

## What Individuals and Companies Can do Relating to Climate Change

An overview of what others are doing, as well as newer, novel suggestions

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## What Individuals and Companies Can do Relating to Climate Change

- The Paris Agreement and the International Scientific Consensus
- Potential future regulatory or legal actions:
  - Common law nuisance cases; command and control; cap and trade; carbon tax; Kigali sanctions
- “Sub-Nationals”:
  - What Chicago and mid-west companies and individuals are doing
  - National NGO efforts
  - City and State efforts - in concert or individually: North American Climate Summit and U.S. Climate Alliance
    - Many cities adopting GHG reduction strategies to meet 2050 goals
- Existing legal opportunities for Deep Decarbonization: mitigation, adaptation and finance/risk: Illustrative sectors:
  - Commercial real estate
  - Manufacturing and chemicals
  - Utilities and power
  - Food/Agricultural
  - Self-made: Tax Credits and Quantified Verified Voluntary Reductions

## Atmospheric CO2 breaks a record. Here's why it matters

Chelsea Harvey, E&E News reporter • Published: Thursday, May 16, 2019

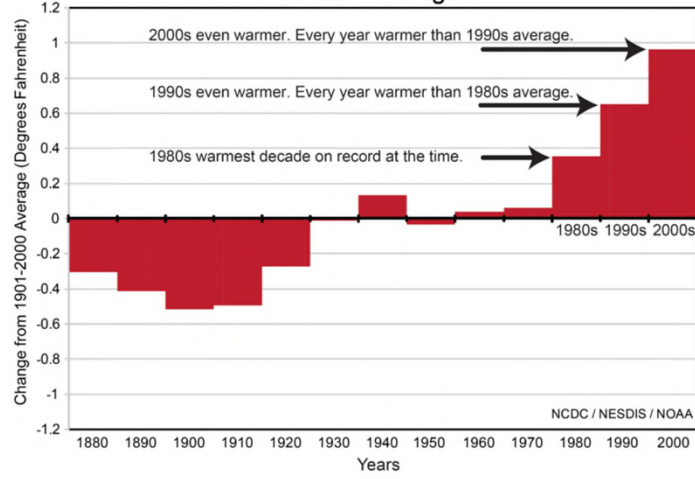


Earth is seen from a satellite on May 10; hours later, atmospheric carbon dioxide hit its highest levels in human history. LEONELLO CALVETTI/SCIENCE PHOTO LIBRARY/Newscom

### Record breaking...

- 415 ppm CO2 levels recorded for the first time in human history
- Atmospheric CO2 is rising at accelerating rate -- now at 3 ppm per year
- Of the hottest years on record, all but two were in the last 24 years
- Carbon budget: emitting an added 420,000,000 to 570,000,000 tons of CO2 gives the world 66% chance of meeting the 1.5 C temperature goal.
  - Same as only 12 years worth of current global GHG emissions!
- The last time CO2 levels over 400 ppm on earth
  - Temperatures were 3 C higher
  - Sea levels were several feet higher
  - No *homo sapiens*.

### Global Temperature Change Decade Averages



Global temperature change — decadal averages, 1880s–2000s (NOAA).<sup>[23]</sup>



## The Paris Agreement

- 195 countries signed the Paris Agreement. Went into force in 2016.
- Goal to limit increase to 2C, hope to hold to 1.5C; INDCs submitted only yield 2.5C
  - Key mechanism added -- international trading/transfer of commitments and benefits
  - Half of extra carbon dioxide in atmosphere emitted in last 30 years!
- Will US actually exit?
  - No country can withdraw for 3 years, not effective for another year: November 4, 2020
- US promise: as of 2016 on track to meet 28% reductions
  - Major causes: Clean Power Plan and Energy Tax Credit incentives
- Large number of state and local governments, and private citizens and companies are stepping forward.

