



# DRAWDOWN

#### www.DrawdownGA.org



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#### Introduction to Drawdown Georgia's Emissions Dashboard Project

Ground Transportation Sector Experts Meeting October 22, 2021

Drs. Rich Simmons and Bill Drummond Georgia Institute of Technology



10:00 Welcome & Intro to Drawdown Georgia (Dr. Rich Simmons)

- -- Please use "chat" for asking questions Ollie Chapman will collect them and read them out
- -- The session will be recorded for internal use but not shared publicly

10:10 Transportation sector emissions (Dr. Bill Drummond)

10:40 Q&A

10:55 Next Steps and Wrap up (Dr. Rich Simmons)





#### 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.



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<sup>®</sup>, we are building a movement in Georgia to accelerate progress toward net zero greenhouse gas emissions.

NEW YORK TIMES BESTSELLER

**BRAWDOWN** THE MOST COMPREHENSIVE Plan ever proposed to Reverse global warming EDITED by Paul Hawken

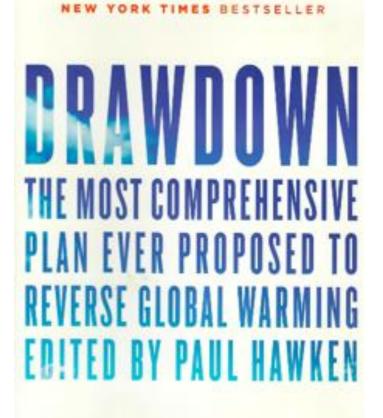


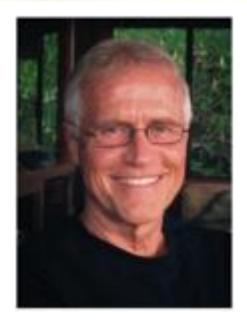


bringing climate solutions home



#### **Starting Point: Project Drawdown Solutions**

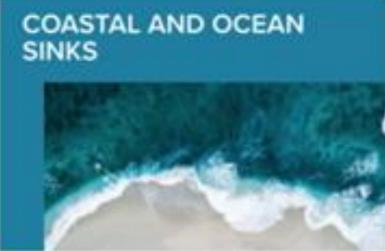




Paul Hawken environmentalist, entrepreneur, journalist, and author pioneer in sustainability





