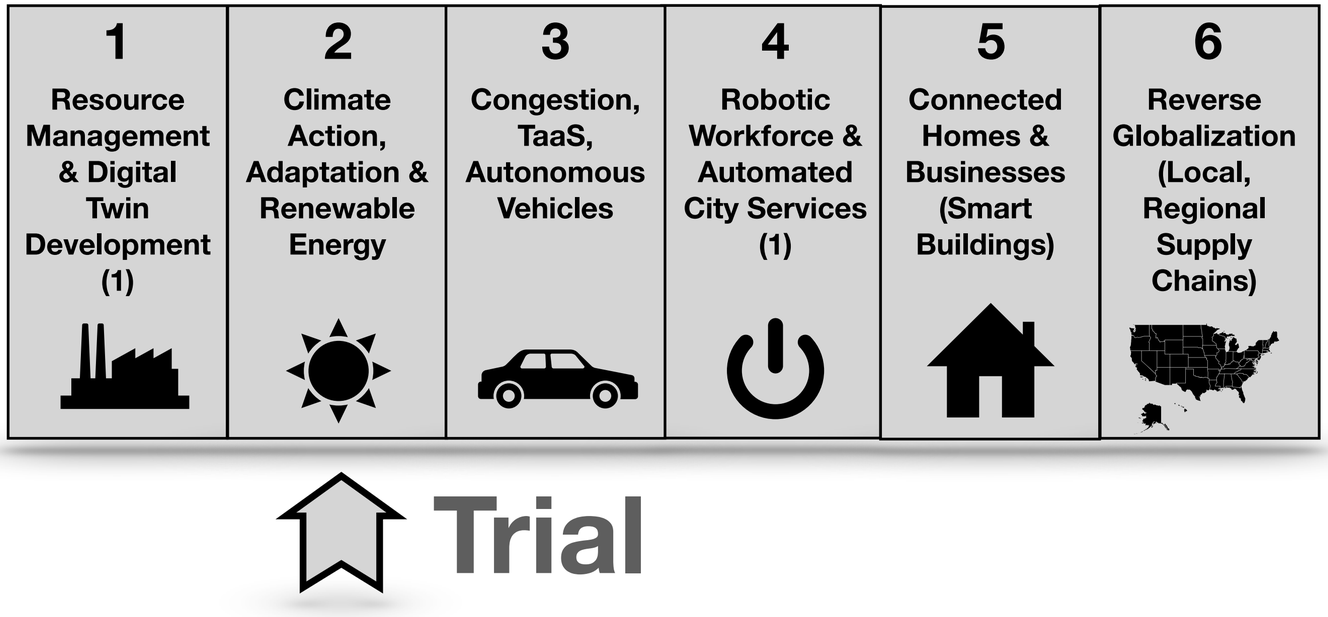
# Coppell Smart City Board

## Trial Data Exploration: Climate Action, Adaptation and Renewable Energy

**December 7, 2020**

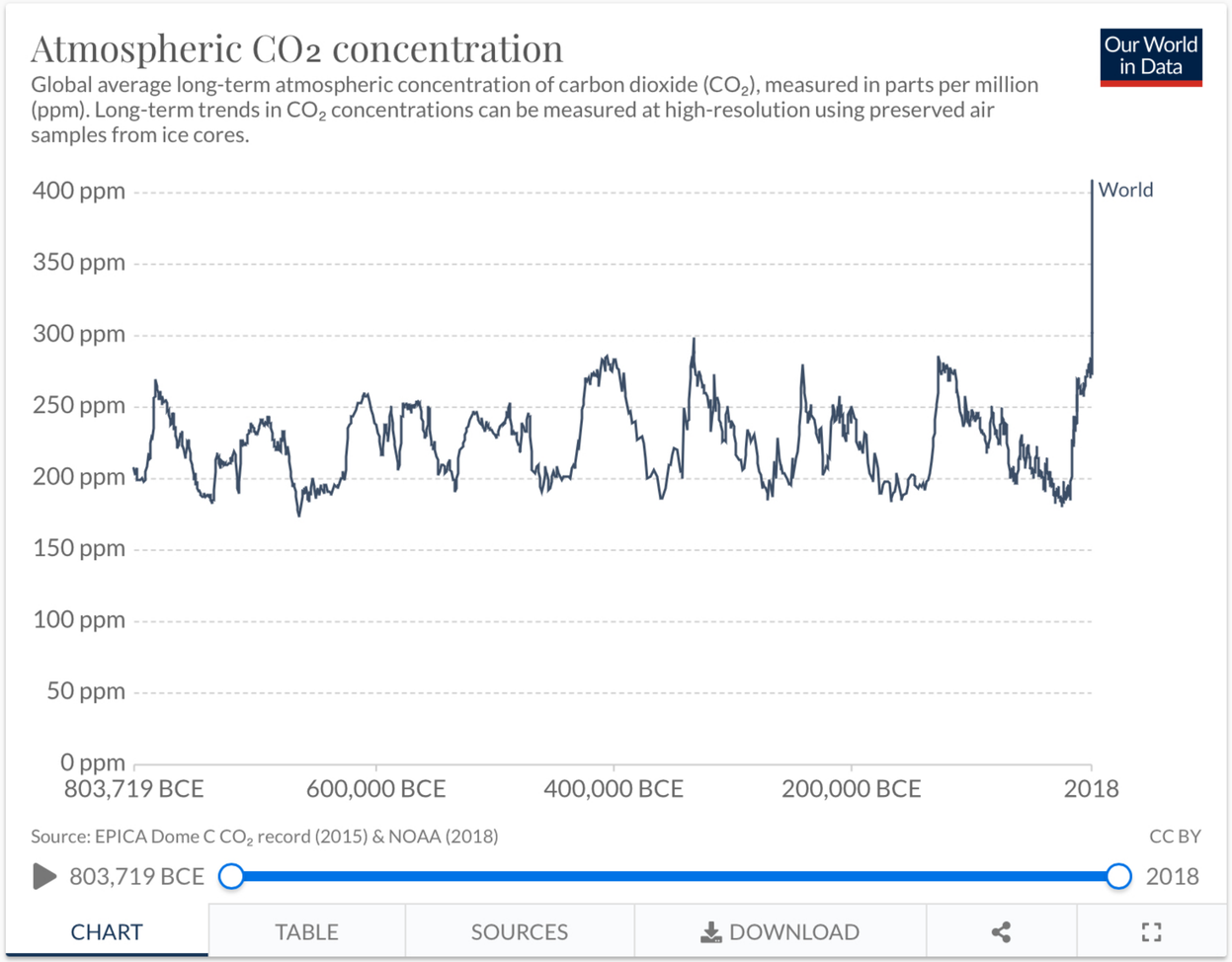