## Potential Legal Consequences from Inaction on Climate

- Common law nuisance and public trust litigation
- Command and control approaches
  - i.e. Clean Power plan (now being withdrawn by EPA) and Ontario proposed sector performance standards
- Cap and trade structures
  - E.g. California AB-32 cap and trade program, Regional Greenhouse Gas Initiative (electric sector only)
- Carbon Tax
  - E.g. Vancouver legislation; economists favored
- Kigali sanctions
  - Automatic trade sanction if next version of Montreal Protocol not adopted

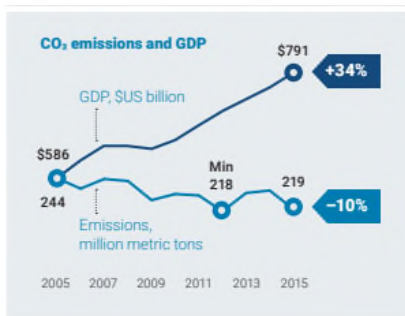
U.S. Climate Alliance: 24 Governors have signed, representing 55% of population

## CDP 2018 Report: State by state analysis - Chapter on Illinois

- Major Industries in Illinois -- GDP in 2016 of \$803B
  - Finance
  - Professional Services
  - Manufacturing
  - Educational services
  - Wholesale trade
- Energy Supply
  - Nuclear - 43%
  - Coal - 41%
  - Renewables - 15%
- Energy Consumption: 5.6 thousands Btu/dollar

## Comparison by the Numbers:

- CO2 emissions and GDP



- State emission reduction target:
  - By 2020, emissions at 1990 levels
  - By 2050, 60% below 1990 levels
- State climate change action plan?
  - None
  - But Chicago and Evanston have adopted plans and others have stormwater and flood management plans

## Top Issues and Risks to Chicago Public Companies

- Among 32 disclosing companies
  - 27 with targets
  - 5 with science targets
  - 4 with carbon pricing included or planned
- Top risk drivers
  - carbon pricing
  - changes in precipitation and droughts
  - fuel/energy taxes and regulations
- Top opportunities
  - Reputation and changing consumer behavior
- Top policy engagement opportunities:
  - Energy efficiency, climate change, carbon pricing, clean energy generation

## Management Actions by Companies Based in Chicago Region

- The CDP report summarized a few of the management activities on climate:
- One respondent stated: our “position [is] that climate change is an important global business issue and that the company must proactively participate in finding solutions that also consider our business interests and those of our customers”
- Another concluded “it was facing real operational disruptions, as well as potential regulatory burdens...[and set] a target to reduce its greenhouse gas emissions by 50% by 2050...and [to] developing the market for sustainable aviation biofuels...”
- Others in the agricultural industry consider the geographic diversity of company operations lowers risk. And the “cost of responding to potential supply chain risks is mitigated by the Company’s ability to move production or growth projects to other sites within the company portfolio.”

## Deadlines for achieving Net-Zero Emissions with > 50% Probability of Success

“Deadlines for achieving Net-Zero Emissions with a Greater than 50% Probability of Success”

Table I from “Legal Pathways to Deep Decarbonization in the United States (published by Environmental Law Institute)

	1.5°C Increase	2°C Increase
Total CO <sub>2</sub> Emissions	2045-2050	2060-2075
Total GHG Emissions covered under Kyoto Protocol	2060-2080	2080-2090

“Deadlines” calculated by UNEP to hold temperatures below 1.5 C or 2 C increases, with the deadline representing the time to achieve net zero emissions of GHGs. See “Legal Pathways to Deep Decarbonization in the United States”, Environmental Law Institute, 2019.

UK Parliament has endorsed Net Zero Emissions by 2050 as UK goal.

## Global Decarbonization Pathways

Sector	Current Energy System	Deep Decarbonized Energy System	Key Metrics in 2050
Electricity	Coal and natural gas dominated	Renewable, nuclear, or CCS	Double output while reducing CO <sub>2</sub> /kWh 30x
Transportation	Oil dominated	Electricity, H <sub>2</sub> , CNG, LNG, biodiesel	Fuel economy >100 mpg equivalent
Buildings	Natural gas and oil dominate heating	Electrification, end-use efficiency	Building energy use >90% electrified
Industry	Fossil Fuel dominated	Electrification, CCS, efficiency, low-carbon fuels	Double efficiency, >40% electrification

