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

Electricity and Residential Sectors Experts Meeting

October 8, 2021

Drs. Marilyn Brown and Bill Drummond

Georgia Institute of Technology

Agenda

10:00 Welcome & Intro to Drawdown Georgia (Dr. Marilyn Brown)
--Please use “chat” for asking questions—Ollie Chapman will collect them
--We will be recording this session, but will not post the video

10:10 Electricity Sector Emissions (Dr. Bill Drummond)
10:20 Q&A

10:30 Residential Sector Emissions (Dr. Bill Drummond)
10:45 Q&A

10:55 Next Steps and Wrap up (Dr. Marilyn Brown)
--Updates about the dashboard (and some PPTs) will be posted here:
bit.ly/CEPL-DDGA

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

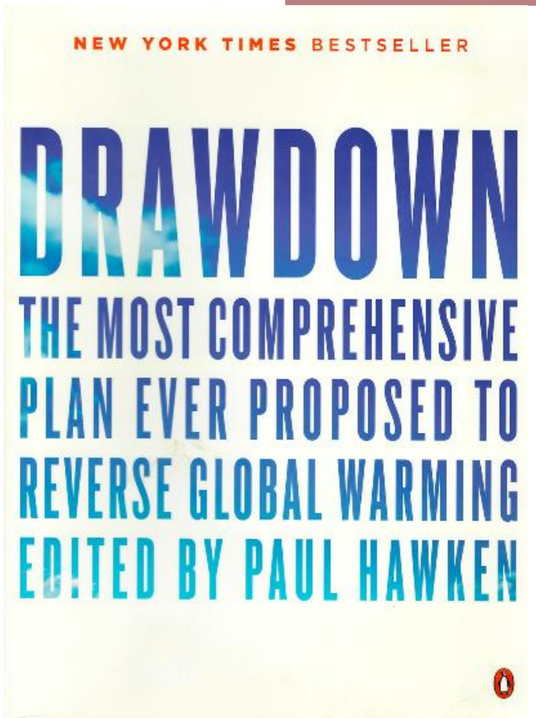
drawdownga.org

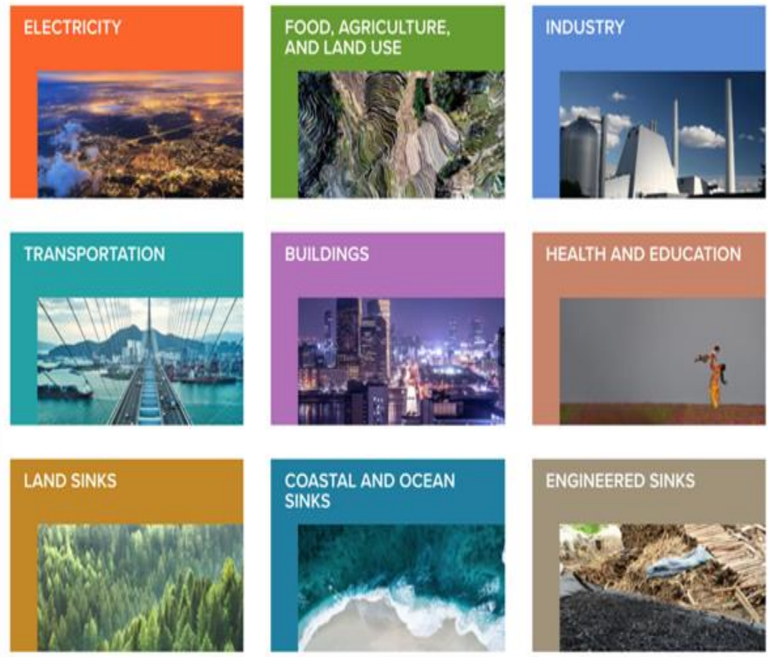
Research conducted at Georgia Tech, University of Georgia, Emory University, Georgia State and other partners.
Funded by the Ray C. Anderson Foundation.

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.

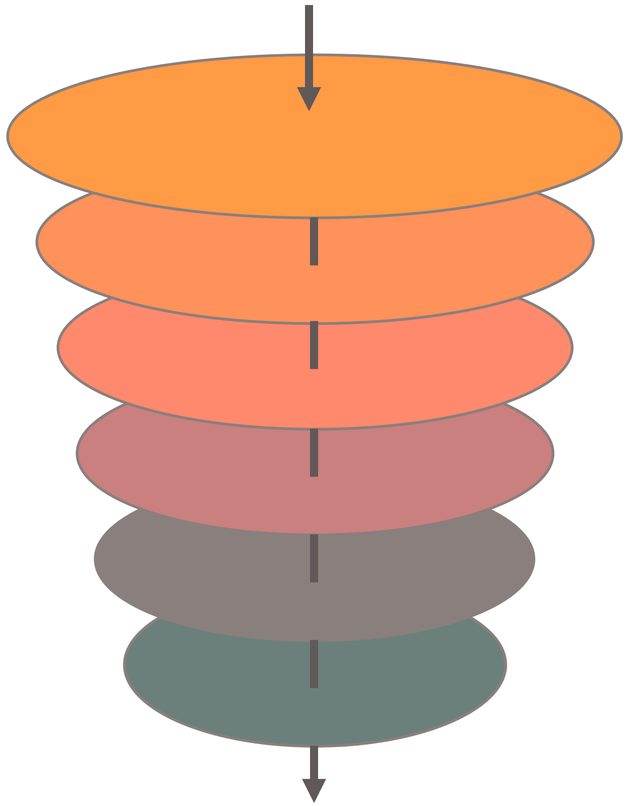




Which are best for Georgia?

Identifying high-impact climate solutions for Georgia

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

Buildings & Materials

- Recycling
- Refrigerant Management
- Retrofitting Buildings

Transportation

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

Food & Agriculture

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

Land Sinks

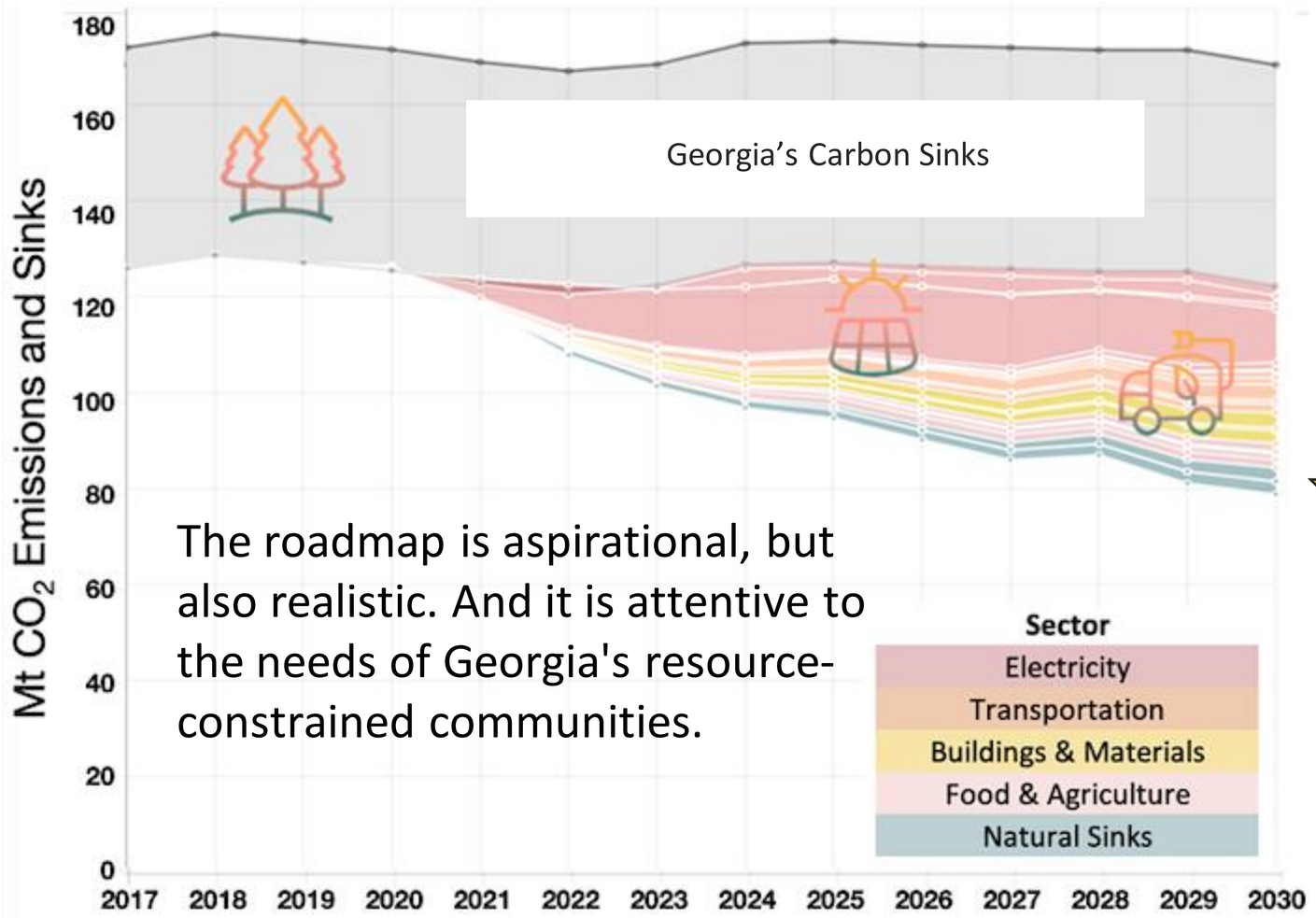
- Afforestation & Silvopasture
- Coastal Wetlands
- Temperate Forest Protection & Management

