Georgia Tech

UNIVERSITY OF GEORGIA

EMORY UNIVERSITY

the RAY C. ANDERSON foundation

DRAWDOWN GA

www.DrawdownGA.org

Introduction to Drawdown Georgia's Emissions Dashboard Project

Commercial and Industrial Sectors
Experts Meeting
October 15, 2021

Drs. Dan Matisoff and Bill Drummond

Georgia Institute of Technology

Agenda

10:00 Welcome & Intro to Drawdown Georgia (Dr. Dan Matisoff)
-- Please use “chat” for asking questions – Ollie Chapman will collect and read them out
-- The session will be recorded but not shared publicly

10:10 Commercial sector Emissions (Dr. Bill Drummond
10:25 Q&A

10:35 Industrial sector Emissions (Dr. Bill Drummond
10:45 Q&A

10:55 Next Steps and Wrap up (Dr. Dan Matisoff)

Localized climate solutions can help during this “decisive decade” — but where is the atlas of state and local roadmaps?

The **Drawdown Georgia** project aims to identify and activate the most promising solutions to significantly reduce Georgia’s net carbon emissions by 2030.

Our methodology can be adapted to fit other states, counties and even cities.

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bringing climate solutions home

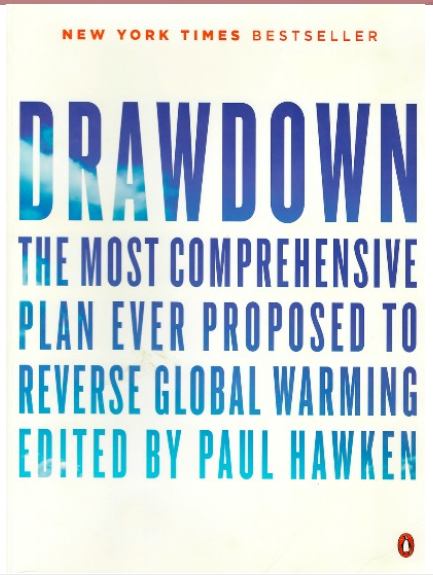
drawdownga.org

Research conducted at Georgia Tech, University of Georgia, Emory University, Georgia State and other partners.
Funded by the Ray C. Anderson Foundation.

Trajectory of the Drawdown Georgia Project

We're bringing climate solutions home.

Inspired by Project Drawdown®, we are building a movement in Georgia to accelerate progress toward net zero greenhouse gas emissions.



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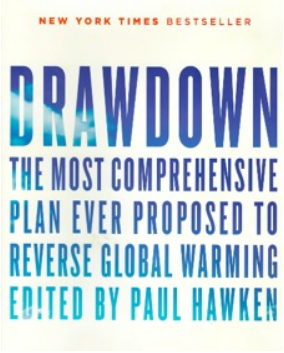
bringing climate solutions home

Starting Point: Project Drawdown Solutions

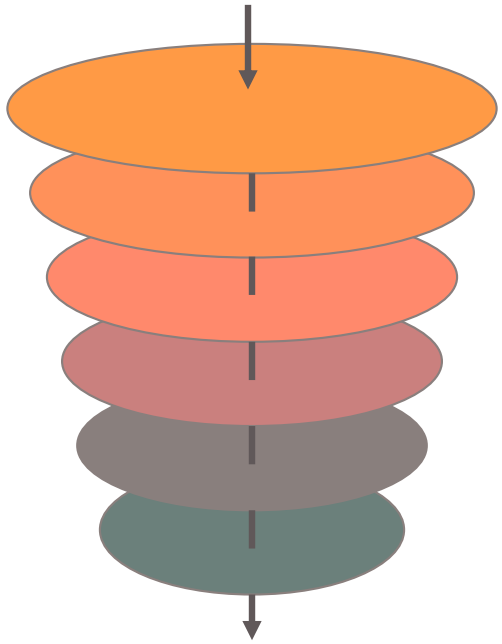


Paul Hawken
environmentalist, entrepreneur, journalist, and author
pioneer in sustainability

Which are best for Georgia?

Trajectory of the Drawdown Georgia Project

The Drawdown Georgia research team ran ~100 global solutions through a series of filters:



Is the solution relevant in Georgia?

Is it technology and market ready to scale by 2030?

Is there sufficient local experience and available data?

Can the solution deliver 1 million metric tons of annual GHG reduction by 2030?

Is it cost competitive with other solutions?

Are there significant "beyond carbon" impacts?