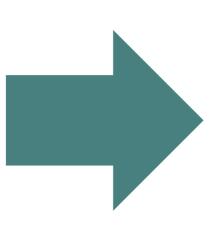


#### INDUSTRY









#### Which are best for **Georgia**?



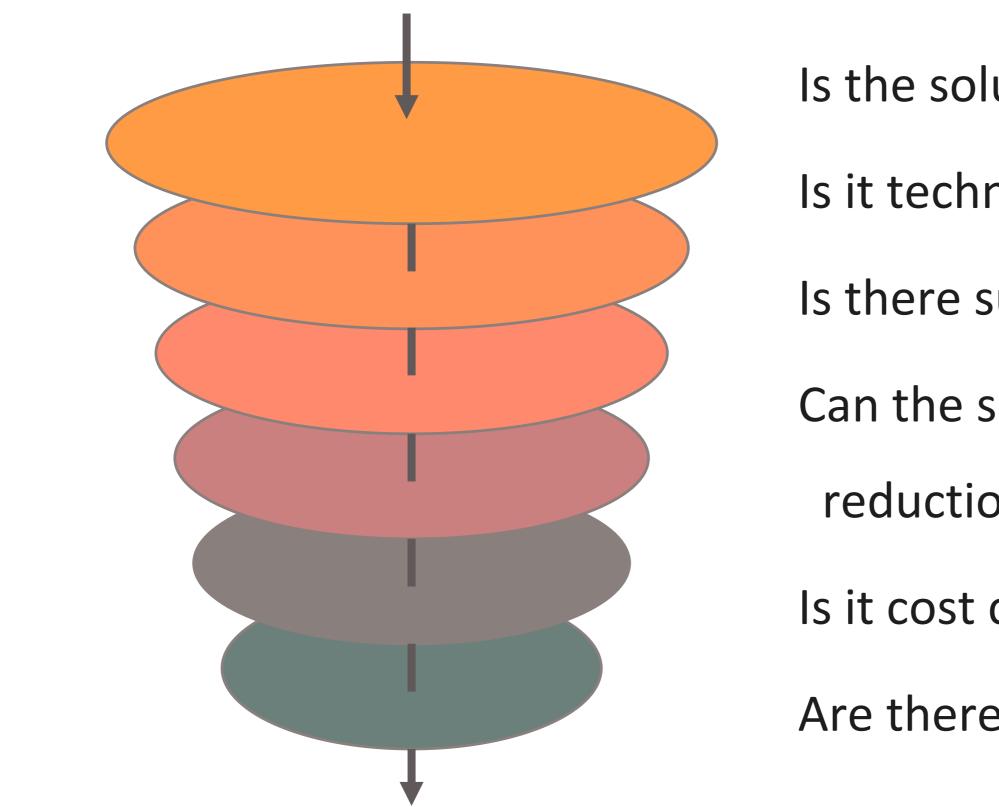






#### **Trajectory of the Drawdown Georgia Project**

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



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. <u>https://doi.org/10.1007/s00267-020-</u>



- 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?

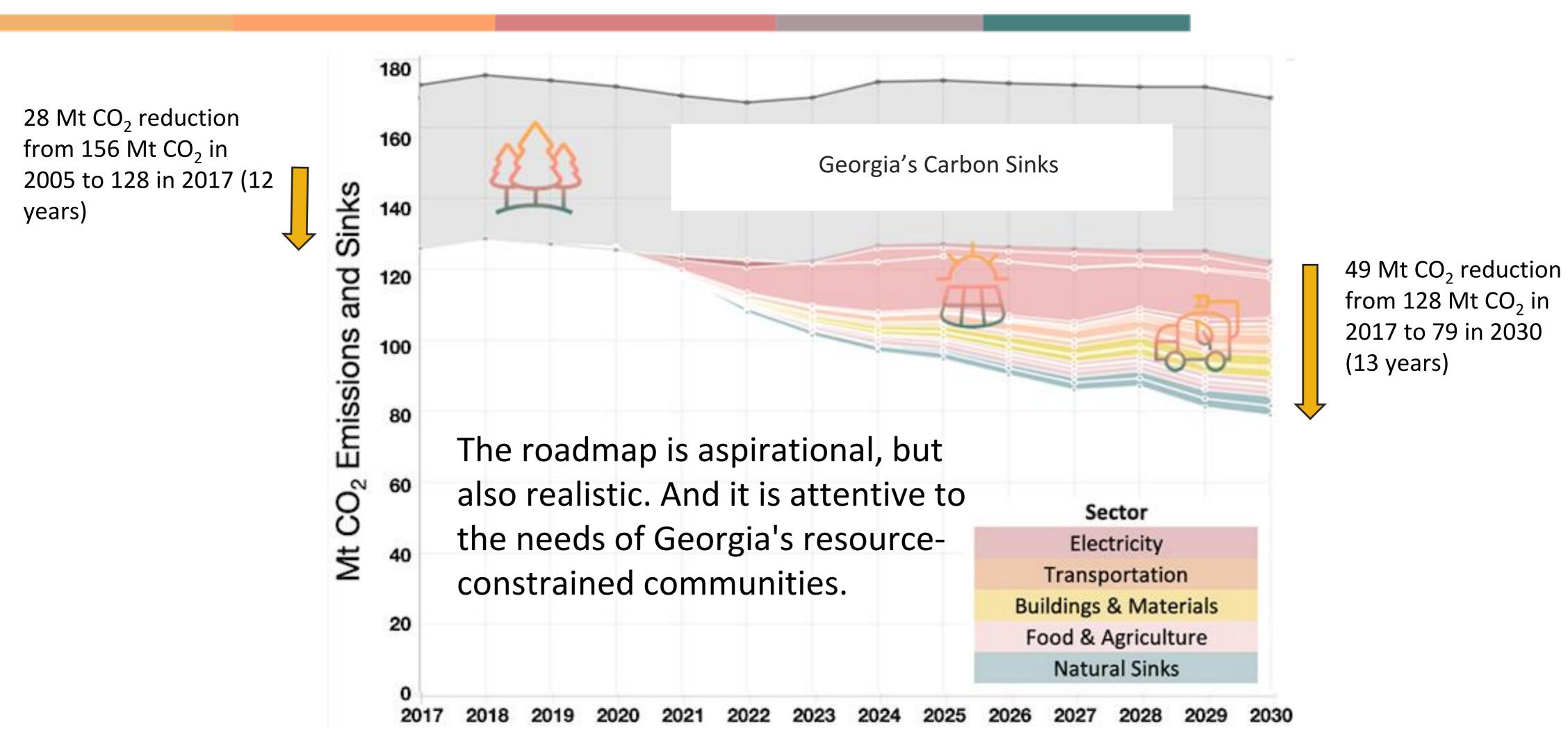
#### Result: 20 Drawdown Georgia Solutions for 2030 + Beyond Carbon Dimensions