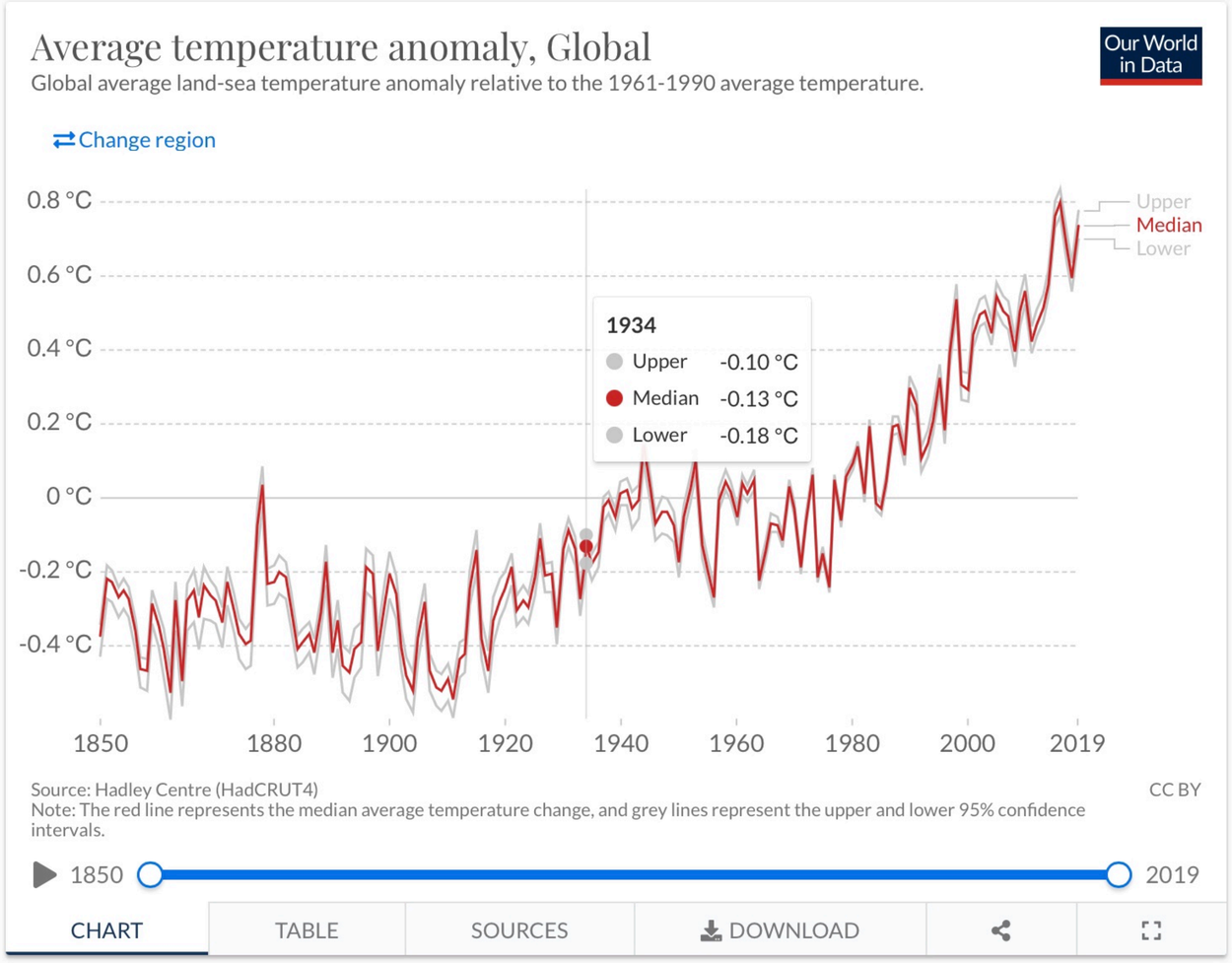

**Purpose: To Create a Sustainable Coppell by Contributing to Climate Change Mitigation Where Possible and Leading Adaptation Strategies Where Necessary.**