Brown, Marilyn A., et al. (2021) "Translating a Global Emission-Reduction Framework for Subnational Climate Action: A Case Study from the State of Georgia," *Environmental Management.* 67: 205-227. https://doi.org/10.1007/s00267-020-

Result: 20 Drawdown Georgia Solutions for 2030 + Beyond Carbon Dimensions

Electricity

- Cogeneration
- Demand Response
- Rooftop Solar
- Large-Scale Solar
- Landfill Methane

Transportation

- Electric Vehicles
- Energy-Efficient Cars
- Energy-Efficient Trucks
- Mass Transit
- Alternative Mobility

Food & Agriculture

- Composting
- Conservation Agriculture
- Plant Rich Diet
- Reduced Food Waste

Buildings & Materials

- Recycling
- Refrigerant Management
- Retrofitting Buildings

Land Sinks

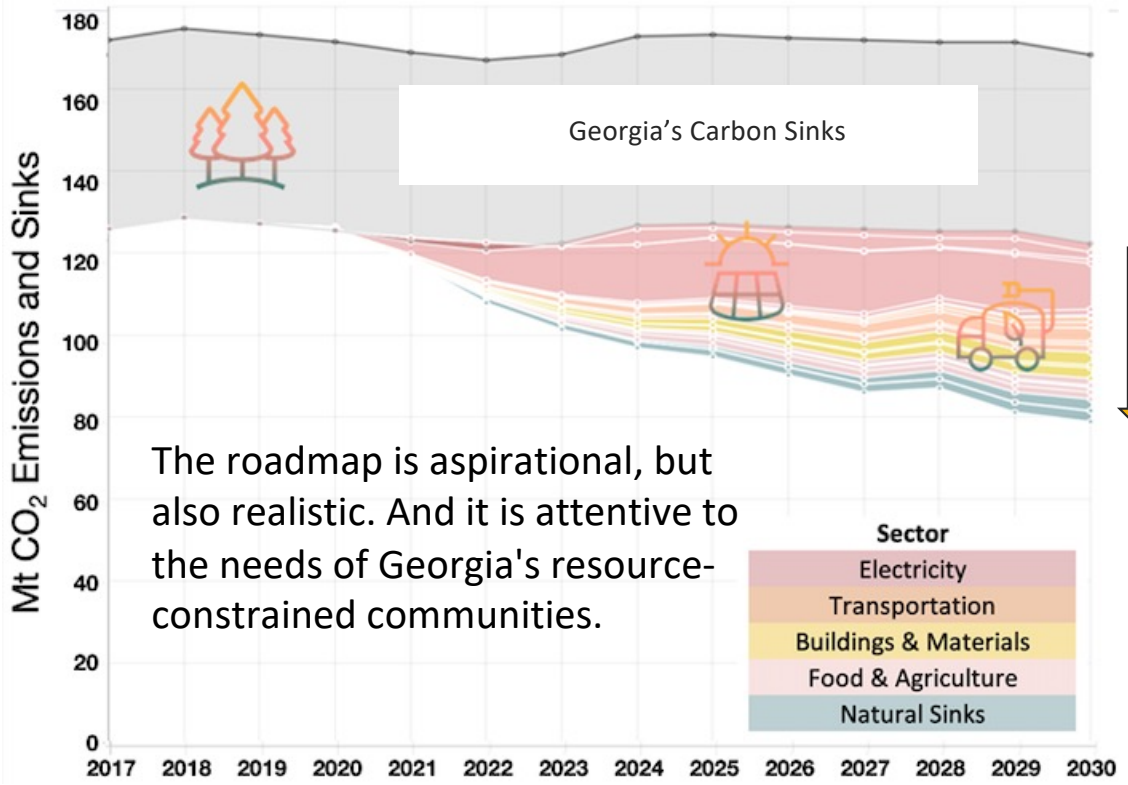
- Afforestation & Silvopasture
- Coastal Wetlands
- Temperate Forest Protection & Management

Beyond Carbon

- Equity
- Economic Development & Jobs
- Public Health
- Environmental Quality

Georgia can reduce its carbon footprint by 50% by 2030 below its 2005 baseline

28 Mt CO_2 reduction from 156 Mt CO_2 in 2005 to 128 in 2017 (12 years)



49 Mt CO_2 reduction from 128 Mt CO_2 in 2017 to 79 in 2030 (13 years)

The roadmap is aspirational, but also realistic. And it is attentive to the needs of Georgia's resource-constrained communities.