ElectricityImage: Colspan="2">CogenerationImage: Colspan="2">Demand ResponseImage: Colspan="2">Rooftop SolarImage: Colspan="2">Large-Scale Solar	TransportationImage: Section of the	Food & AgricultureImage: Image: I		
Landfill Methane	Alternative Mobility			
<b>Buildings &amp; Materials</b>	Land Sinks	Beyond Carbon		
<b>Recycling</b>	Afforestation & Silvopasture	hُلْهُ Equity		
Refrigerant Management	Coastal Wetlands	Economic Development &		
Retrofitting Buildings	Temperate Forest Protection & Management	<ul> <li>Public Health</li> <li>Environmental Quality</li> </ul>		

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& Jobs

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



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





#### **Electric Vehicles**

#### A solution for Georgia that:

- Reduces carbon emissions
- Is synergistic with a cleaner grid
- Results in air quality benefits
- Helps diversify transportation energy resources
- Can generate new jobs



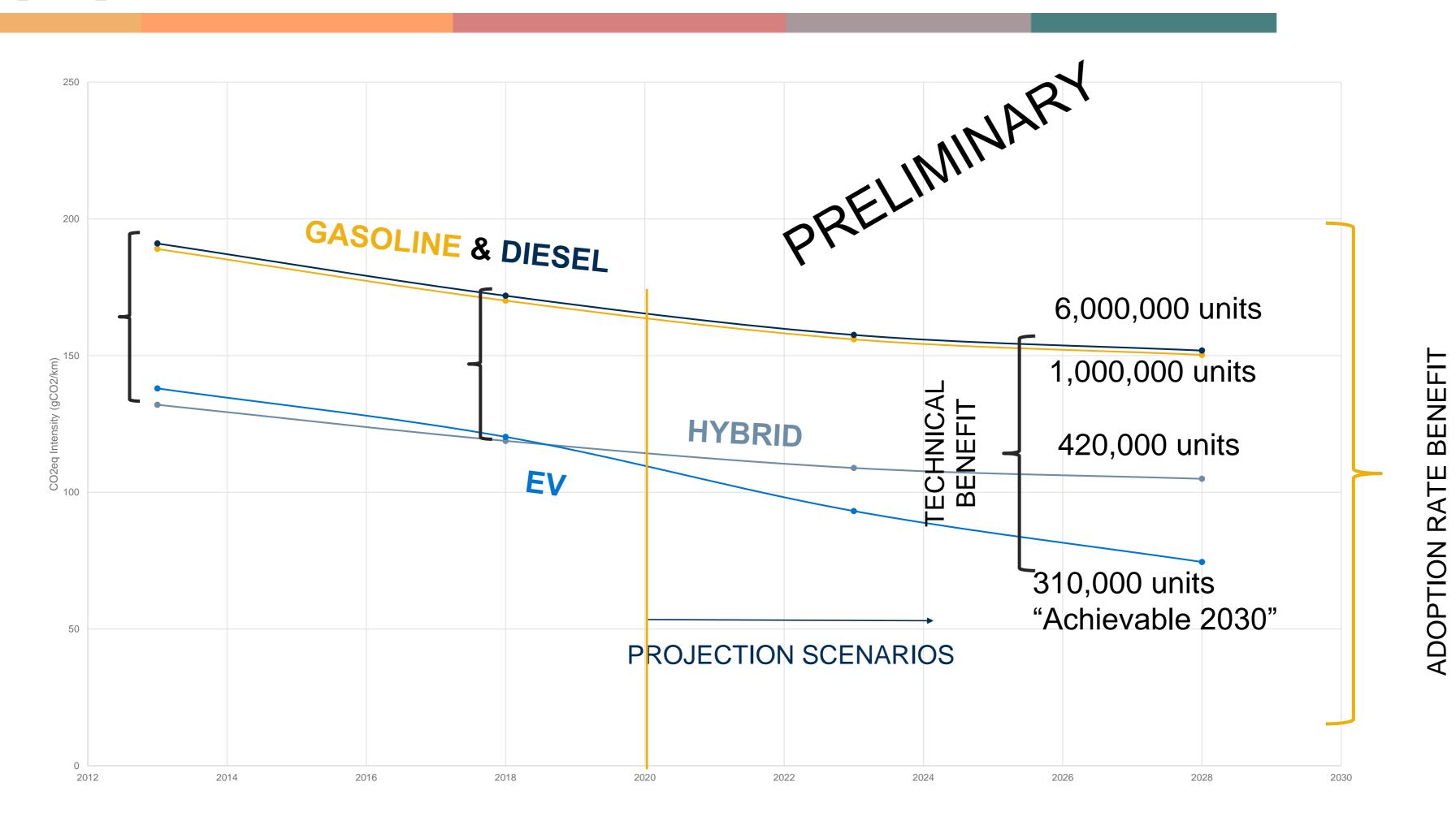








#### **Despite an aggressive baseline, grid CO2 intensity reductions** propel per vehicle EV contributions



-Gasoline - Diesel - Hybrid - EV

Conventional vehicles improve at 1.5% y/y through 2025 EVs approach a relative CO2 intensity of 50% compared to conventional cars

**But**, adoption rate will dictate overall impact from this solution

R. Simmons, Strategic Energy Institute, Georgia Institute of Technology, 2020







### **Summary of GT Vehicle-Grid Research Studies**

#### Reuse, Remanufacturing, and Recycling of EV batteries.

- Recycling of EV batteries; second use in smart homes and local electrical grids.
- Partners: PNNL, US Advanced Battery Consortium, Major automaker