- Use the City of Coppell Innovation Hub to research, aggregate and categorize credible impacts from Climate Change in North Texas; and, likely ramifications to Coppell city assets, residents and businesses by 2040.
- Conduct a Feasibility Study, driven by trends in battery technology and modeled peak electricity utilization (as Climate Change drives higher temps) for creating a Battery Storage Municipal Utility.
- Based in part on results from the Feasibility Study above, determine upgrades to the City's Building Standards and Codes necessary due to Climate Change mitigation or adaptation.
- Use the Citizen Engagement Platform to engage Residents with climate problems and opportunities uncovered.
- Using data collected from the Resource Management OS and relevant results from studies above; and, Citizen Engagement Results - convert city assets to 100% renewables; and, develop incentives for conversion by residents and businesses.

# The Basics

The industrial revolution has driven a rise in the cumulative tons of CO2 (carbon dioxide) and other heat-trapping gases present in the atmosphere causing an alarming rise in global temperatures and related negative effects which threaten Earth's inhabitants.

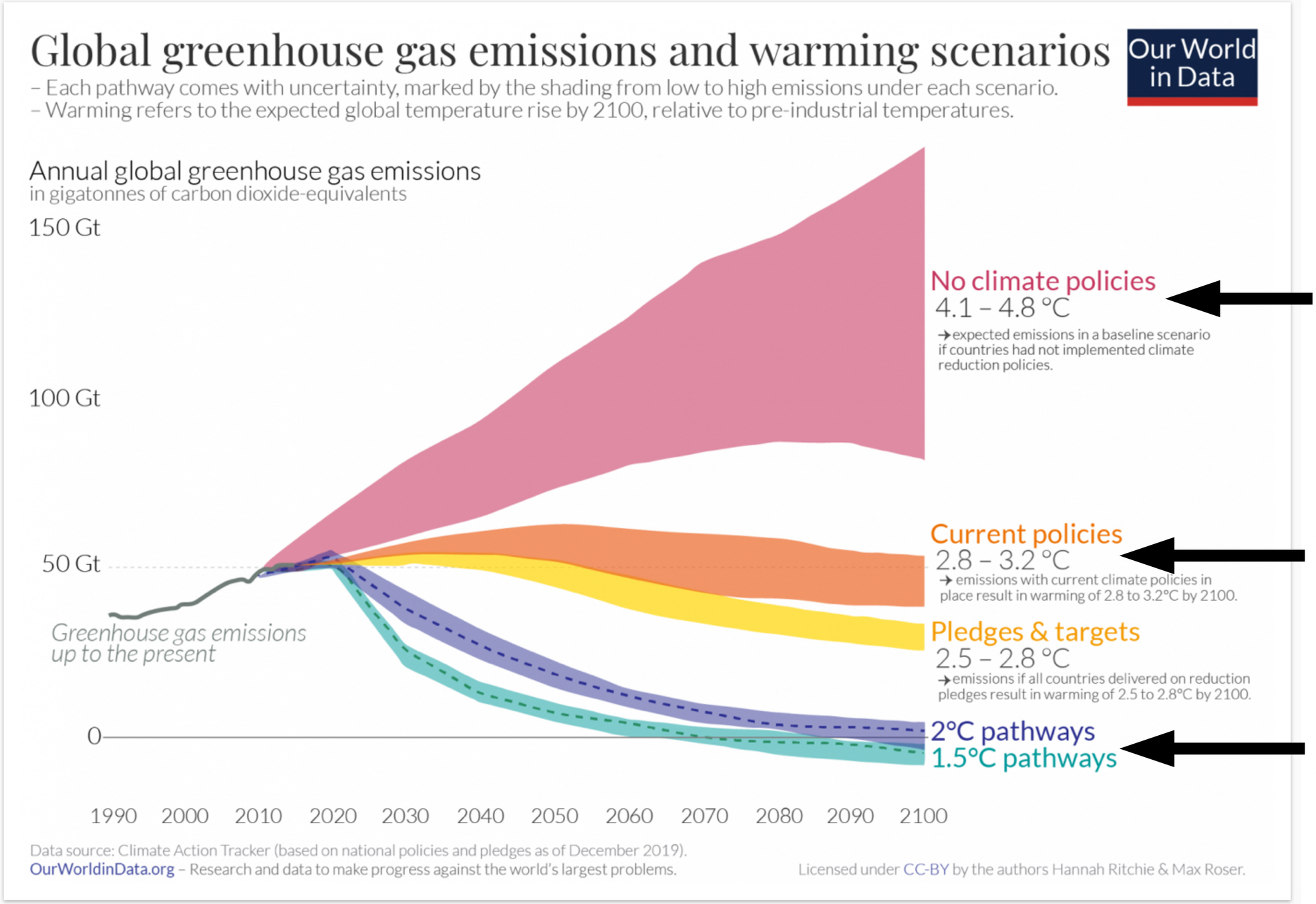


# The Paris Agreement (COP21)


- Establishes global warming ***goal*** **at no greater than 2 degrees Celsius** (3.6 degrees F) this century and pursue country pledges at a 1.5C limit. Pledges submitted; however, do not meet either goal.