Source: Brown, et al. 2021. Framework for Localizing Global Climate Solutions and their Carbon Reduction Potential," *Proceedings of the National Academy of Sciences,* https://doi.org/10.1073/pnas.2100008118

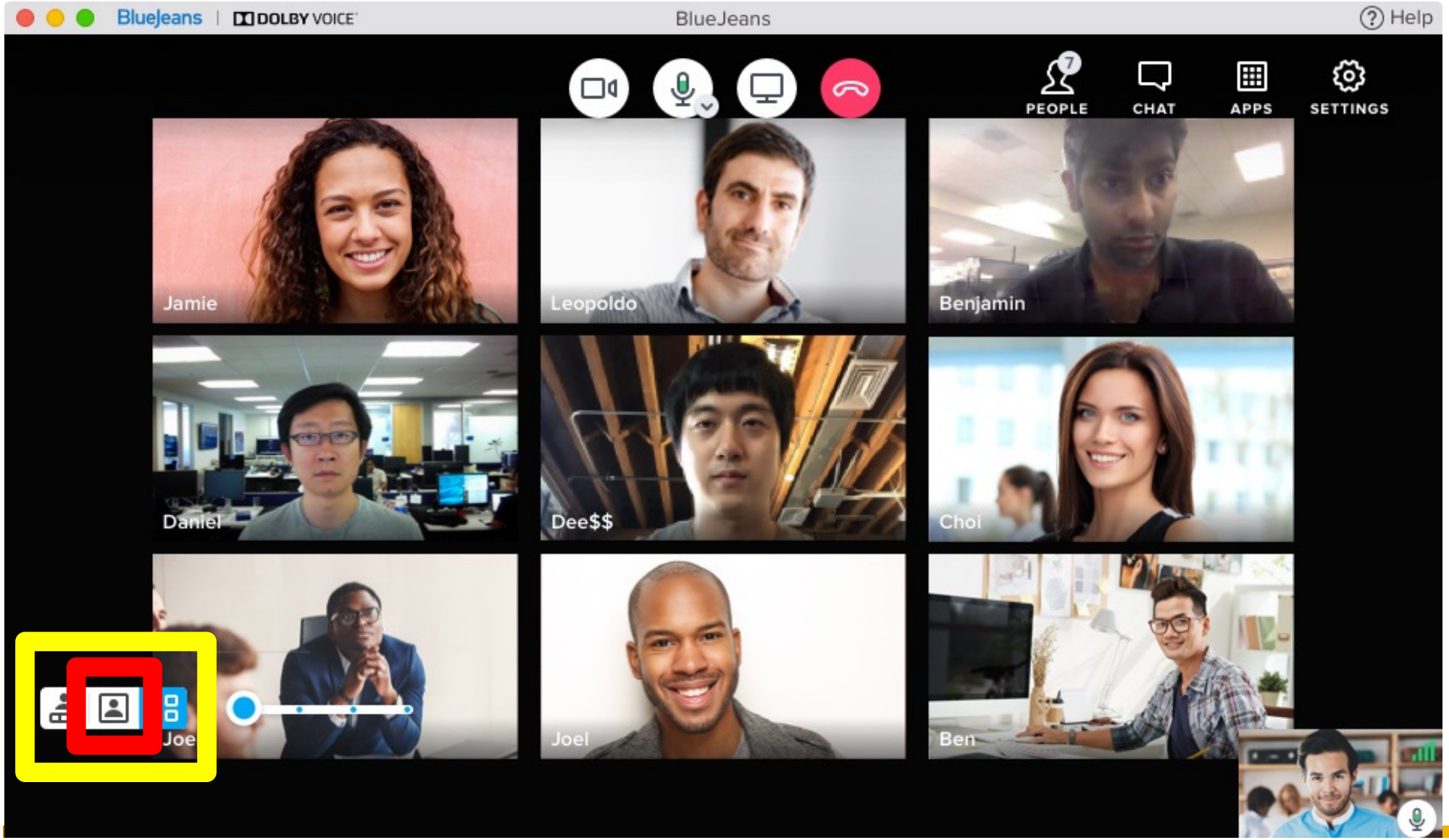
Our current task focus on solution activation

1. Tracking GHG Footprint of Georgia's Counties

2. Business Engagement

3. Planning and Tracking Solution Activation

Georgia Tech · University of Georgia · Emory University · the Ray C. Anderson Foundation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Joel
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Clear all filters