## Benefits and Risks

- Public Health Risks and Benefits
- National Security
- Food Security

## Technical and Economic Feasibility of Deep Decarbonization

Strategy and Sector	Measures
<b>Energy Efficiency Strategies</b>	
Residential and commercial energy efficiency	<ul style="list-style-type: none"> <li>• Highly efficient building shell required for all new buildings</li> <li>• New buildings require electric heat pump heating, ventilation, and air conditions (HVAC) and water heating</li> <li>• Existing buildings retrofitted to electric HVAC and water heating</li> <li>• Near universal light-emitting diode (LED) lighting in new and existing buildings</li> </ul>
Industrial energy efficiency	<ul style="list-style-type: none"> <li>• Improved process design and material efficiency</li> <li>• Improved motor efficiency</li> <li>• Improved capture and reuse of waste heat</li> <li>• Industry-specific measures, such as direct reduction in iron and steel</li> </ul>
Transportation energy efficiency	<ul style="list-style-type: none"> <li>• Improved internal combustion engine efficiency</li> <li>• Electric drive trains for both battery and fuel cell vehicles (light-duty vehicles (LDVs))</li> <li>• Materials improvement and weight reduction in both LDVs and freight</li> </ul>
<b>Energy Supply Decarbonization Strategies</b>	
Electricity supply decarbonization	<ul style="list-style-type: none"> <li>• Different low-carbon generation mixes with carbon intensity &lt;50 grams of CO<sub>2</sub> per kilowatt hour (g CO<sub>2</sub>/kWh) that include renewable, nuclear and carbon capture and storage (CCS) generation</li> </ul>
Electricity Balancing	<ul style="list-style-type: none"> <li>• Flexible demand assumed for electric vehicle charging and thermal building loads</li> <li>• Flexible intermediate energy production for H<sub>2</sub> and power-to-gas processes to take advantage of renewable overgeneration</li> <li>• Hourly/daily storage and regulation from pumped hydro</li> <li>• Natural gas with CCS</li> </ul>



## Technical and Economic Feasibility of Deep Decarbonization (cont.)

Strategy and Sector	Measures
Pipeline gas supply decarbonization	<ul style="list-style-type: none"> <li>Synthetic natural gas (SNG) from gasified biomass and anaerobic digestion</li> <li>H<sub>2</sub> and SNG produced with wind/solar overgeneration provides smaller but potentially important additional source of pipeline gas</li> </ul>
Liquid fuels decarbonization	<ul style="list-style-type: none"> <li>Diesel and jet-fuel replacement biofuels</li> <li>Centralized H<sub>2</sub> production through electrolysis</li> <li>Centralized H<sub>2</sub> production through natural gas reformation with CCS</li> </ul>
<b>Fuel Switching Strategies</b>	
Petroleum	<ul style="list-style-type: none"> <li>LDVs to H<sub>2</sub> or electricity</li> <li>Heavy-duty vehicles (HDVs) to liquefied natural gas (LNG), compressed natural gas (CNG), or H<sub>2</sub></li> <li>Industrial-sector petroleum uses electrified where possible, with the remainder switched to pipeline gas</li> </ul>
Coal	<ul style="list-style-type: none"> <li>No coal without CCS used in power generation or industry by 2050</li> <li>Industrial-sector coal uses switched to pipeline gas and electricity</li> </ul>
Natural gas	<ul style="list-style-type: none"> <li>Low-carbon energy sources replace most natural gas for power generation; non-CCS gas retained for balancing in some cases</li> <li>Switch from gas to electricity in most residential and commercial energy use, including majority of space and water heating and cooking</li> </ul>

## Actions of National Business Groups

- CERES and CDP
  - Long-running “voluntary” questioning to major public companies
- World Resources Institute
  - “We are still in” Declaration. “An open letter to the International Community and Parties to the Paris Agreement from U.S. State, Local, and Business Leaders.” 3,600 signatories, representing 155 million Americans and \$9 trillion of the U.S. economy, 10 states and 10 tribes. (as of 5/2/19)
  - Investments in clean energy, even by industrials and electronics manufacturers
- Nature Conservancy
  - “Healthy Soils” initiative