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

7

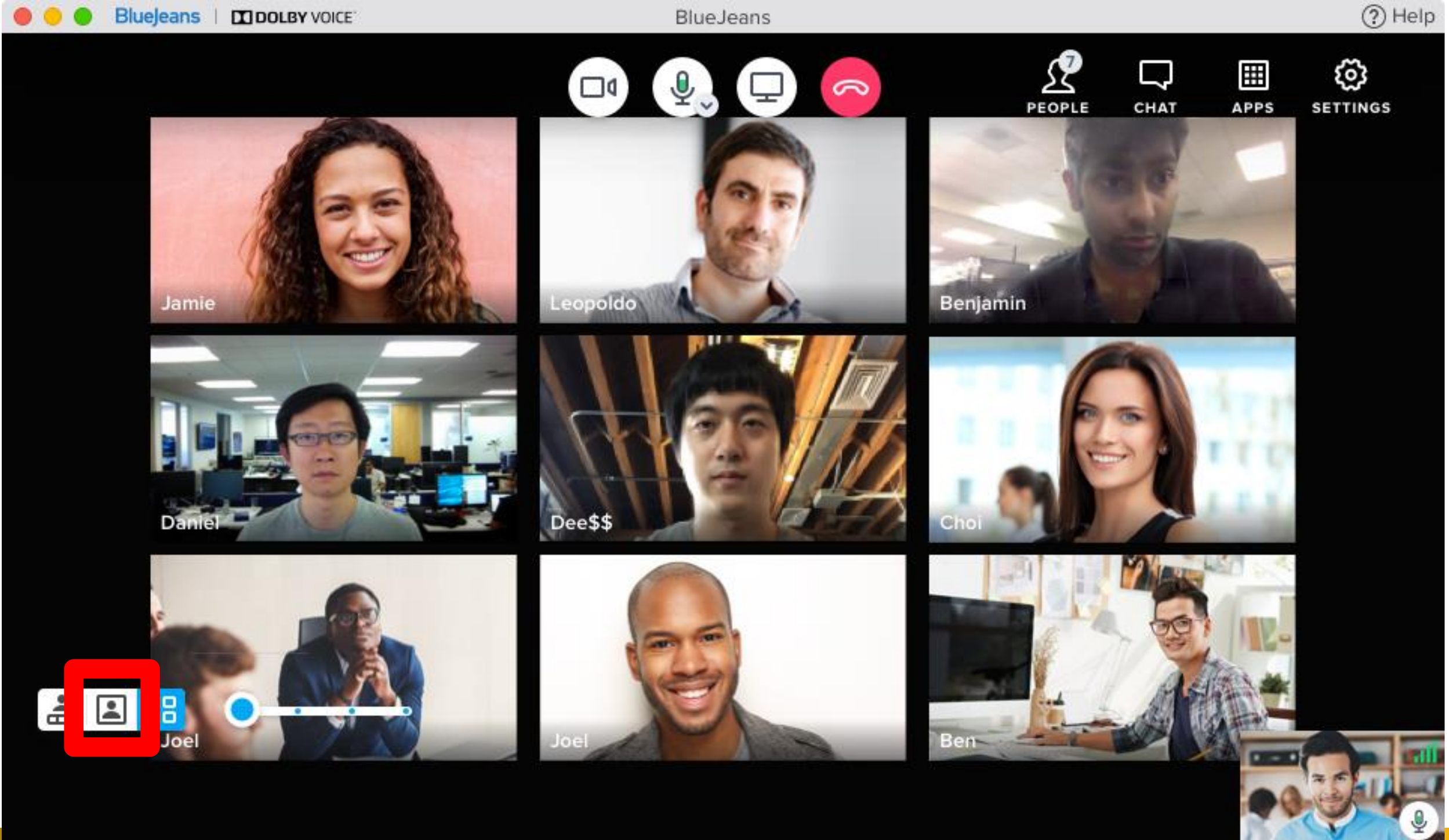
Our current tasks focus on solution activation

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


BlueJeans | DOLBY VOICE
BlueJeans
Help
7
PEOPLE
CHAT
APPS
SETTINGS
Jamie
Leopoldo
Benjamin
Daniel
Dee$$
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Joel
Joel
Ben