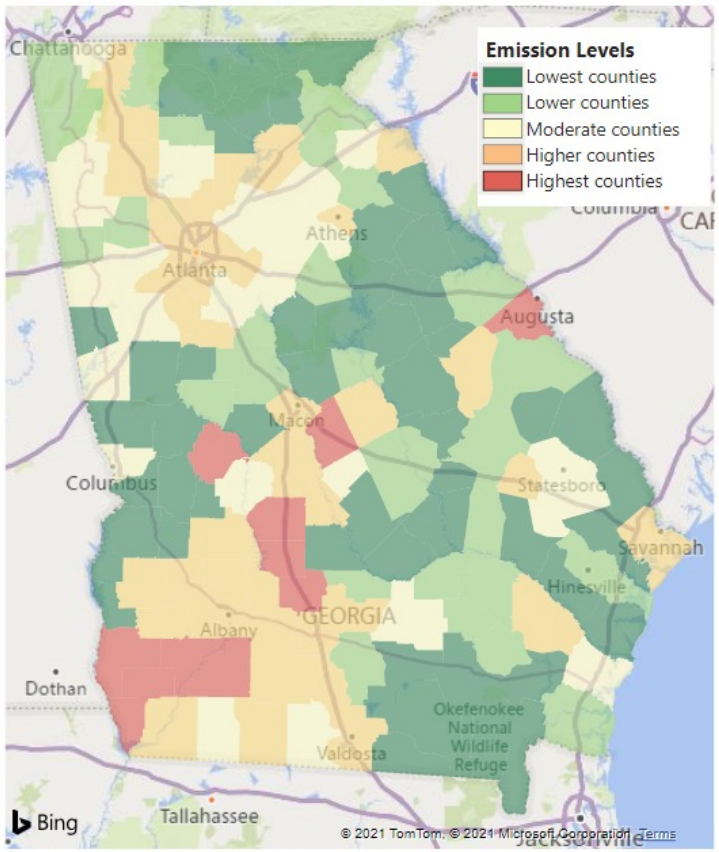
Month: April

Year: 2021

NAME	Year	Month	Sector Name	Emissions (MT)	Emiss
Appling	2021	April	Agriculture	19,965.18	
Appling	2021	April	Commercial	1,772.70	
Appling	2021	April	Forestry	-34,803.33	
Appling	2021	April	Industrial	5,802.65	
Appling	2021	April	Residential	2,579.84	
Appling	2021	April	Transportation	10,284.94	

Emissions by Sector

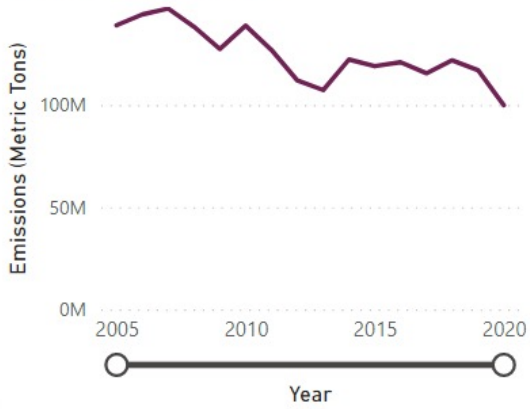
Emissions (Metric Tons) per 1000 People



Emissions for this Month (MT)	Emissions, Year Total (MT)
8.20M	34.67M

Emissions per 1000 People (MT)	Emissions, One Year % Change
751	42.60

Total Emissions Over Time



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Inspired by Project Drawdown, we are building a movement in Georgia to accelerate progress toward net zero greenhouse gas (GHG) emissions. This dashboard tracks GHG emissions in Georgia. Filter by date, county, or sector using the selectors, or click on a county directly on the map. Hold the Ctrl button down to select multiple counties; click outside the state to clear county selections. Note that emissions data for each month is dated on the 1st.

To learn more about Drawdown Georgia, visit **drawdownga.org**

Why geospatial tracking and visualization?

- Our goal is to help elected officials, concerned citizens, and interested businesses understand their **local sources** of greenhouse gas emissions …
- By providing **reasonable emission estimates** that are as timely as possible and as local as possible …
- Presented in an attractive, interactive, online **dashboard format,** and …
- Developed with open-source software and publicly-available data.