## Types of Activities Which may Present an Opportunity

- Mitigation
- Adaptation
- Finance and Risk

## Mitigation

- Energy efficiency -- spend less and get the same or more energy
  - Product standards
  - Building energy efficiency
- Wind and solar power [primarily supported by Federal Tax incentives]
  - Central station or distributed generation
    - Contract for differences or direct receipt
  - Renewable Portfolio Standards [30 states with D.C.]
    - May focus on other desired conduct
      - Waste gas from abandoned mines, reclaimed materials, etc.
    - Renewable Energy Certificates (RECs), a kind of tradable currency
- Conservation Farming practices
  - DOA funding, also carbon offset opportunities
  - Conservation easements
  - “Healthy Soils” and other practices

## Adaptation

- What must be done to carry on/rebuild/protect
  - “What can you/your enterprise do?”
- A significant business opportunity -- now
  - Rebuilding after “natural” disasters
  - Protecting supply chain
  - Better levee and flood protection
  - Migrating structures/cities to more secure locations [what if there is a 3 foot sea level rise in 25 years?]
  - Protecting against severe weather
    - Droughts
    - Hurricanes, thunderstorms, etc.
    - Insect and vector migration to follow the warming climate. [“Will Chicago weather in 20 years resemble Memphis today?”]
    - Excessive Heat and Humidity
  - “Resilience” is now the safe term. [f/k/a “Sustainability”]

## Finance and Risk Opportunities

- Governments do not have sufficient capital [or resolve] to address the climate challenges
- Consider the extra- ordinary results, and much lower costs than expected, from Title IV of the Clean Air Act of 1990 (f/k/a the “Acid Rain Program”)
  - Achieved greater environmental results and at a fraction of the expected costs - over a command and control approach.
  - Included roles for financial interests -- not just the engineers, bureaucrats and executives.
  - Adopted in 1990 with support from George H. W. Bush.
- Use of market principles, and a “price on carbon”, improves efficiency and results of governmental programs.
  - Consider Chicago, the “risk capital of the world”, per Chinese diplomat
  - “Weather derivatives” a known commodity
  - Leading climate policy and program is California’s “cap and trade” program. RGGI and CA provinces too

## Illustrative Actions by Sector

- Commercial Real Estate
- Manufacturers and chemicals
- Food and agriculture
- Energy suppliers
- Self-made tools: tax credits and quantified verified voluntary reductions

## Energy Supplies

- McKinsey report (2019) breaks down the Fourth National Climate Assessment. It predicts “cost storm” for utilities: hurricanes and wildfires are getting worse, many US power plants are sited near shorelines, and that many adaption measures can be cost-effective. It identifies quantifying resiliency, hardening the grid, explore nonwire options [decentralize generation, battery storage, microgrids, environmental management [wetlands, barriers, etc.]
- Not just central station utilities
- Tax credits and Renewable Portfolio Standards
- Energy tax credits for---Wind and Solar generation, and Carbon Capture and Storage
  - Statutory language can extend to chemical reactions of CO2 to produce commercial products [other than as a fuel]
- Used and being used by---
  - Through “contract for differences” by investors, internet firms, manufacturers, and many others

## Commercial Real Estate

- LEED certification -- substantial improvement in current energy use; expanding to include materials
  - Opportunity to affect what is “good practice” and expand market acceptance
  - NYC requirement to limit carbon emissions from large buildings by 28% or pay a fine
- Chicago real estate census and reporting
  - Expand to defined sub-areas such as the Museum campus? To waste and not just electricity?
- Locating developments to enhance mass transit
- As inducement for tenants to sign
- Can co-locate solar power units
- 80% of GHG emissions from commercial real estate due to structures.
  - Energy intensive to build; is mass timber construction better?
  - Insulating materials have great potential GHG impact when destroyed or removed

## Manufacturing and Chemicals

- Certain components of Manufacturing are major sources of GHG emissions; efficiency often a goal, but not the most lucrative one. Major industrial sources of carbon emissions:
  - Refining and chemicals
    - Heaters and boilers
    - Steam cracking at petrochemicals
  - Pulp and paper
    - Heating to dry paper
  - Food processing
    - Preservation and other effects
  - Iron and steel and other primary metals
    - Off-site energy supply
    - On-site - processes and CHP
  - Cement and lime production
    - Clinker production