#### **EVacuating Urban Areas with Electrified Transportation Systems.**

- Explore evacuations of urban areas with heavily electrified transportation systems.
- Partners: Sandia, Los Alamos National Labs (w/data from DOE, NREL, NC utility)

#### EV Mobility Systems that Consider Environmental and Grid Impacts.

- EV-based mobility systems to increase EV adoption, reduce environmental impacts & congestion.
- Partners: MARTA, UPS and the Atlanta Regional Commission.

#### Smart Usage of Renewable Energy Resources for Electrified Vehicles.

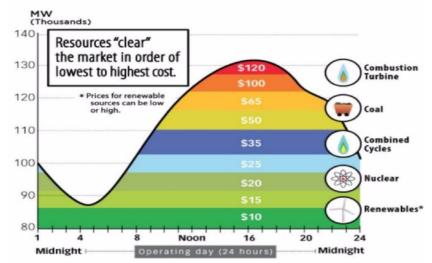
- Smart charging to optimize renewables, net demand, and EV costs.
- Focus on time of use, and hourly/daily interactions.
- Partners: Cox Automotive, Georgia Power.

#### Integrated Assessment Modeling of Renewable Hydrocarbons.

- Develop carbon to renewable fuels models to assess decarbonization scenarios for alt fuels.
- Partners: Polytechnic University of Milan, EU Institute for Economics and Environment.

#### Human-Centered Micro e-Mobility

- Demonstrate & assess an e-bike/e-trike ecosystem with charging infrastructure for ATL community.
- Partners: Friends of Refugees, City of Clarkson, Community Stakeholders, e-mobility orgs.



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## **SE Electric Transportation Regional Initiative**

SETRI



- Utilities
- Charging Companies
- NGOs

#### Policy & Government Engagement





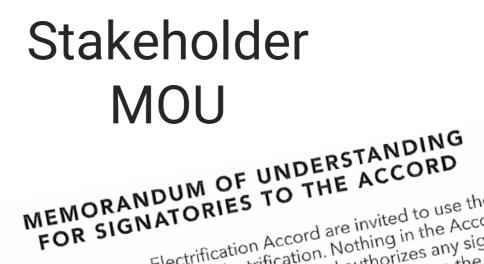
Technology, Infrastructure & Economic Development



#### 60+ Partner Organizations

Auto OEMs & Transportation

Universities & Labs



Signatories to the Transportation Electrification Accord are invited to use the princi

on behalt of other signatories, though signatories are weicome to t signatories as evidence of the appropriateness of these principles.