Commercial emissions

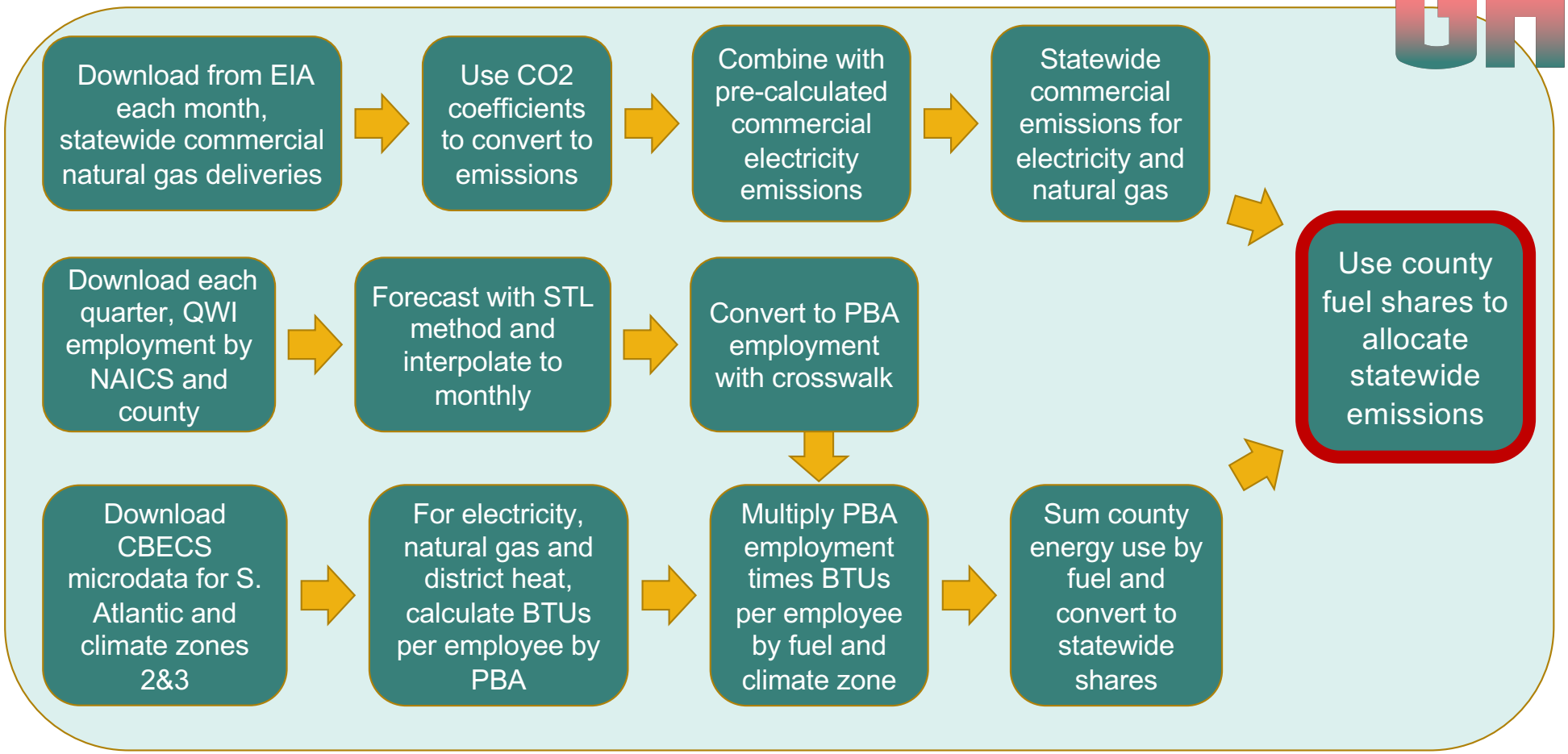
Commercial data sources

1. EIA Open Data API monthly data
   a. Commercial natural gas deliveries
   b. Prior calculation of commercial electricity emissions
2. Census Quarterly Workforce Indicators **(QWI)** employment by county and NAICS code
3. EIA commercial buildings energy consumption survey **(CBECS)** microdata from 2012

Commercial basic strategy

1. From the EIA API download statewide commercial **natural gas** deliveries and calculate natural gas emissions
2. Load prior calculated commercial **electricity** emissions
3. Download, if needed, most recent QWI county **employment,** forecast and interpolate to monthly employment
4. Convert NAICS employment to CBECS **Principal Building Activities**
5. From CBECS microdata, calculate PBA **energy use per employee factors** for electricity, natural gas, and district heat
6. Apply CBECS factors to employment, sum by energy source
7. **Allocate** statewide emissions by county percent of energy use for each fuel