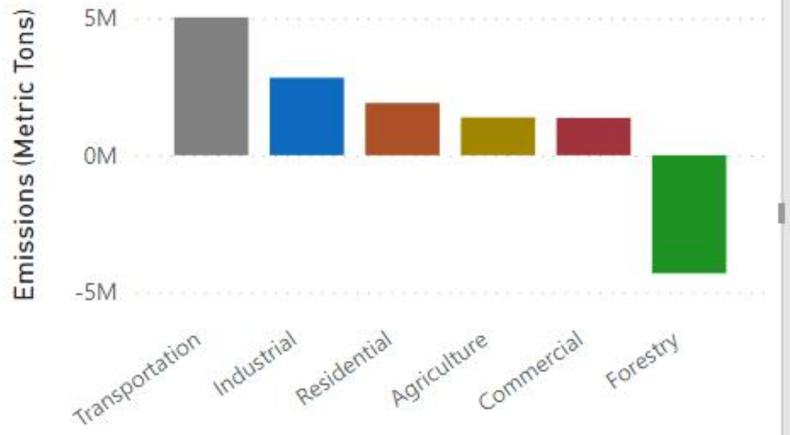
Clear all filters

Month: April

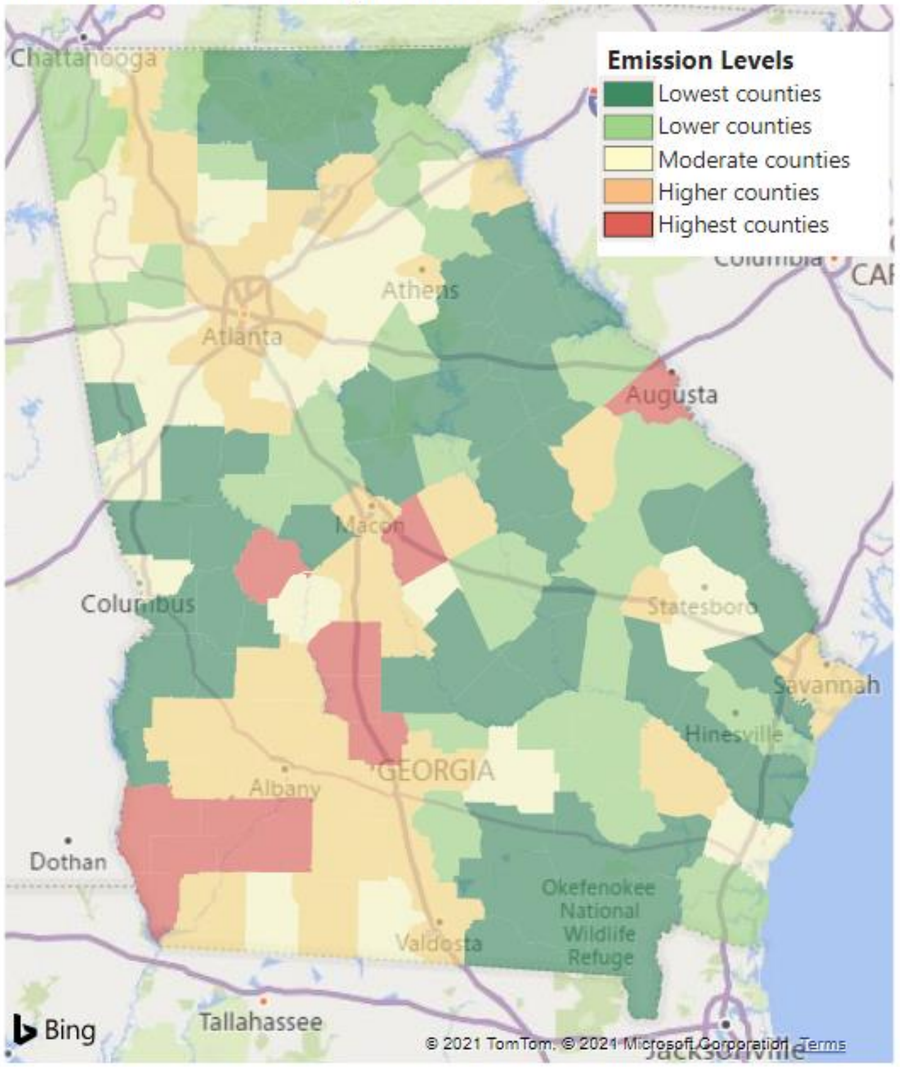
Year: 2021

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



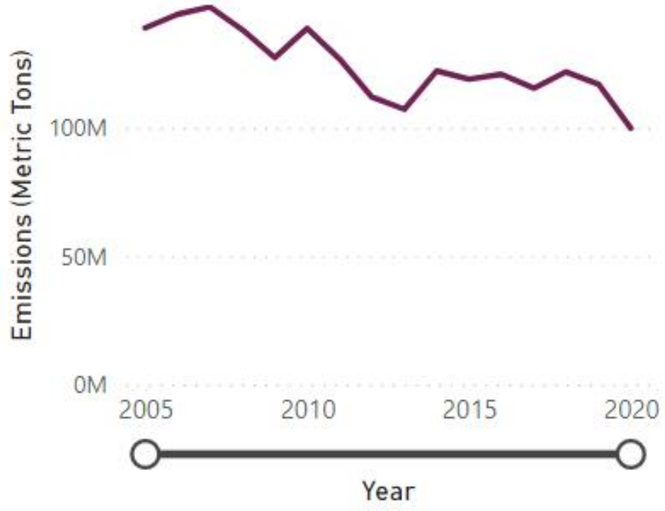
Emissions (Metric Tons) per 1000 People



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 and sinks** 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**.

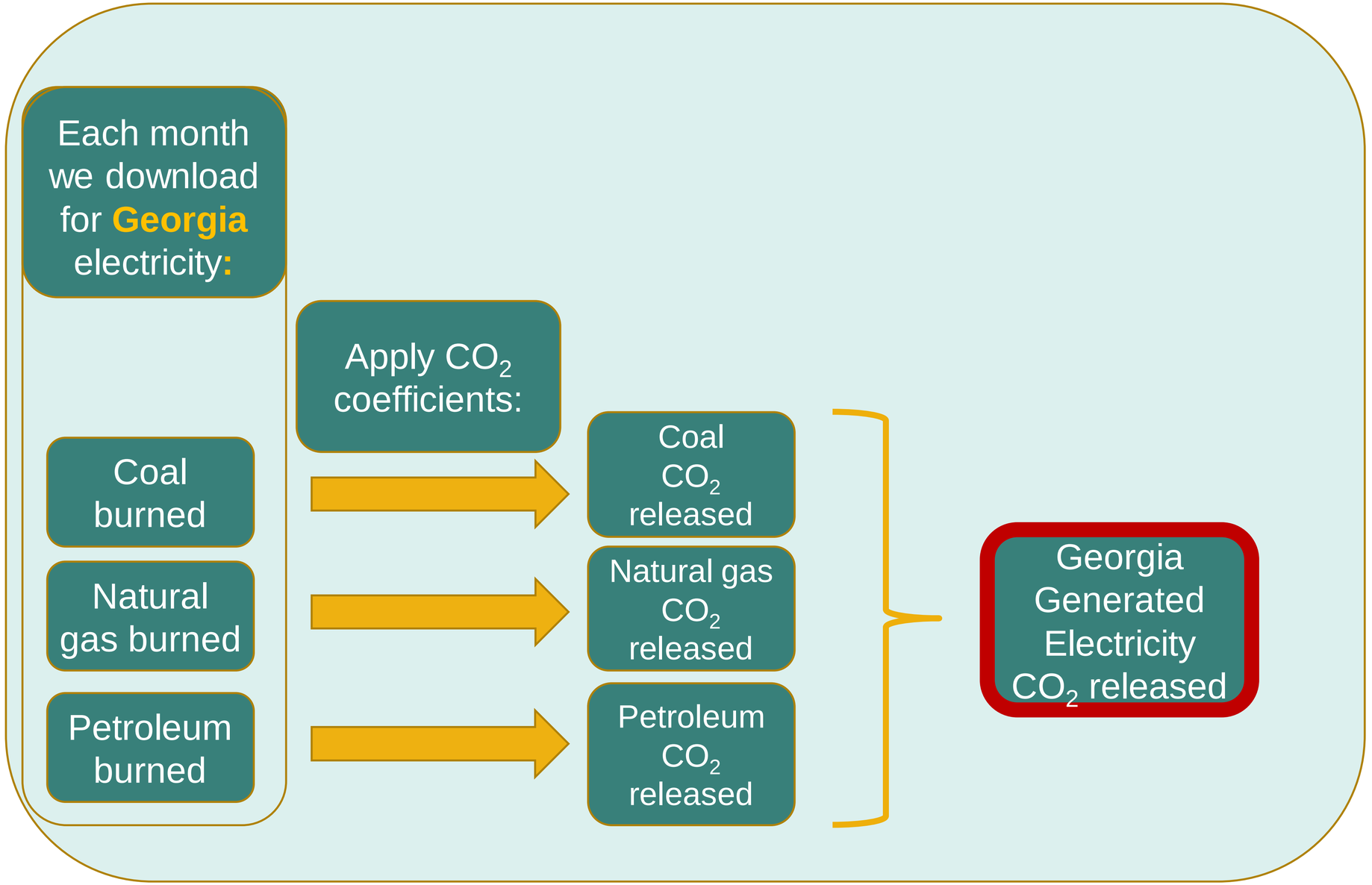
Electricity basic strategy

1. From the EIA API download monthly electric power sector **fuel use**, **net generation**, and **retail sales**
2. Apply most recent EIA **CO_2 coefficients** to calculate total Georgia electricity generation CO_2 emissions
3. Calculate electricity **imported from Alabama**
4. Calculate **Alabama CO_2 emissions per kWh** and apply to imported electricity to calculate “imported” emissions
5. **Sum** Georgia emissions plus imported electricity emissions, and distribute to sectors according to sales

Electricity Data Sources

1. **EIA Open Data API monthly data**
   a. State-level coal, natural gas, and petroleum products used to generate electricity
   b. State-level sales by sector
   c. Plant-level data on net generation
2. **EIA Open Data API annual data**
   a. State-level CO_2 coefficients for coal, natural gas, and petroleum used for electric power
   b. State-level electricity net imports/exports
   c. State-level net generation of electricity
   d. State-level retail sales of electricity