- US: cut greenhouse gas emissions by **26-28% below its 2005 level by 2025**. Most countries goals were out to 2030. Some more aggressive, some not.
- **Agreement enforces *measurement***: requires self-reporting and can trigger independent audits.
- **Financing** from rich countries to poor to exceed $100B annually after 2020.
- Countries generally aren't on track to hit emission-reduction targets (though the idea is to ramp up ambition over time). Of the 195 signatories, 7 are considered "within range" of their targets as of 2018 (not much changed in 2019).
- Within the last 8 weeks: China, Japan and South Korea committed to Net Zero emissions by 2050 meaning 4 of the largest 5 economies have updated pledges to 2C goal. **President-elect Biden has stated intention to do the same**. The original US pledge is expected to change to 45-50% decrease from 2005 levels by 2030.
- Pledges were to be reviewed in 2020, but this review was rescheduled due to COVID to **COP26 November 2021 in Glasgow**.

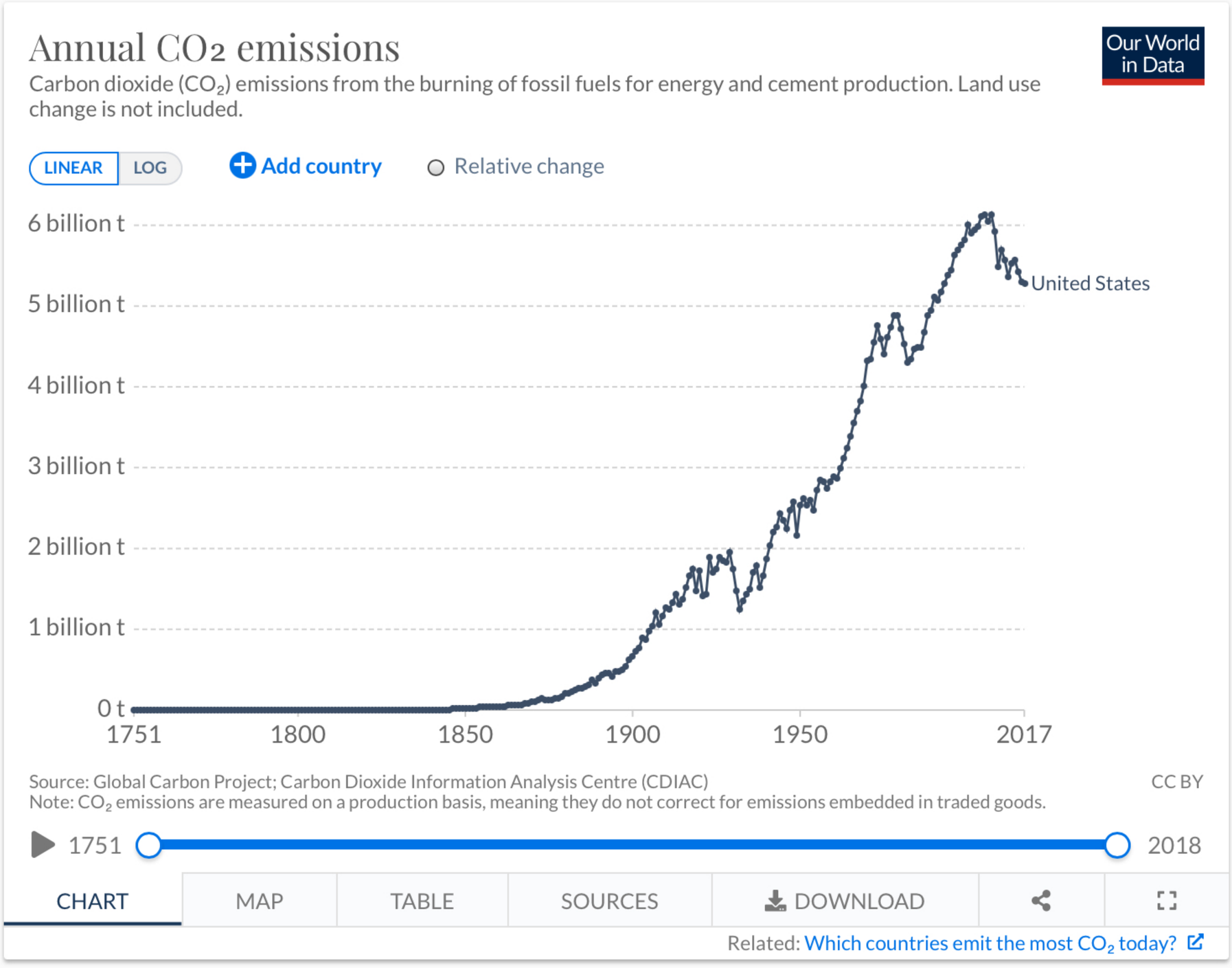
Sources:
1) "The Uninhabitable Earth", David Wallace Wells
2) The Paris Agreement on Climate Change, Natural Resources Defense Council
3) The Paris Agreement Summary, Climate Focus; The Netherlands, US and Germany