## Short Lived Climate Pollutants

### Diverse sources and opportunities

- Very high GHG -- large benefit per tonne reduced
- Carbon Black
  - Transportation; stationary sources; residential sources, open burning of biomass
- Methane [24x GHG potency compared to CO<sub>2</sub>]
  - Oil and Gas sources [including wells]; coal mine; livestock waste; wastewater treatment plants
- Nitrous oxides [over 100x GHG potency compared to CO<sub>2</sub>]
  - Agriculture [fertilizers]; other fossil fuel sources
- Fluorinated gases [hundreds to thousands times GHG potency]
  - Used in insulation for buildings and appliances;
  - HFCs a rapidly growing segment to replace gases used to substitute for CFCs

## Manufacturing and chemical sector emissions

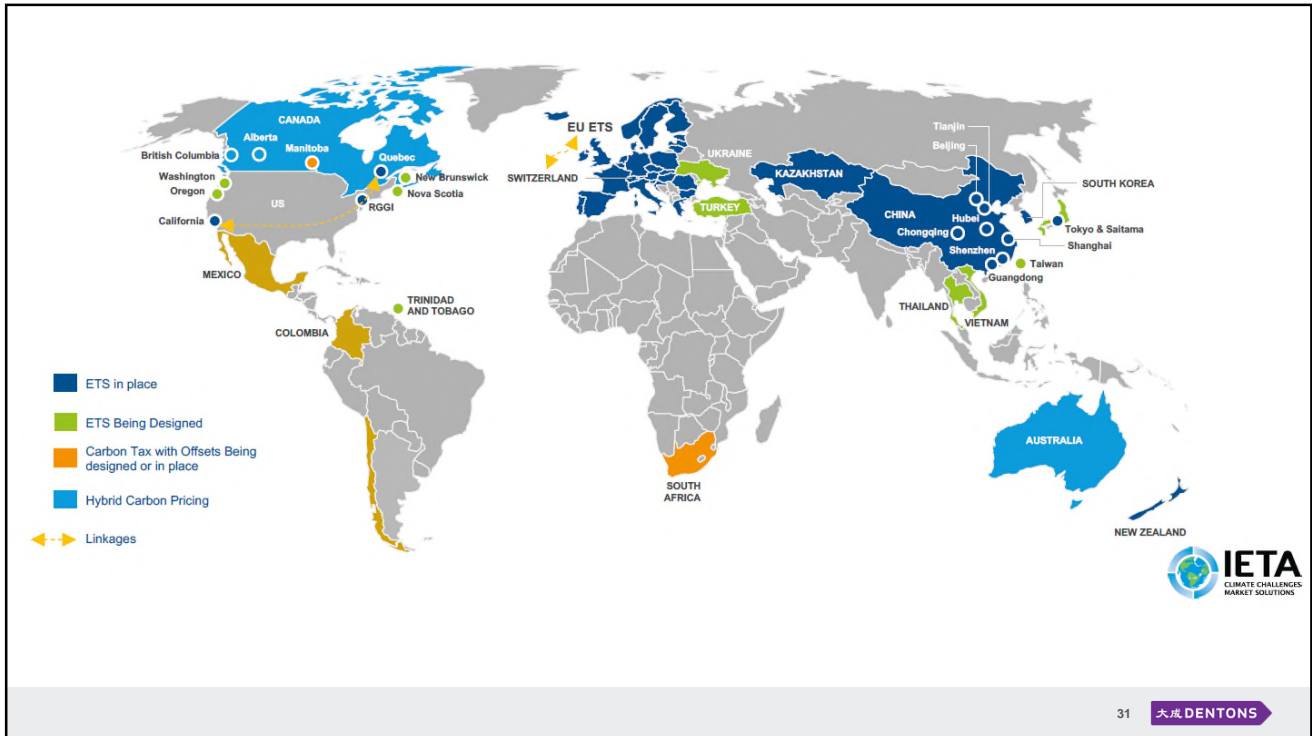
- Technology advancements, leading to patent protection
  - Could also be work practices
- “Supply chain” requirements, including internationally
- “Beyond compliance” measures which may justify carbon offsets
  - Methodology development for scientific acceptability and project quantification
- Use or acquisition of offset credits
  - Purchase in “voluntary markets” at price of \$1 to \$2 per tonne
  - “Carbon neutral” claims or regulatory requirements [being proposed in CA]