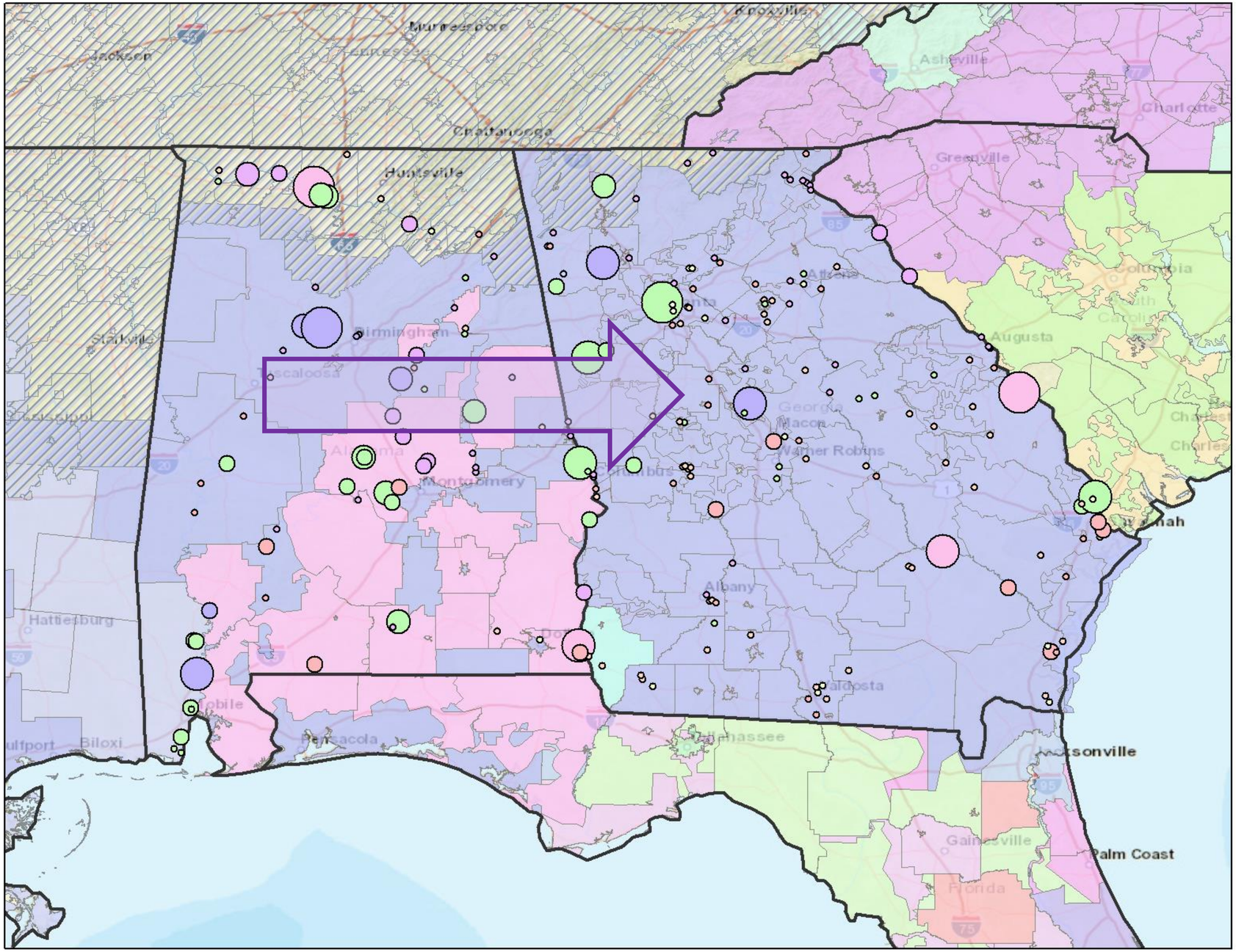
Georgia Electricity Generation



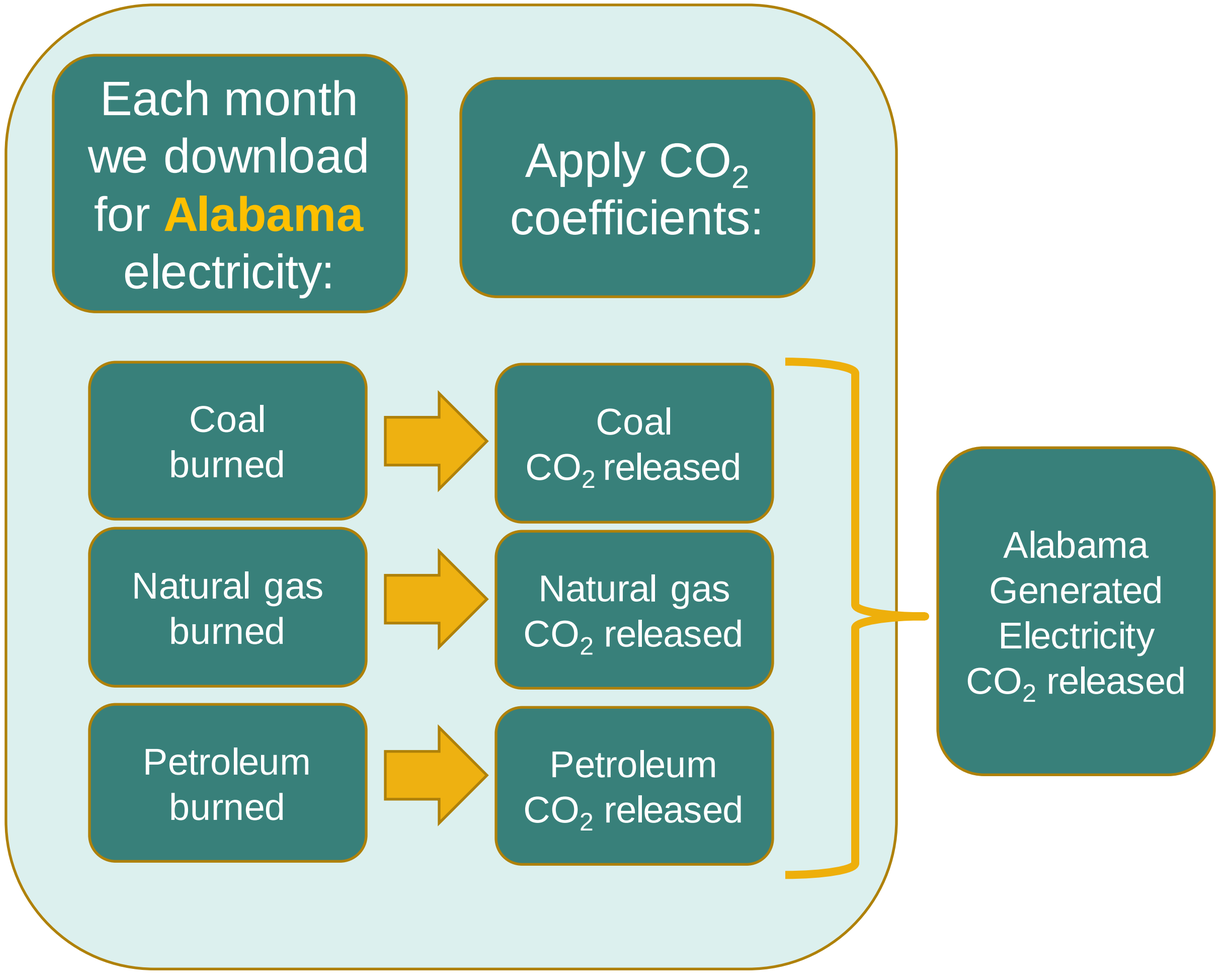
Side note:

We also download residential natural gas usage data and apply CO2 coefficients to calculate residential natural gas emissions.

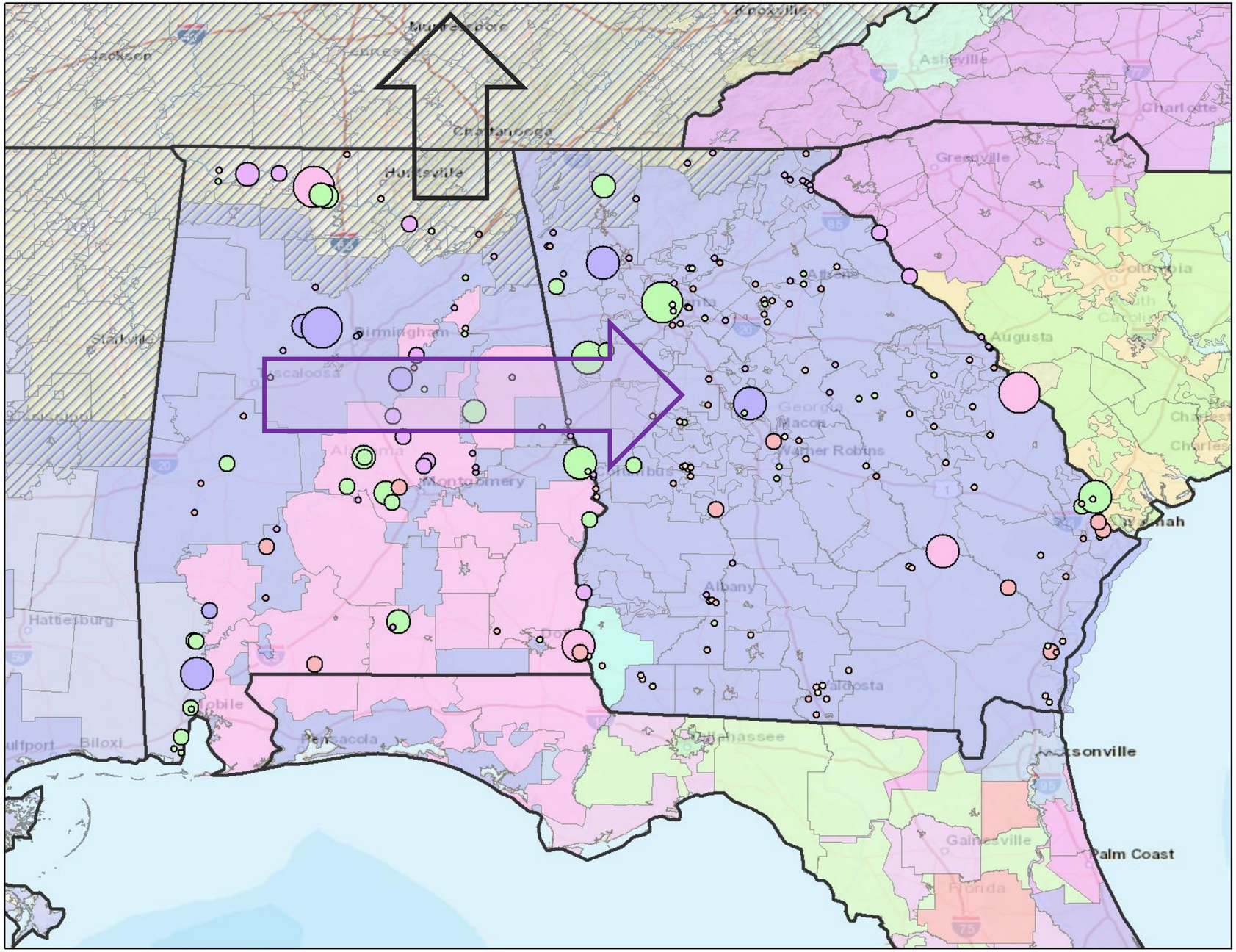
Georgia imports about 20% of its electricity in recent years, largely from Alabama.