**... the most harmful impacts *can* still be mitigated**

Best case given current COP21 pledges and progress

COP21 (Paris), stated goals, requires "negative emissions"

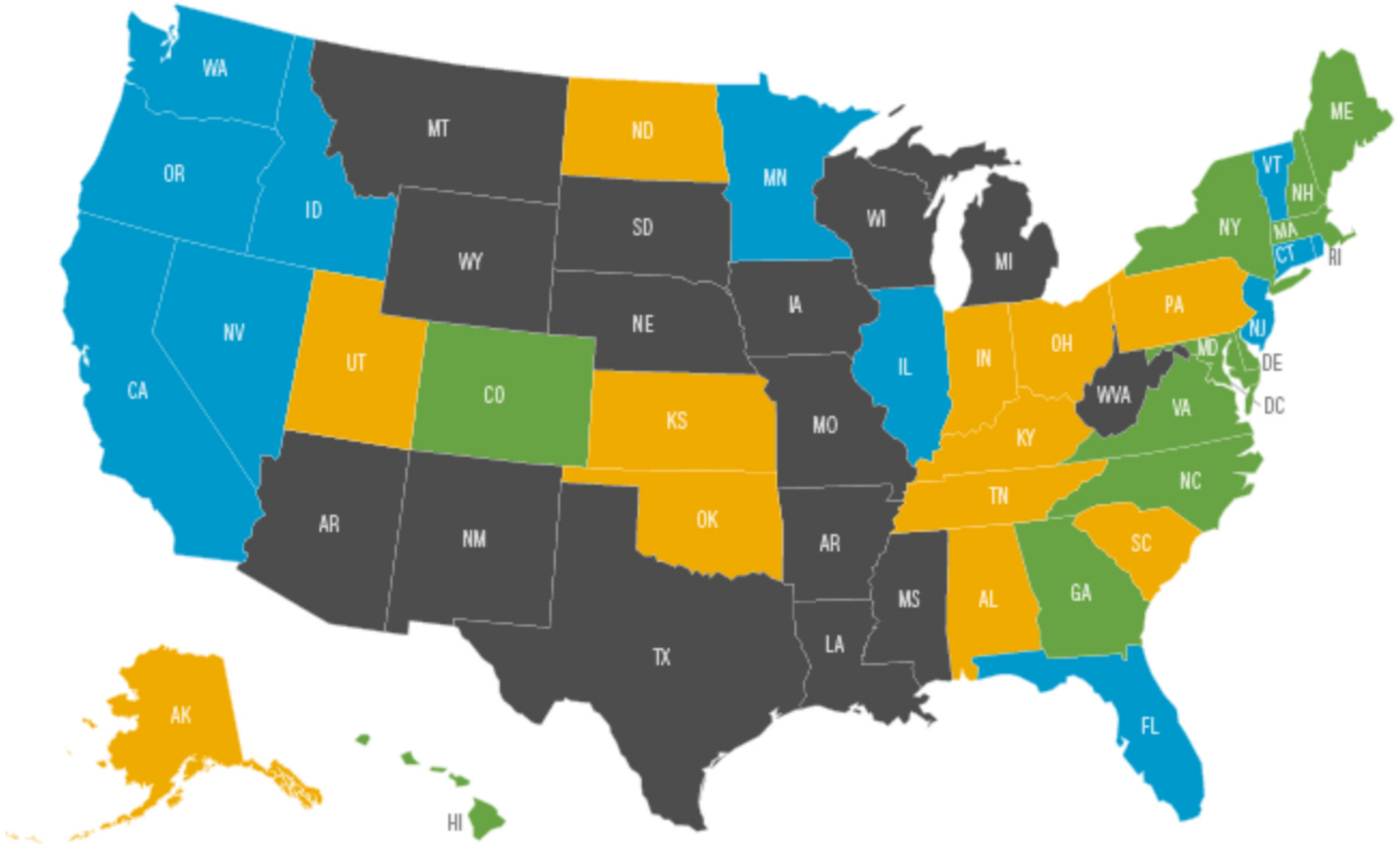



**Progress is being made in the US, our cumulative impact is being slowed...**

## Comparing Leaders and Laggards on Carbon Intensity.

Carbon Intensity Categorizations

- Better than average carbon Intensity In 2017, better than average % Improvement 2005-2017 **(Leaders)**
- Better than average carbon Intensity In 2017, worse than average % Improvement 2005-2017 **(Slow progress, but still ahead)**
- Worse than average carbon Intensity In 2017, better than average % Improvement 2005-2017 **(Improved but still behind)**
- Worse than average carbon Intensity In 2017, worse than average % Improvement 2005-2017 **(Laggards)**




