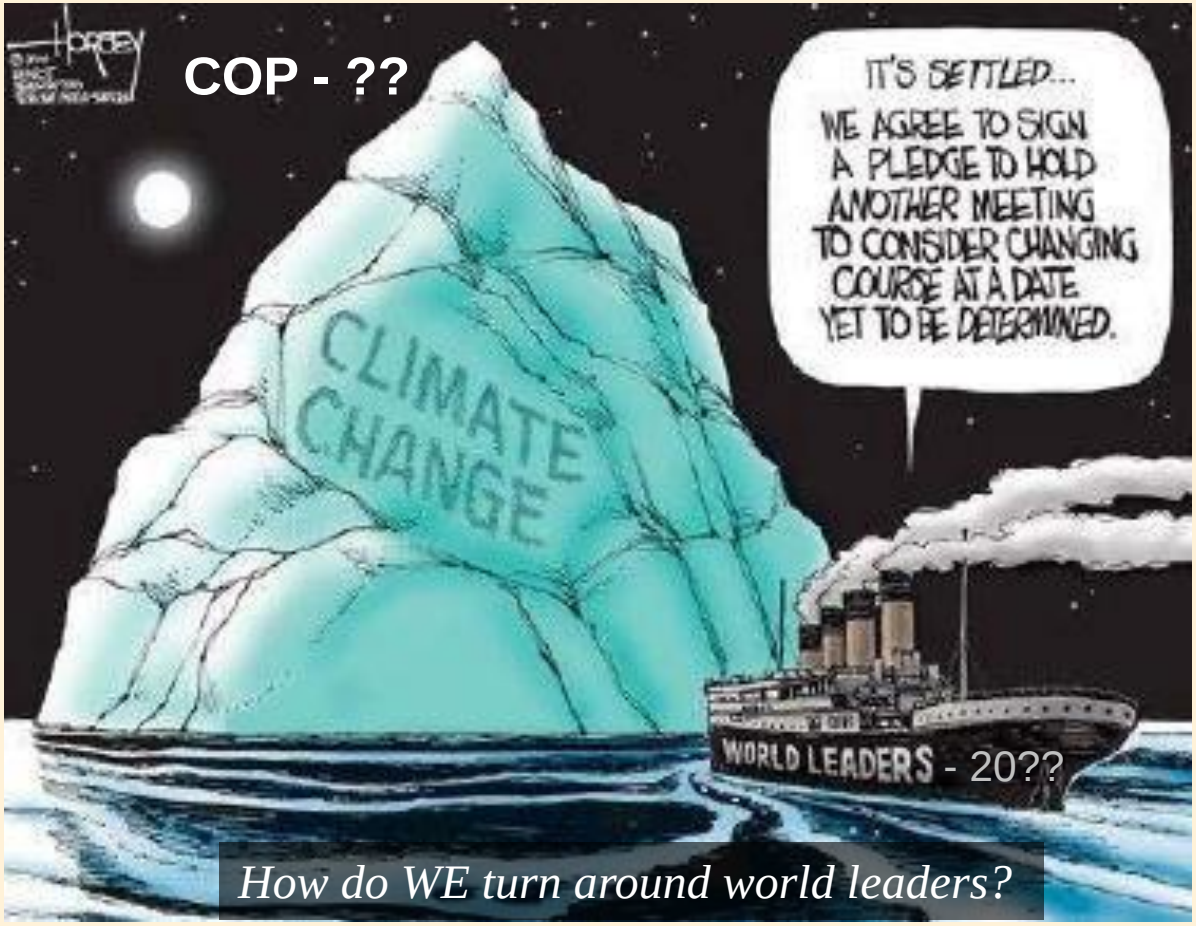
My Great-Grandchildren

It is their future (after 2050), not ours, and we should be fighting the climate crisis for them.

Global warming concerns our youth. Support youth climate rallies!

Greta Thunberg: "*We need public pressure, not just international summits*"

Q: In what ways can we best apply that public pressure?



Thank you!

Questions/Comments?

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