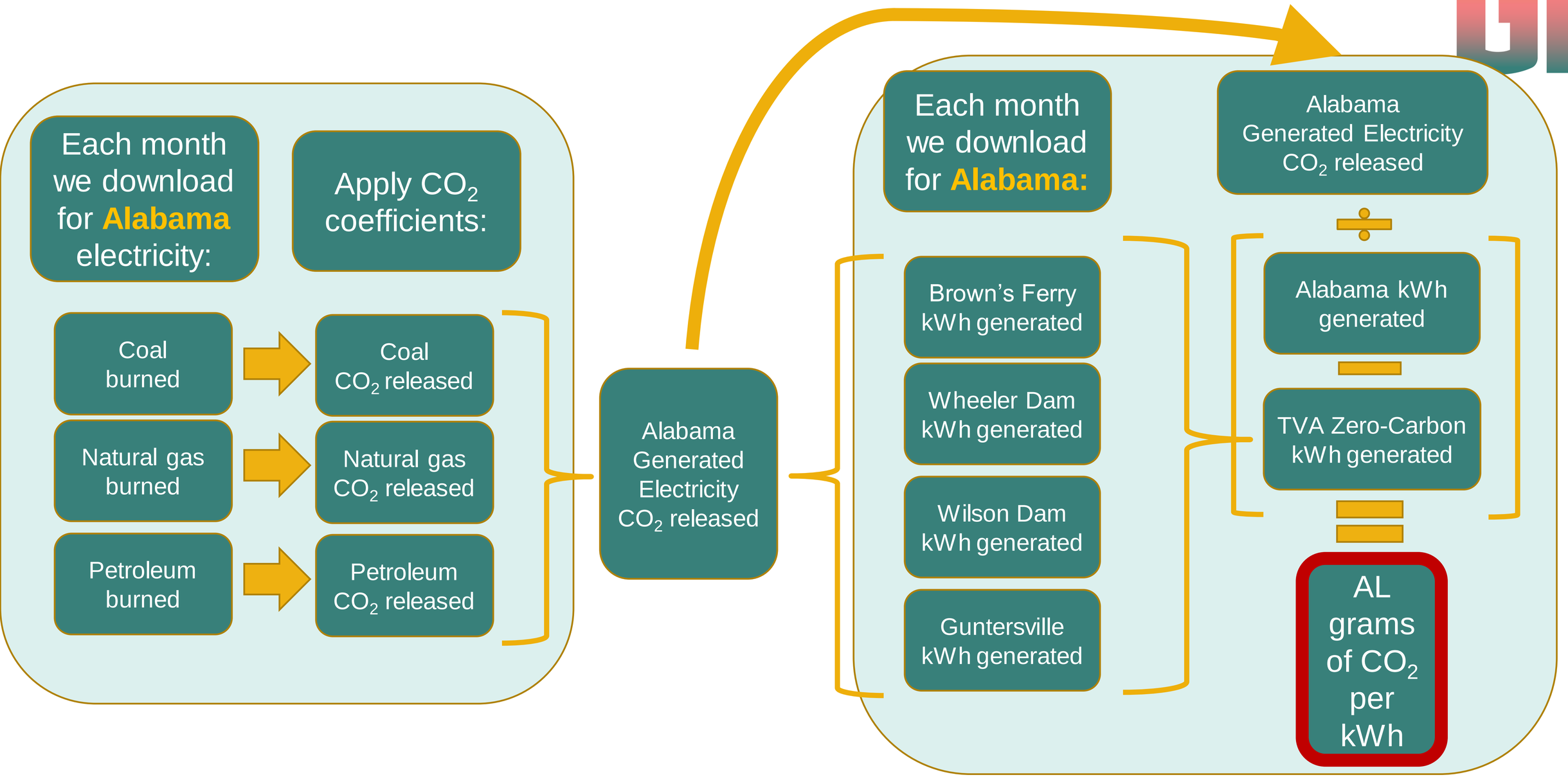
Alabama CO2 from Electricity Generation



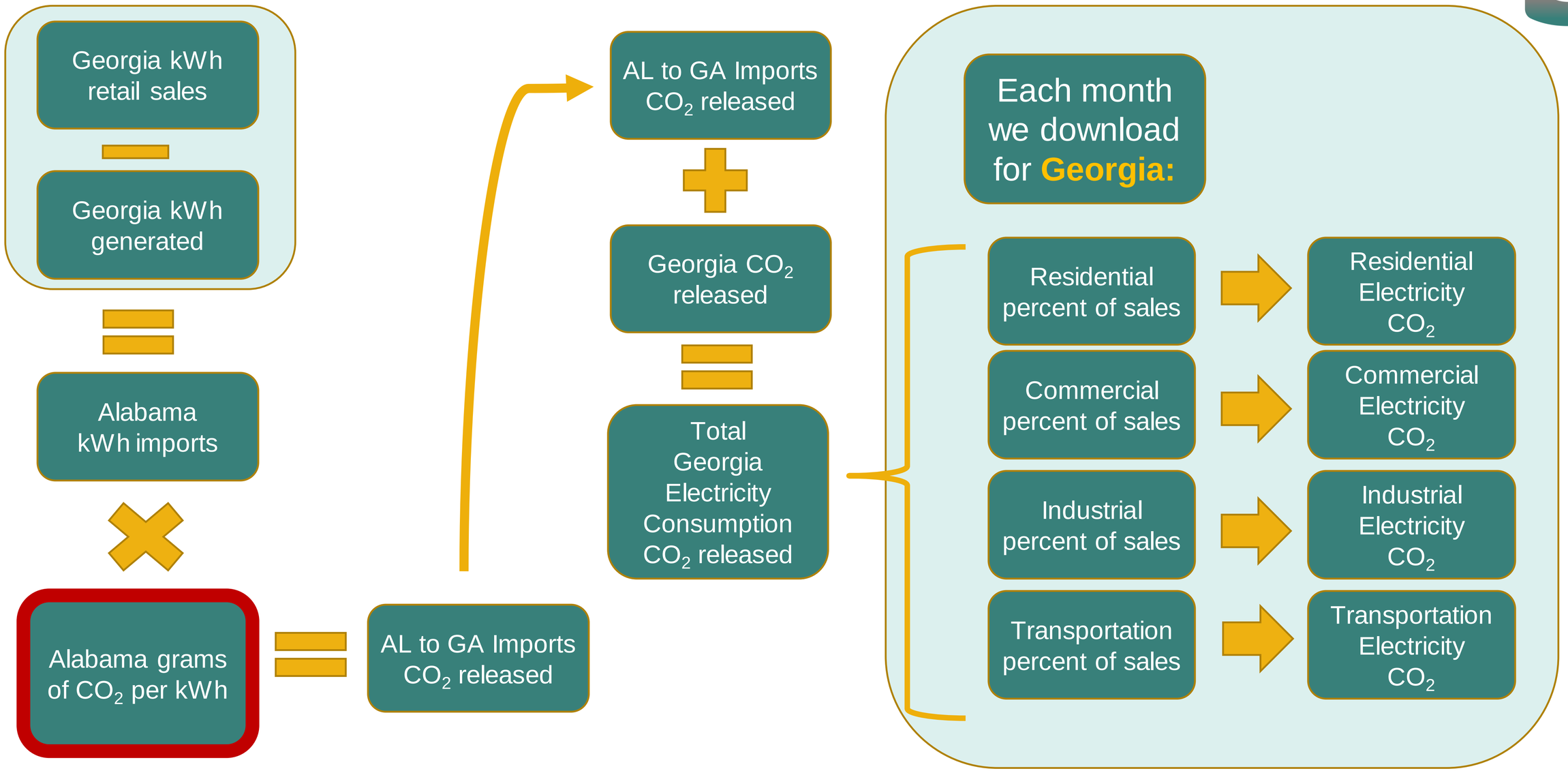
Northern Alabama TVA area (diagonal striping) includes Brown's Ferry nuclear plant and three hydro plants