*Source:* America's New Climate Economy

20.07.22

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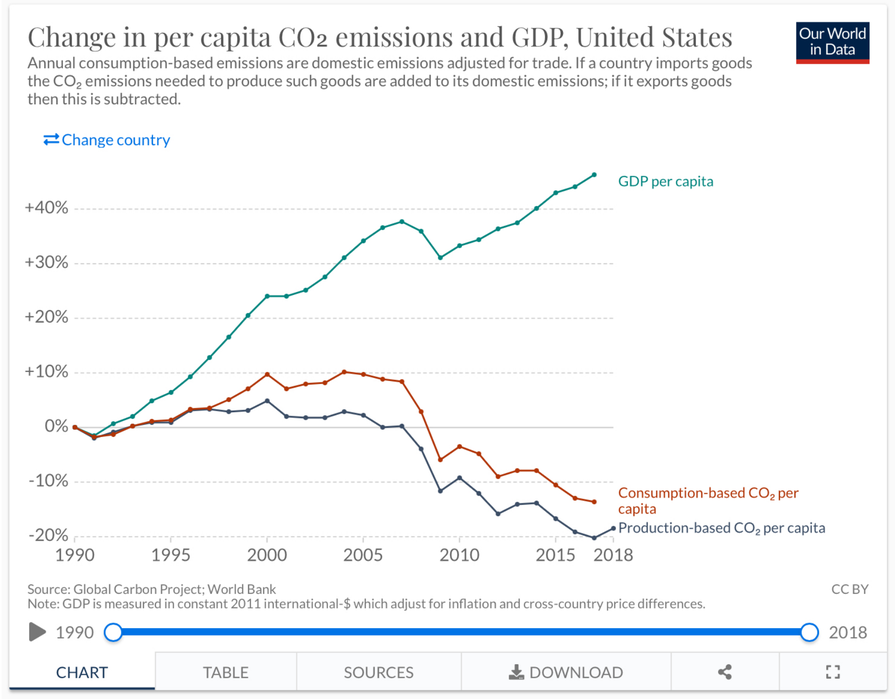
# ...Texas continues to grow CO2 emissions

True from the perspective of CO2 emission reductions and disconnecting GDP growth and fossil fuel consumption



# Forecasted Impacts to 2040 North Texas

- **Temperatures will rise**. The number of 100F days in Texas will double by 2036. Between 2041-2050 average temperatures in North Texas in August will rise from 86 to 94 with extremes above 120F.

- **Longer droughts will occur**. Soil moisture will decrease 10-15% by 2050. Maintenance on airport runways, rail tracks and roads will need to be more frequent with more severe buckling occurring.

- **More extreme rain and thunderstorms will occur**. Between 2000-2018 urban flooding in Texas increased 15%, this trend will continue as extreme events increase 2-3% by 2036. Note: DFW area urban flood plains are projected to expand.

- **The "Summer" Season will be longer (earlier springs, later falls)**. Longer periods of atmospheric ozone that exacerbates asthma, longer mosquito (and related disease) breeding season, longer allergy and breathing discomfort season.

- **Electricity grid demand will increase**. The combined impacts of the electrification of transportation and increasing usage of air conditioning will significantly increase demand.

- **Outdoor work will be challenging**. Outdoor activity generally will become increasingly difficult and policies regarding outdoor work will need to be reviewed.

Sources/Experts:

1) John Nielsen-Gammon, Texas A&M

3) Katherine Hayhoe, Texas Tech University

4) Arne Winguth, University of Texas at Arlington (UTA)

5) Texas 2036

6) "Climate Change Risk Assessment", UTA for the North Central Texas Council of Governments.