Commercial emissions



Commercial questions and discussion

Industrial emissions

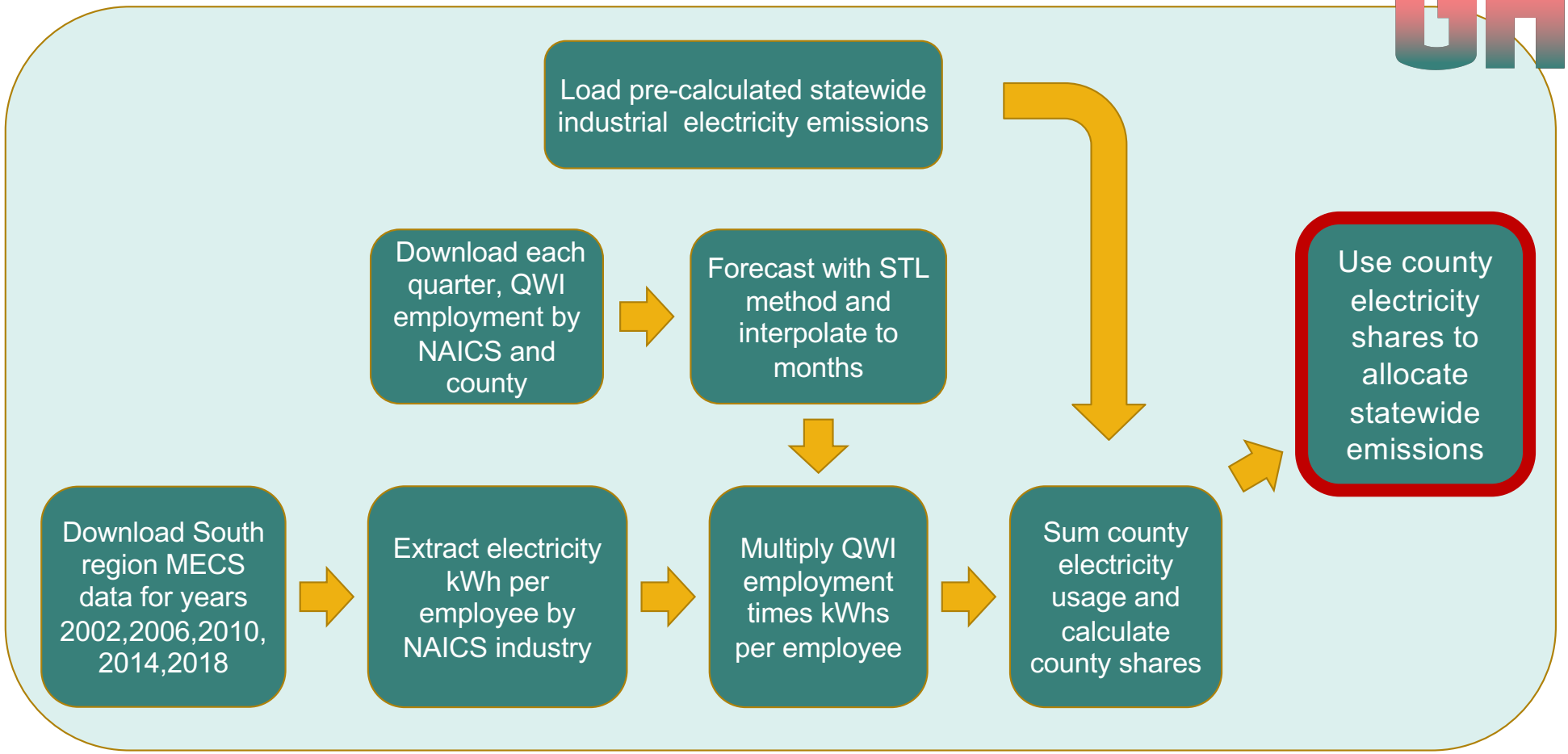
Industrial data sources

1. EIA Open Data API monthly data: Prior calculation of **statewide electricity emissions**
2. Census Quarterly Workforce Indicators **(QWI)** employment by county and NAICS code
3. EIA manufacturing energy consumption survey **(MECS)** for South Census region for years 2002, 2006, 2010, 2014 ,2018
4. EPA State Inventory Tool **(SIT)** industrial process emissions

Industrial electricity basic strategy

1. Load prior calculations of **monthly industrial electricity emissions**
2. Load prior calculations of monthly **QWI industrial employment**
3. Load **MECS** for 2002, 2006, 2010, 2014, and 2018 and extract **kWh per employee** by NAICS industry
4. **Interpolate** kWh per employee values for intermediate years and extend for years beyond 2018
5. For each industry **multiply kWh per employee times QWI employment**, sum across industries, and calculate each county's share of statewide emissions
6. Multiply each county's **share of industrial electricity usage** times statewide industrial electricity emissions