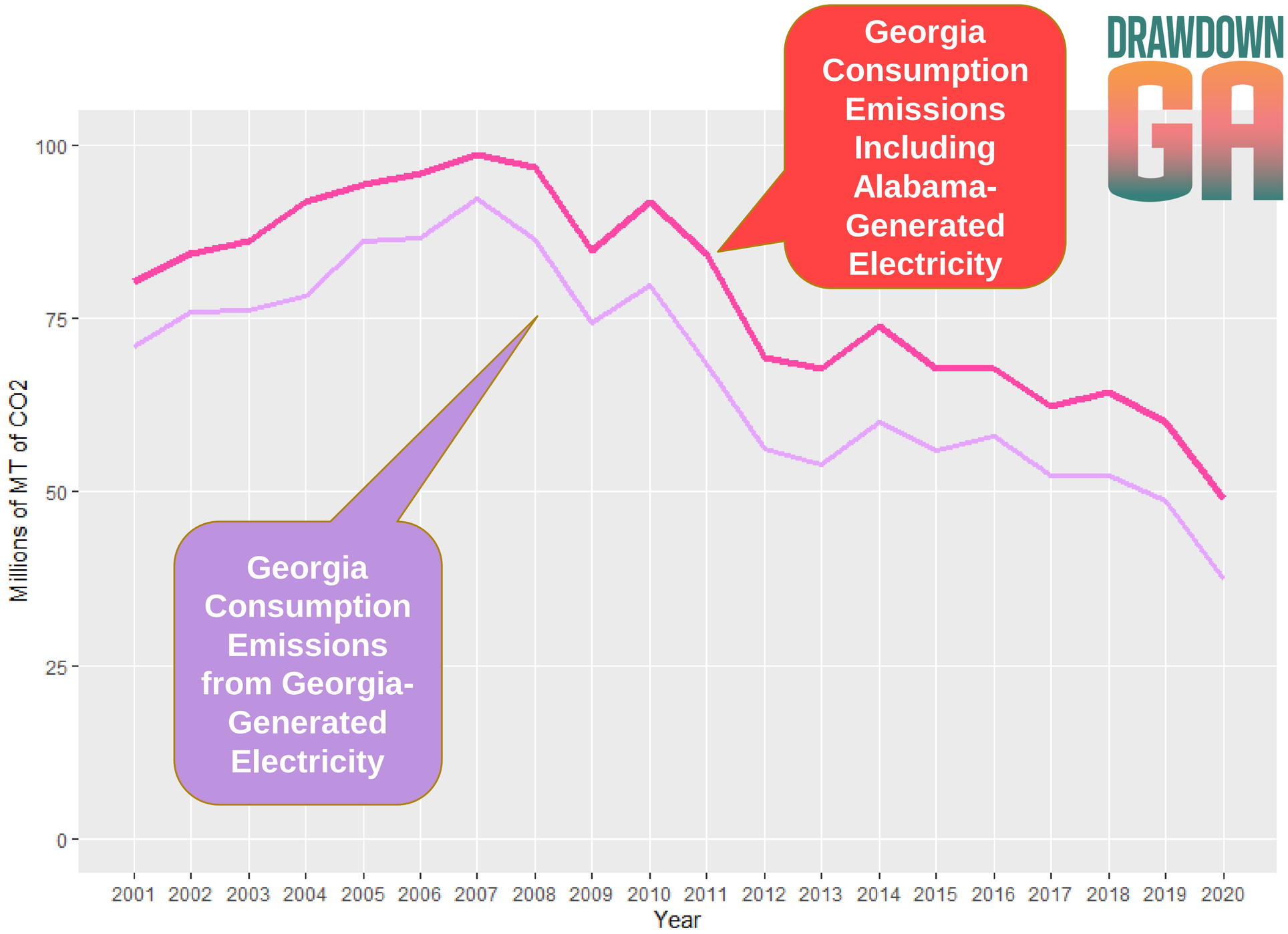
Alabama TVA Zero-Carbon Adjustment



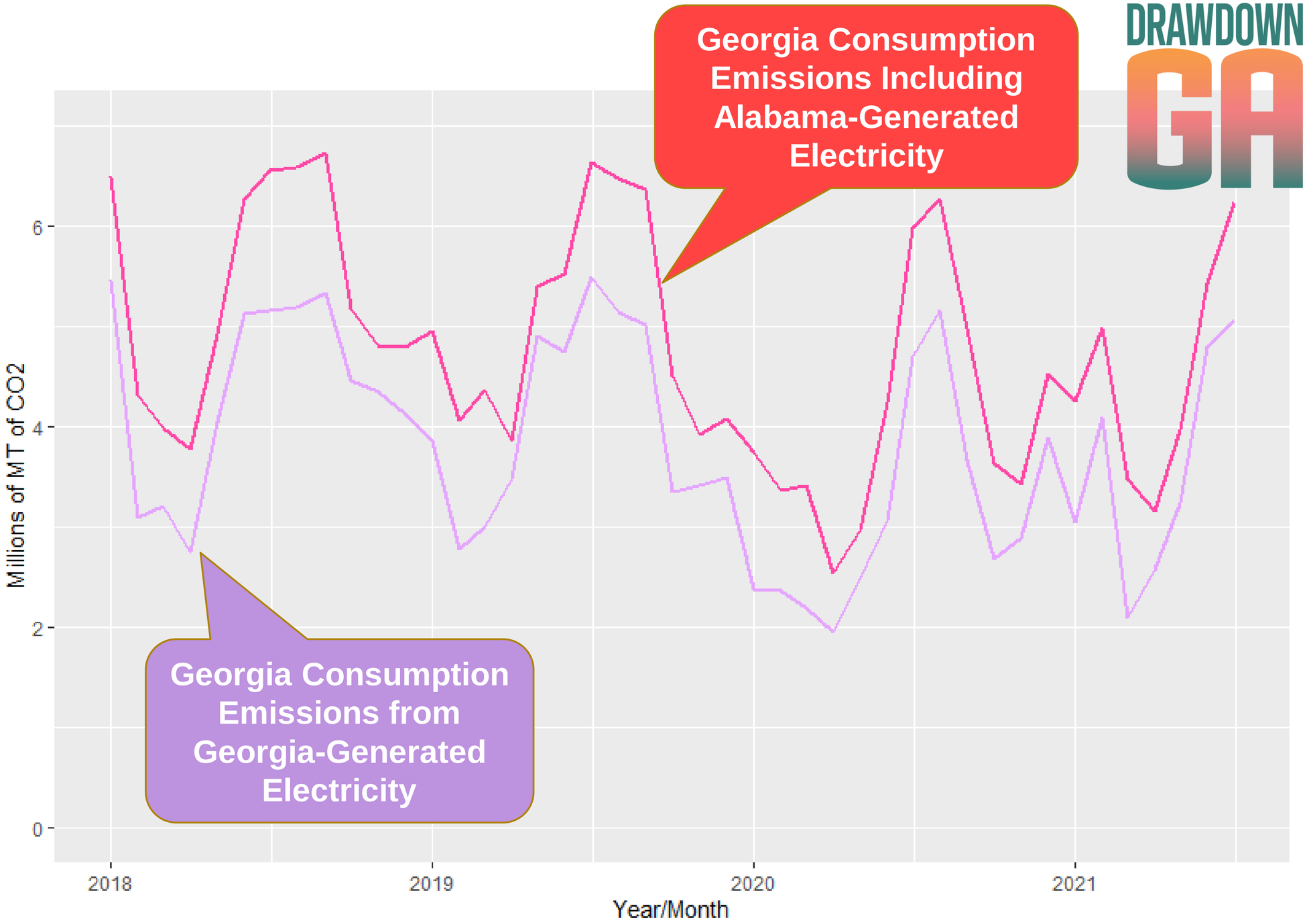
Georgia Electricity Consumption



Annual Georgia CO_2 Consumption Electricity Emissions in Millions of MT



Monthly Georgia CO_2 Consumption Electricity Emissions in Millions of MT



Electricity questions and discussion

Residential electricity and natural gas county-level allocation

Basic local allocation strategy

1. Identify one or more **county-level indicator variables** that should track the local share of statewide emissions
2. Calculate annual or monthly county-level **proportions** of the indicator(s)
3. **Distribute** the statewide emissions using county-level proportions
4. If the major indicator proportions are based on annual data, separate monthly data may be applied to **distribute annual emissions among individual months**

Local Residential Allocation CO_2 Data Sources

1. **Census American Community Survey** annual public use microsample
   a. Cost of electricity: The ACS asks: "LAST MONTH, what was the cost of electricity for this house, apartment or mobile home?"
   b. Tenure: was the dwelling unit owned or rented
   c. Number of rooms
2. **Census American Community Survey** 5-year sample county-level data
3. **EIA Residential Energy Consumption Survey (RECS)** microdata
4. **NOAA 1991-2020 Climate Normals** for local heating and cooling degree days
5. **EIA Open Data API** for monthly residential natural gas usage, heat content, and CO_2 coefficients

County-level Residential Allocation of Electricity and Natural Gas CO_2 Emissions

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From annual ACS microdata calculate household **electricity and natural gas expenditures** by local area and tenure