## Food and Agriculture

- Chicago Council on Global Affairs, ongoing programs and research on food and agriculture.
  - Global Food Security Symposium -- annual event on global agriculture and food security -- and insecurity
  - Also sponsoring:
    - **A Digital Handbook for Innovation in Illinois**
      - “If you are an innovator in search of more information about how to get things done in Illinois, you have come to the right place. This directory will assist:
        - Entrepreneurs and innovators both currently residing in and considering relocation to Illinois;
        - Startups, small businesses and researchers in need of legal, financial or consulting advice;
        - Corporate innovators looking to connect to entrepreneurs and a broader network of resources
- “Risky Business” -- The Economic Risks of Climate Change in the United States
  - Midwest Region: BAU in Missouri and Illinois, 15%<sup>^</sup> average yield loss in 5 to 25 years, 73% by 2199
  - Combined effect of heat and humidity on humans
  - Agriculture may be “best equipped to manage these risks” and adapt.

## Risk and Markets

- “Environmental commodities” or markets are used in many countries around the world.
- Strong record from use in Acid Rain program [Title IV of Clean Air Act Amendments of 1990]
  - Achieved substantially greater reductions in SO<sub>2</sub> at a much lower cost, within a decade
  - Not just government command and control, not just utilities and consultants. Used finance and trading to maximize results.
- Today, these countries/regions shown on the following slide use markets for climate mitigation
  - By putting a price on carbon through a financial instrument, may be able to create a global market with reductions coming from locations where such can be achieved most efficiently
- Purpose: to get the largest reduction per dollar spent or invested [Biggest bang]
  - For climate, “ a tonne is a tonne is a tonne”.
  - According to the science, we need the most reductions we can get.
  - The planet will continue -- will our civilization?



## Air Travel

- International Civil Aviation Organization (“ICAO”) has adopted a set of rules for reducing GHG emissions from airline travel.
- Four principles
- Three foundations
- Strategies being developed/used
  - Bio-fuels:
  - Recites that to be exclusive
  - Use of offsets



## For the “Innovators” or Inventors

- Beyond the programs and rules which governments, and most associations, adopt:
  - Is there a unique, “ahead of the pack” concept or practice you or your company has?
  - It may be qualified to become a method to create carbon offset credits -- a topic whose time is coming
  - Net neutral carbon emissions being considered in CA.
- Concept of an offset: if this is an activity or a technology that has very low adoption rate (e.g. 5% of market) it may qualify. Purpose is to provide incentive to other businesses in that market to adopt the same practice.
- Others which have been recognized or are in process
  - Zero GWP blowing agent to manufacture poly-urethane foams; now a recognized method
  - Propane as a refrigerant in consumer and retail refrigeration; also now recognized
  - Waste industrial carbon dioxide exhaust capture and reacted to create methanol, a building block for plastics.

## And for Consumers, Managers and Executives — Actions for you

- Identify opportunities for your company and peer organizations - and pursue
  - Adaptation [recovery from extreme weather, pro-active siting decisions]
  - Technology developments [patents, know-how, offset methodologies]
  - Mitigation [distributed solar, roof-top solar]
  - Develop and enhance market methods for more efficient price on carbon
- Invest in new appliances with enhanced features
  - Energy Star competition is incentivizing companies to produce better, more efficient appliances
- Invest in smart thermostat systems
- Improve efficiency of commercial buildings
- Use an electric vehicle for short haul ( and some long-haul) trips.
- Use mass transit and car pools where possible

## Conclusion

- Individual action -- by companies, individuals, institutions -- are necessary, regardless of federal government
- Such “sub-nationals” (including state and local governments) are leading, and often replacing the federal government in U.S.
- “Climate change” has many risks which require redress:
  - Security risks
  - Physical risks
  - Disruption of social and supply chain networks
  - Humanitarian challenges
- “Climate change” also presents opportunities for growing your business.

## Thank you

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*Recognized by Chambers Global, “Best Lawyers in the US” in categories of Climate Change and Environmental; American College of Environmental Lawyers, American Lawyer “Citizen of the Year (2014)”; Innovation Award, American Carbon Registry (2017)*

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