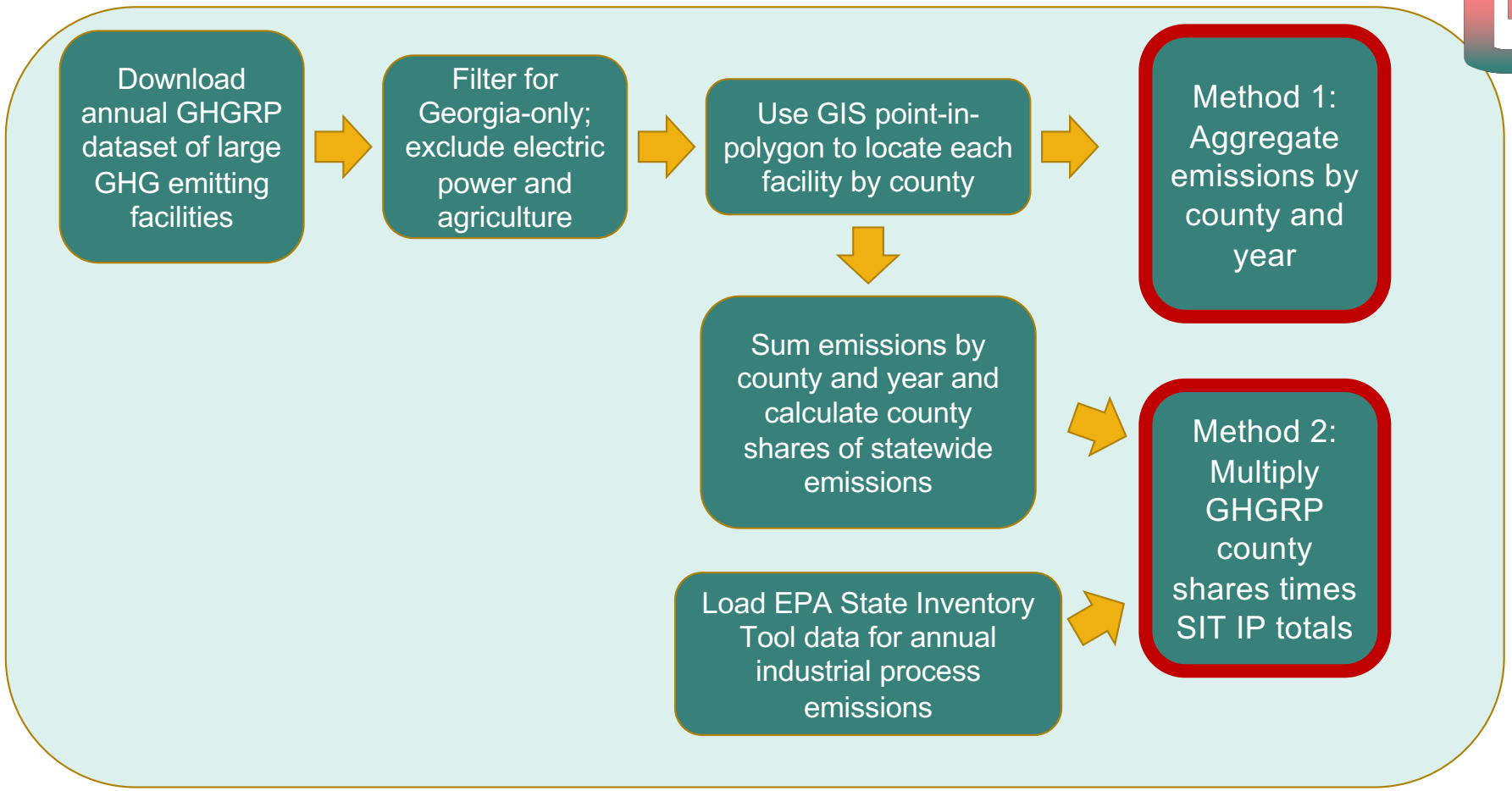
Industrial electricity emissions



Industrial non-electricity basic strategies

1. Download annual EPA **Greenhouse Gas Reporting Program** datasets from facilities emitting over 25,000 metric tons annually
2. **Filter** for Georgia-only sources and exclude facilities from electric power and agriculture sectors
3. Conduct GIS **point-in-polygon** operation to locate each facility by county
4. **Aggregate** emissions by county and by year
5. **Method 1:** result is county annual aggregate emissions
6. **Method 2:**
   a. Calculate each county's share of annual statewide emissions
   b. Use shares to allocate EPA State Inventory Tool emissions from industrial processes

Industrial non-electricity emissions



Industrial questions and discussion

Note: STL forecast method

STL stands for Seasonal and Trend decomposition using Loess regression. The method is available in the R forecast package developed by Rob Hyndman.

1. The method first identifies (and removes for further analysis) the seasonal component
2. It then identifies (and removes for further analysis) the trend component
3. It then fits a Loess (local), ARIMA (autoregressive integrated moving average), or ETS (exponential time series smoothing) to the remaining component.