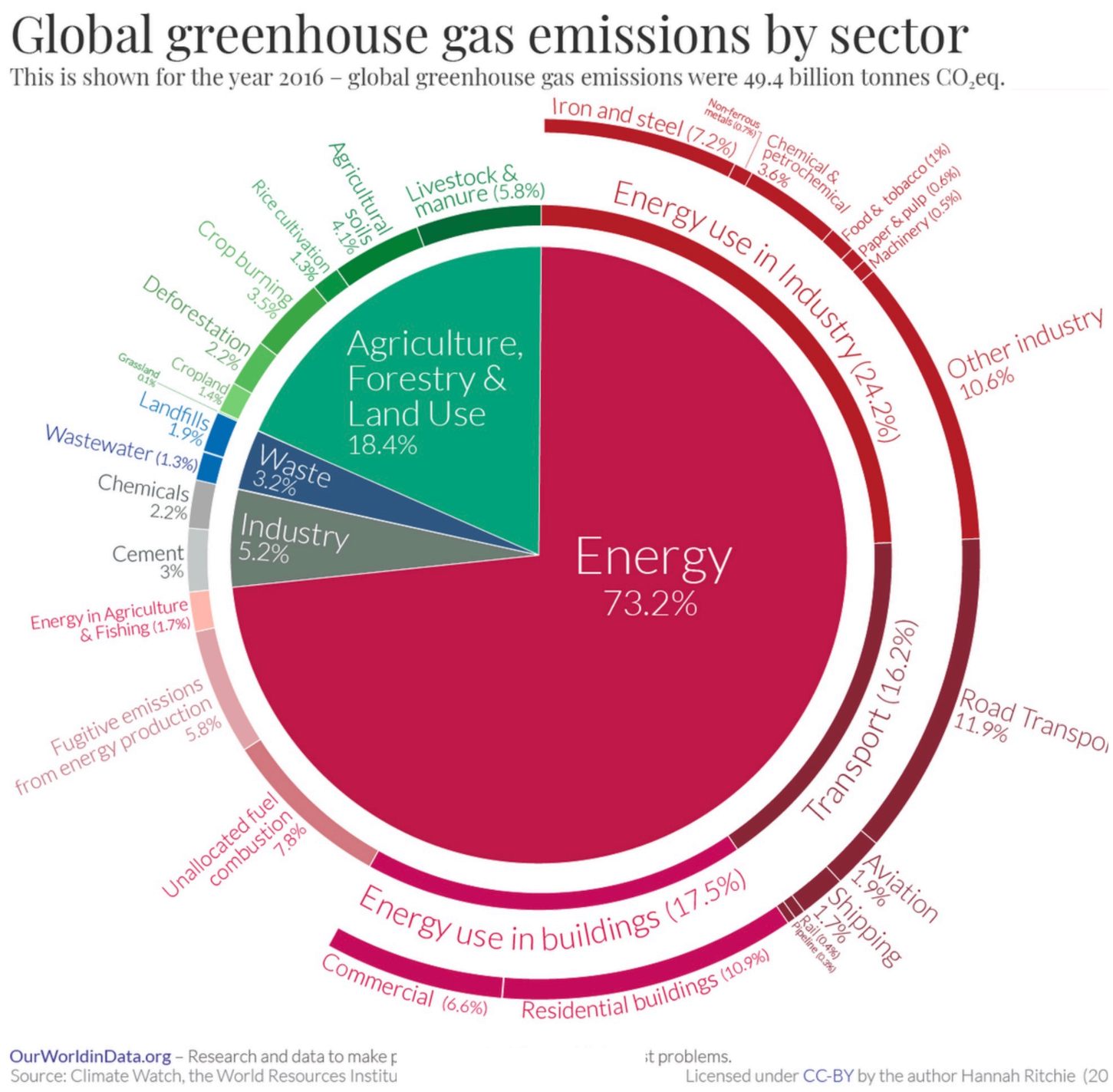
# City Level

- **Cities Recognized as The Front Line of Climate Change**. By 2050 70% of humanity is projected to live and work in cities. (COVID may alter that.)

- **But Control Over Emissions Fairly Insignificant**. Some cities have direct control over as little as 4% of the buildings, vehicles and businesses that emit greenhouse gases.

- **Data Portals and Unified Climate Data Reporting**. CDP is a global non-profit that operates a disclosure system for cities' (and other entities) environmental impact and mitigation data. ICLEI and CDP unified their reporting and data portals in 2019, rolls into UN's Data Portal on climate. GCoM endorses the unified reporting of CDP and ICLEI.

- **Only CDP A-List City in Texas: San Antonio**:
  - Climate Dashboard establishing Baselines
  - Reducing Waste including: retrofits, reporting to business owners over time
  - Energy Benchmarking including peer-to-peer building performance comparison
  - Reduction of vehicle miles, enhanced commuter incentives, transportation electrification, public charging infrastructure, anti-idling policies
  - Tracking local energy provider to 40% renewable electrical grid by 2040
  - Reporting via CDP Unified Reporting System




# Where do we look for opportunities in Coppell?

- Almost 80% of greenhouse gas emissions globally are from:
  - Energy use in businesses
  - Energy use in residential buildings
  - Energy use in transportation
- What type of cement Coppell's builders use matters - further contributing to the 80%
- The rest *appears* to be related to purchasing policies and individual behavior (like meat eating, travel by plane, investing choices) - consumer education

# Seems to be plenty of Smart City Transformational Opportunities...

- Around data collection, reporting and comparisons of pertinent energy units that indicate GHG (green house gas) emissions within the City of Coppell.
- For leadership in expanding building-types included in reporting, reporting true emissions output of city activity.
- To review buildings (and building codes) for retrofit, identify conservation opportunities, model impacts and track the data (modeled vs. actual) over time.
- To review cement type(s) used within the city and effect change.
- To model vehicle miles relevant to Coppell, to model the percentage of electrical vehicle miles, to model impacts over time and develop incentives. The Transportation Smart Portfolio can contribute to emissions reduction.
- To project renewable energy grid conversion relevant to Coppell and *study* alternatives (municipal battery utility could be both mitigation and adaptation, for example).
- To report Climate Data so that it rolls up to Global Climate initiatives - enhancing Coppell's brand, developing a source of pride and contributing to the Paris Agreement's ultimate success.