Convert ACS **PUMA** local area geography to counties

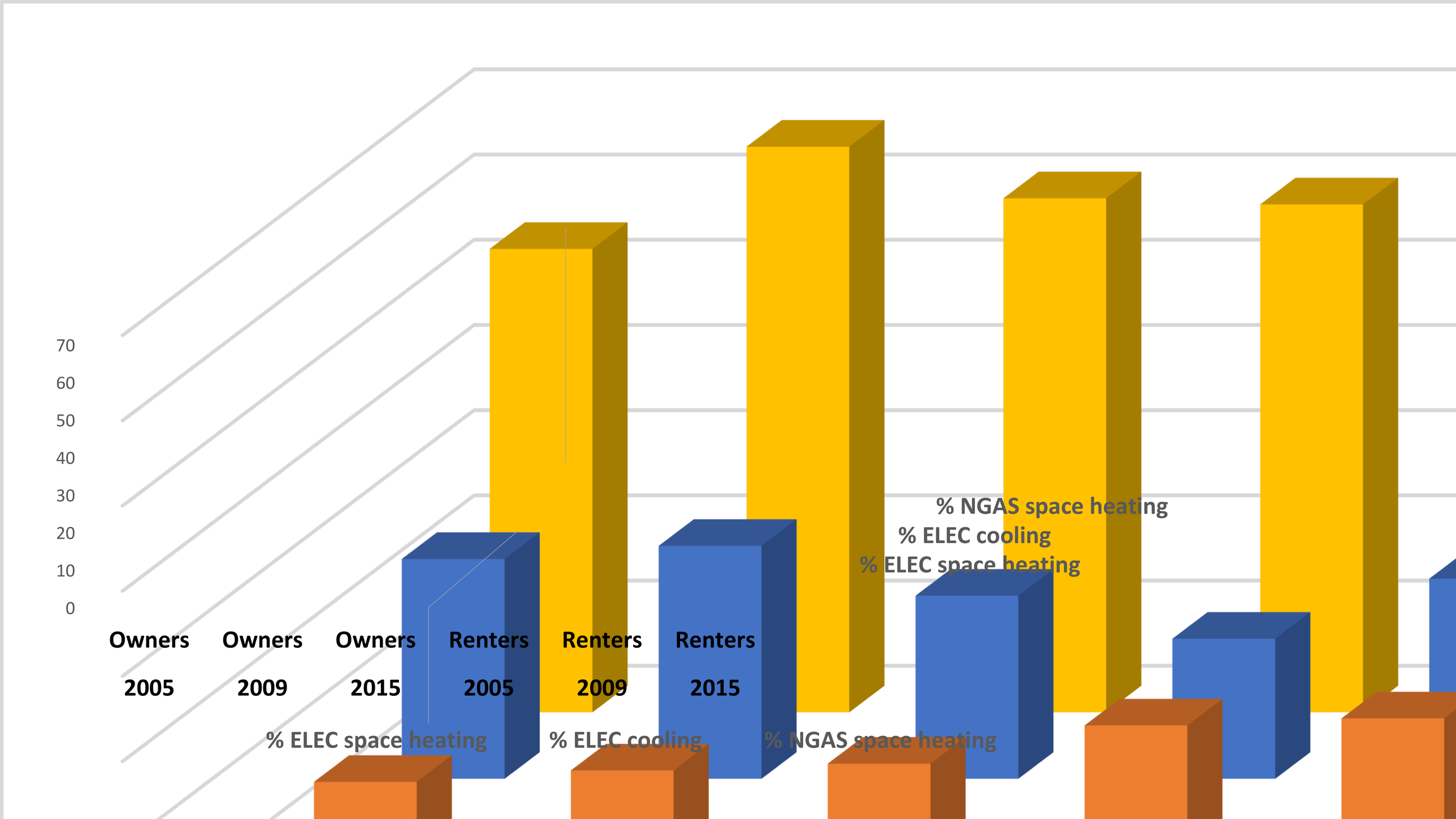
Calculate each county's **annual shares** of statewide electricity and natural gas expenditures

From 2005, 2009, and 2015 RECS microdata, calculate **variable** electricity and natural gas space heating and cooling costs as percentage of total electricity and natural gas costs, by tenure

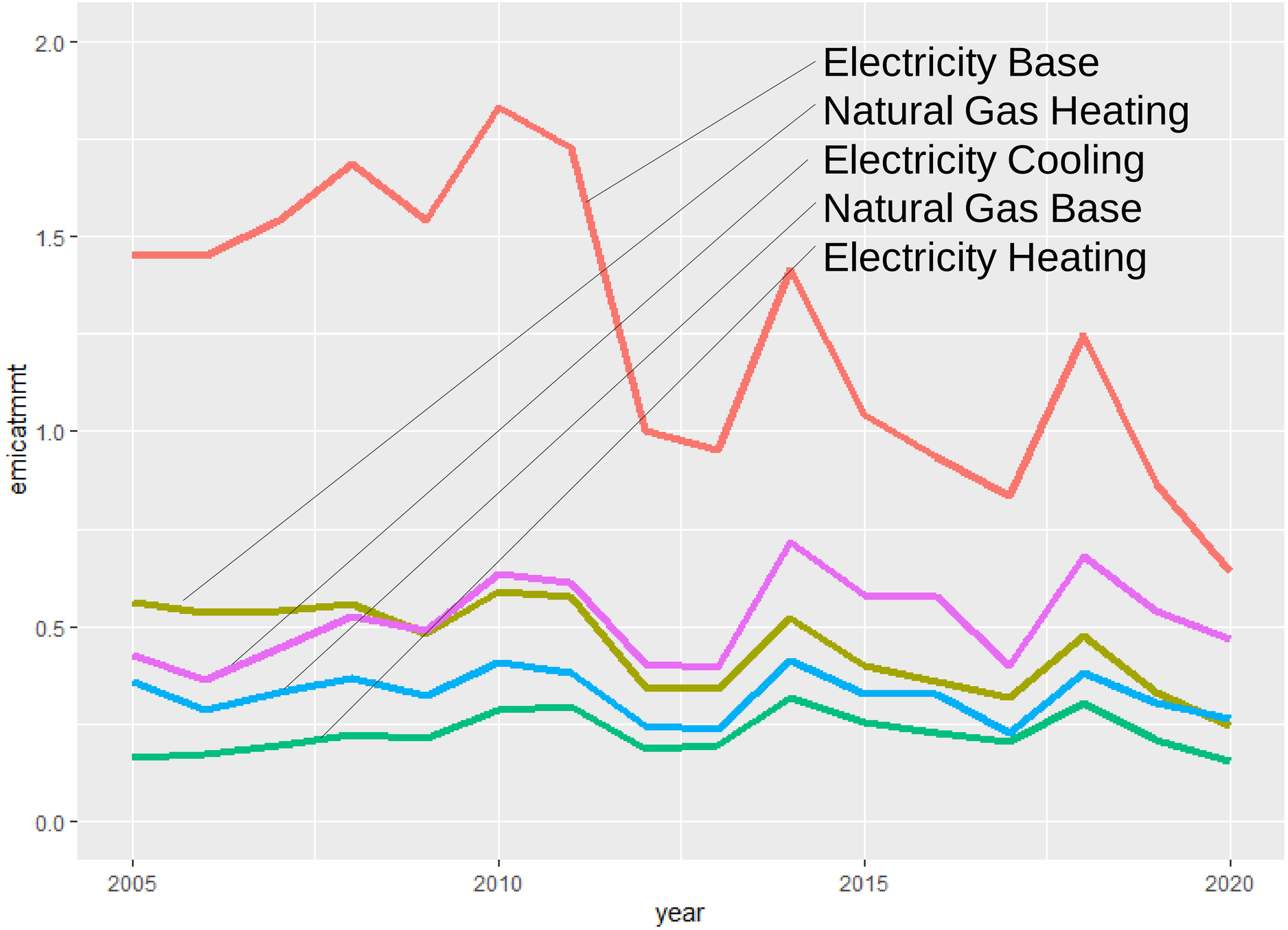
Transfer nearest-station 1990-2020 **climate normals** (hdd and cdd) to counties