STL forecasts apply the three components to forecast future, months, quarters, or years

Hyndman, R.J., & Athanasopoulos, G. (2018) Forecasting: principles and practice, 2nd edition, OTexts: Melbourne, Australia. OTexts.com/fpp2. Accessed on 10/12/2021.

Note: EIA SEDS industrial sector definition

- An energy-consuming sector that consists of all facilities and equipment used for producing, processing, or assembling goods. The industrial sector encompasses the following types of activity **manufacturing** (NAICS codes 31-33); **agriculture**, **forestry**, **fishing and hunting** (NAICS code 11); **mining, including oil and gas extraction** (NAICS code 21); and **construction** (NAICS code 23).
- Overall energy use in this sector is largely for process heat and cooling and powering machinery, with lesser amounts used for facility heating, air conditioning, and lighting. Fossil fuels are also used as raw material inputs to manufactured products. Note: This sector includes generators that produce electricity and/or useful thermal output primarily to support the above-mentioned industrial activities. Various EIA programs differ in sectoral coverage.

Clear all filters

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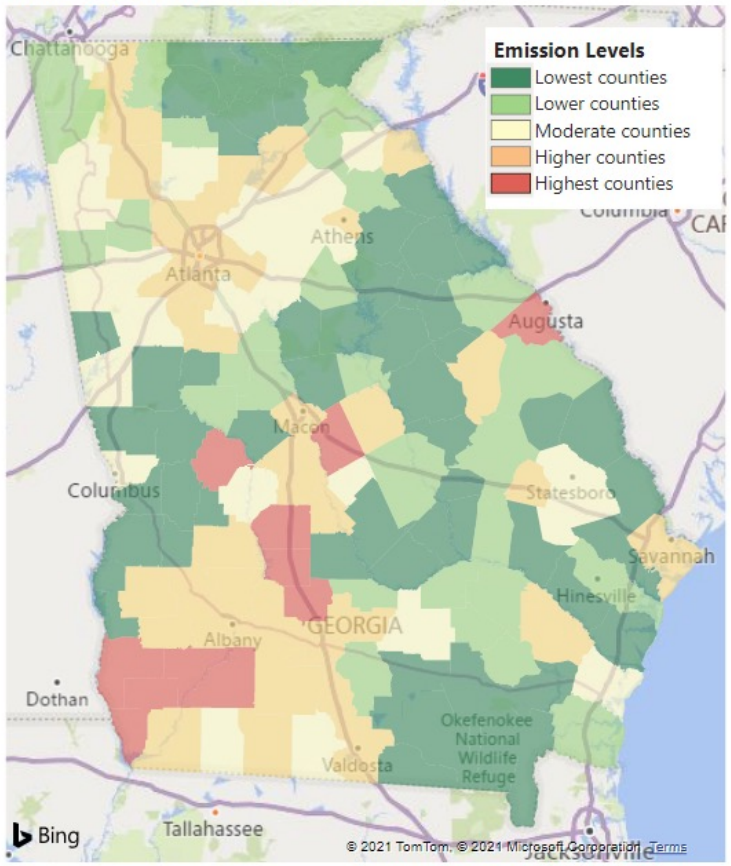

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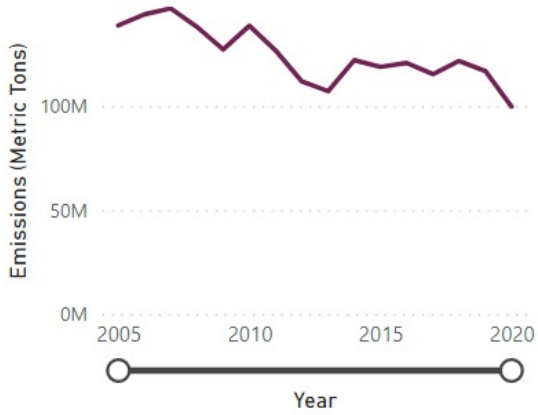

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Up Next

Two more seminars on Fridays 10:00am to 11:00am:

- Transportation Oct. 22nd – Drs. Rich Simmons & Bill Drummond
- Forests, Food, and Farms Oct. 29th – Drs. Jackie Mohan, Jeff Mullen & Bill Drummond

Updates about the dashboard (and some PPTs) will be posted here:
https://cepl.gatech.edu/projects/Drawdown-Georgia

THANKS!

For more information:
Ollie Chapman at
ochapman3@gatech.edu

For more about Drawdown Georgia:

- www.drawdownga.org

For more about Drawdown Georgia research program:

- https://cepl.gatech.edu/projects/Drawdown-Georgia

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