## ...to assign to "Over Starting In and By" bullets

# Additional Sources


1. IPCC, 2013: *Climate Change 2013: The Physical Science Basis. Contribution of Working Group I to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change* [Stocker, T.F., D. Qin, G.-K. Plattner, M. Tignor, S.K. Allen, J. Boschung, A. Nauels, Y. Xia, V. Bex and P.M. Midgley (eds.)]. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA, 1535 pp.
2. Lacis, A. A., Schmidt, G. A., Rind, D., & Ruedy, R. A. (2010). Atmospheric CO2: Principal control knob governing Earth's temperature. *Science*, *330*(6002), 356-359.
3. In this chart – using the "Change region" button you can also view these changes by hemisphere (North and South), as well as the tropics (defined as 30 degrees above and below the equator). This shows us that the temperature increase in the North Hemisphere is higher, at closer to 1.4°C since 1850, and less in the Southern Hemisphere (closer to 0.8°C). Evidence suggests that this distribution is strongly related to ocean circulation patterns (notably the North Atlantic Oscillation) which has resulted in greater warming in the northern hemisphere.

   Delworth, T. L., Zeng, F., Vecchi, G. A., Yang, X., Zhang, L., & Zhang, R. (2016). The North Atlantic Oscillation as a driver of rapid climate change in the Northern Hemisphere. *Nature Geoscience*, *9*(7), 509-512. Available online.
4. IPCC, 2014: *Climate Change 2014: Synthesis Report. Contribution of Working Groups I, II and III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change* [Core Writing Team, R.K. Pachauri and L.A. Meyer (eds.)]. IPCC, Geneva, Switzerland, 151.
5. 2014: Climate Change 2014: Impacts, Adaptation, and Vulnerability. Part A: Global and Sectoral Aspects. Contribution of Working Group II to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change
   [Field, C.B., V.R. Barros, D.J. Dokken, K.J. Mach, M.D. Mastrandrea, T.E. Bilir, M. Chatterjee, K.L. Ebi, Y.O. Estrada, R.C. Genova, B. Girma, E.S. Kissel, A.N. Levy, S. MacCracken, P.R. Mastrandrea, and L.L.White (eds.)]. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA, 1132 pp. Available online.
6. Berkeley Earth. Global Temperature Report for 2019. Available at: http://berkeleyearth.org/archive/2019-temperatures/.
7. Berkeley Earth. Global Temperature Report for 2019. Available at: http://berkeleyearth.org/archive/2019-temperatures/.
8. This is because water has a higher 'specific heat capacity' than land, meaning it we would need to add more thermal energy to increase its temperature by one degree relative to the same mass of land.
9. IPCC, 2013: *Climate Change 2013: The Physical Science Basis. Contribution of Working Group I to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change* [Stocker, T.F., D. Qin, G.-K. Plattner, M. Tignor, S.K. Allen, J. Boschung, A. Nauels, Y. Xia, V. Bex and P.M. Midgley (eds.)]. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA, 1535 pp.
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11. Mitchell, J. F. B., Johns, T. C., Ingram, W. J., & Lowe, J. A. (2000). The effect of stabilising atmospheric carbon dioxide concentrations on global and regional climate change. *Geophysical Research Letters*, *27*(18), 2977-2980.
12. Samset, B.H., Fuglestvedt, J.S. & Lund, M.T. Delayed emergence of a global temperature response after emission mitigation. *Nature Communications*, **11,** 3261 (2020). https://doi.org/10.1038/s41467-020-17001-1.
13. Bernhard Bereiter, Sarah Eggleston, Jochen Schmitt, Christoph Nehrbass-Ahles, Thomas F. Stocker, Hubertus Fischer, Sepp Kipfstuhl and Jerome Chappellaz. 2015. Revision of the EPICA Dome C CO2 record from 800 to 600kyr before present. *Geophysical Research Letters.* . doi: 10.1002/2014GL061957.
14. The underlying data for this chart is sourced from the Climate Action Tracker – based on policies and pledges as of December 2019.
15. Rogelj, J., D. Shindell, K. Jiang, S. Fifita, P. Forster, V. Ginzburg, C. Handa, H. Kheshgi, S. Kobayashi, E. Kriegler, L. Mundaca,R. Séférian, and M.V.Vilariño, 2018: Mitigation Pathways Compatible with 1.5°C in the Context of Sustainable Development. In: Global Warming of 1.5°C. An IPCC Special Report on the impacts of global warming of 1.5°C above pre-industrial levels and related global greenhouse gas emission pathways, in the context of strengthening the global response to the threat of climate change, sustainable development, and efforts to eradicate poverty [Masson-Delmotte, V., P. Zhai, H.-O. Pörtner, D. Roberts, J. Skea, P.R. Shukla, A. Pirani, W. Moufouma-Okia, C. Péan, R. Pidcock, S. Connors,
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