Use county **monthly hdd and cdd** to proportion variable costs among months

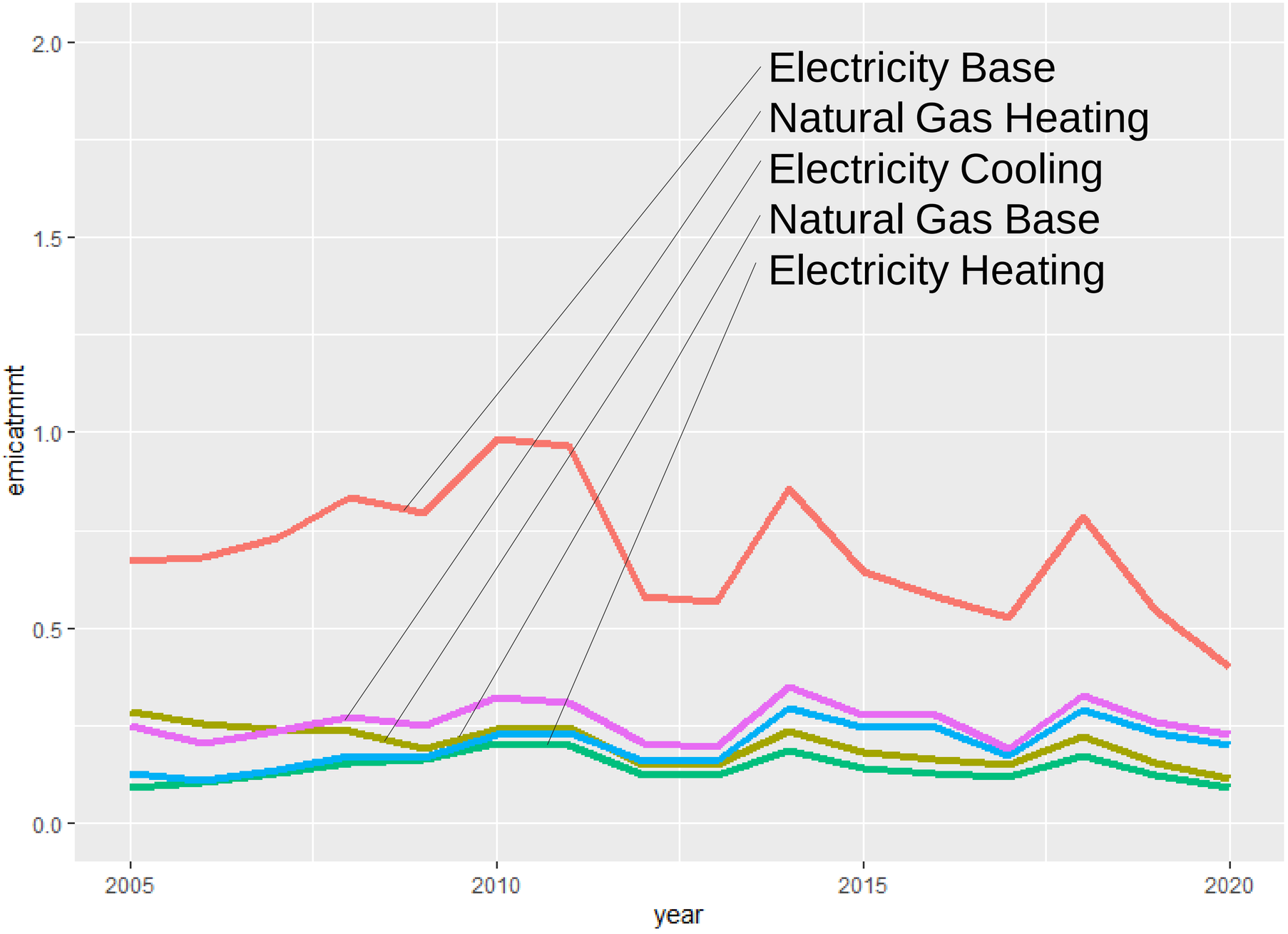
Allocate statewide CO_2 emissions based upon county share of statewide expenditures and monthly share of hdd and cdd


70
60
50
40
30
20
10
0
Owners 2005
Owners 2009
Owners 2015
Renters 2005
Renters 2009
Renters 2015
% ELEC space heating
% ELEC cooling
% NGAS space heating
% NGAS space heating
% ELEC cooling
% ELEC space heating

Owners' Statewide CO_2 Emissions in Millions of MT



Renters' Statewide CO_2 Emissions in Millions of MT



Notes on County Allocations

1. The ACS asks: **“LAST MONTH, what was the cost of electricity (or natural gas) for this house, apartment or mobile home?”**

2. The analysis uses ACS Public Use Microsample (PUMS) microdata, whose lowest level of geography is the **PUMA**. **PUMAs** have a minimum population of 100,000. Costs in **PUMAs** with multiple counties are allocated based upon each county’s proportion of **PUMA** rooms.

3. The three categories of RECS variable energy costs are **(a)** electricity space heating, **(b)** natural gas space heating, and **(c)** electricity cooling.

4. To test the relationship between hdd/cdd and the variable costs, the next slide shows the results of regression models predicting **the proportion of the three variable costs** with **hdd/cdd independent variables.**

5. The two **tenure** categories used throughout the analyses are **owner** and **renter.**

Residential questions and discussion

Clear all filters

Month: April

Year: 2021

NAME	Year	Month	Sector Name	Emissions (MT)	Emiss
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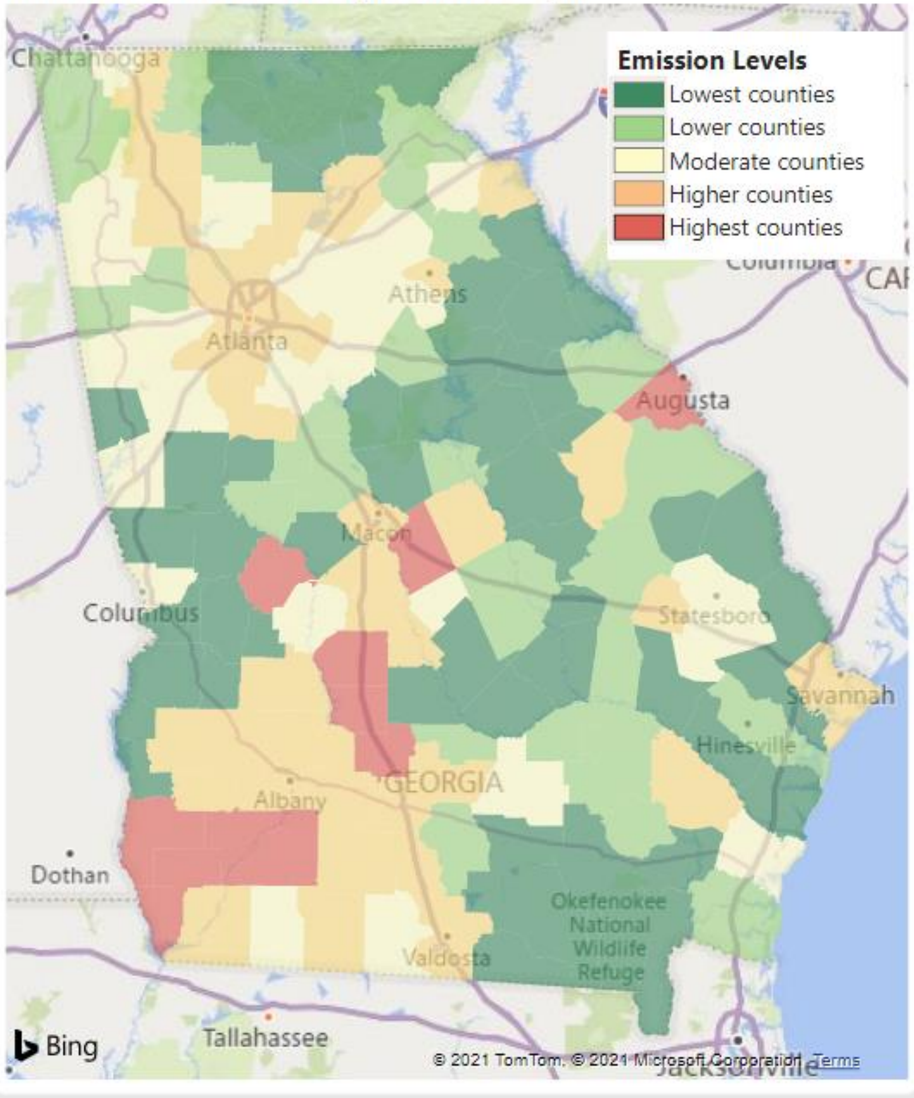
Emissions by Sector

Emissions (Metric Tons) per 1000 People



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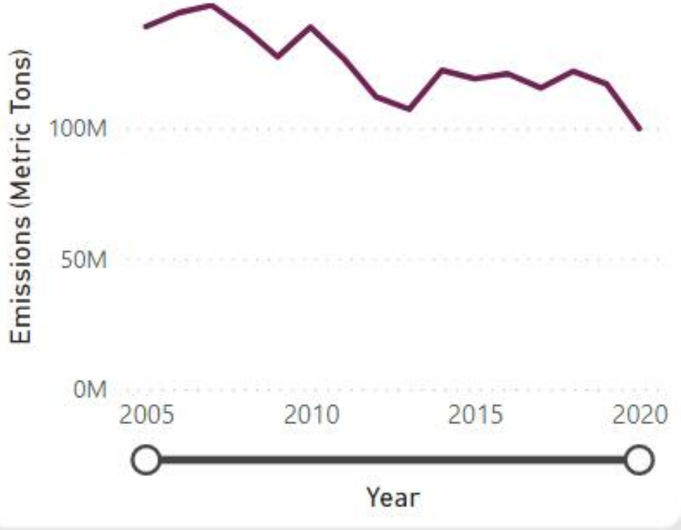

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Up Next

Three more seminars on Friday's 10:00 - 11:00 am:

- Commercial Buildings & Manufacturing, Oct. 15th –

Drs. Dan Matisoff & Bill Drummond

- Transportation, Oct. 22nd –

Drs. Rich Simmons & Bill Drummond

- Forests, Farms, and Food, Oct. 29th –

Drs. Jackie Mohan, Jeff Mullen & Bill Drummond

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THANKS!

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

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