Signatories to the Transportation Electrification Accord are invited to use the principles in their efforts to advance transportation electrification. Nothing in the Accord binds any signatory to any specific position. Nothing in the Accord authorizes any signatory to specific position. in their efforts to advance transportation electrification. Nothing in the Accord binds any signatory to speak signatory to any specific position. Nothing in the Accord authorizes any signatory to speak on behalf of other signatories, though signatories are welcome to use the existence of cosignatory to any specific position. Nothing in the Accord authorizes any signatory to speak on behalf of other signatories, though signatories are welcome to use the existence of co-signatories as evidence of the appropriateness of these principles.

https://southeastev.org/

#### **Education & Awareness**





#### Our current task focus on solution activation

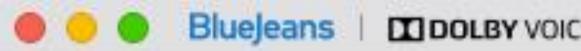






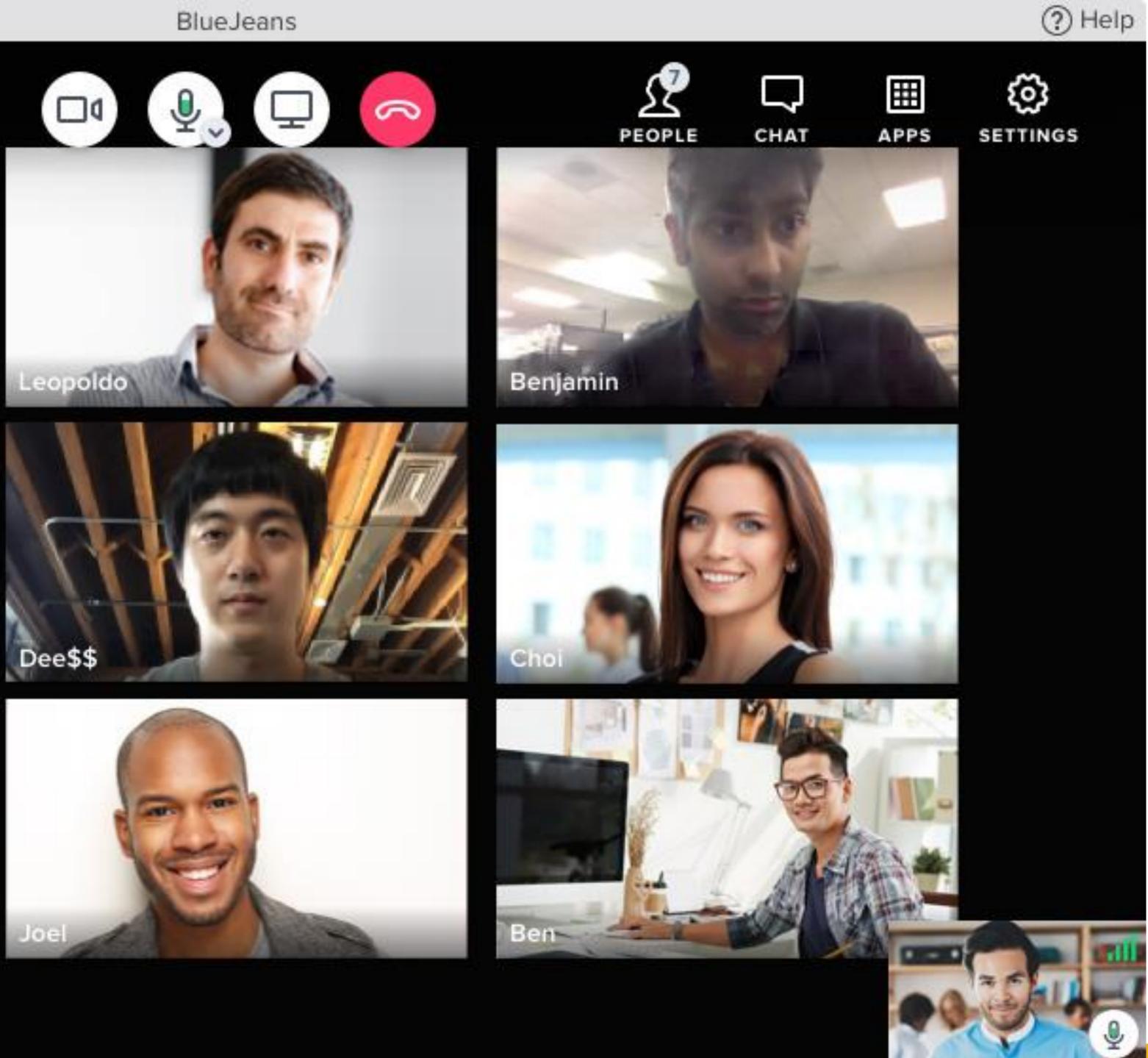






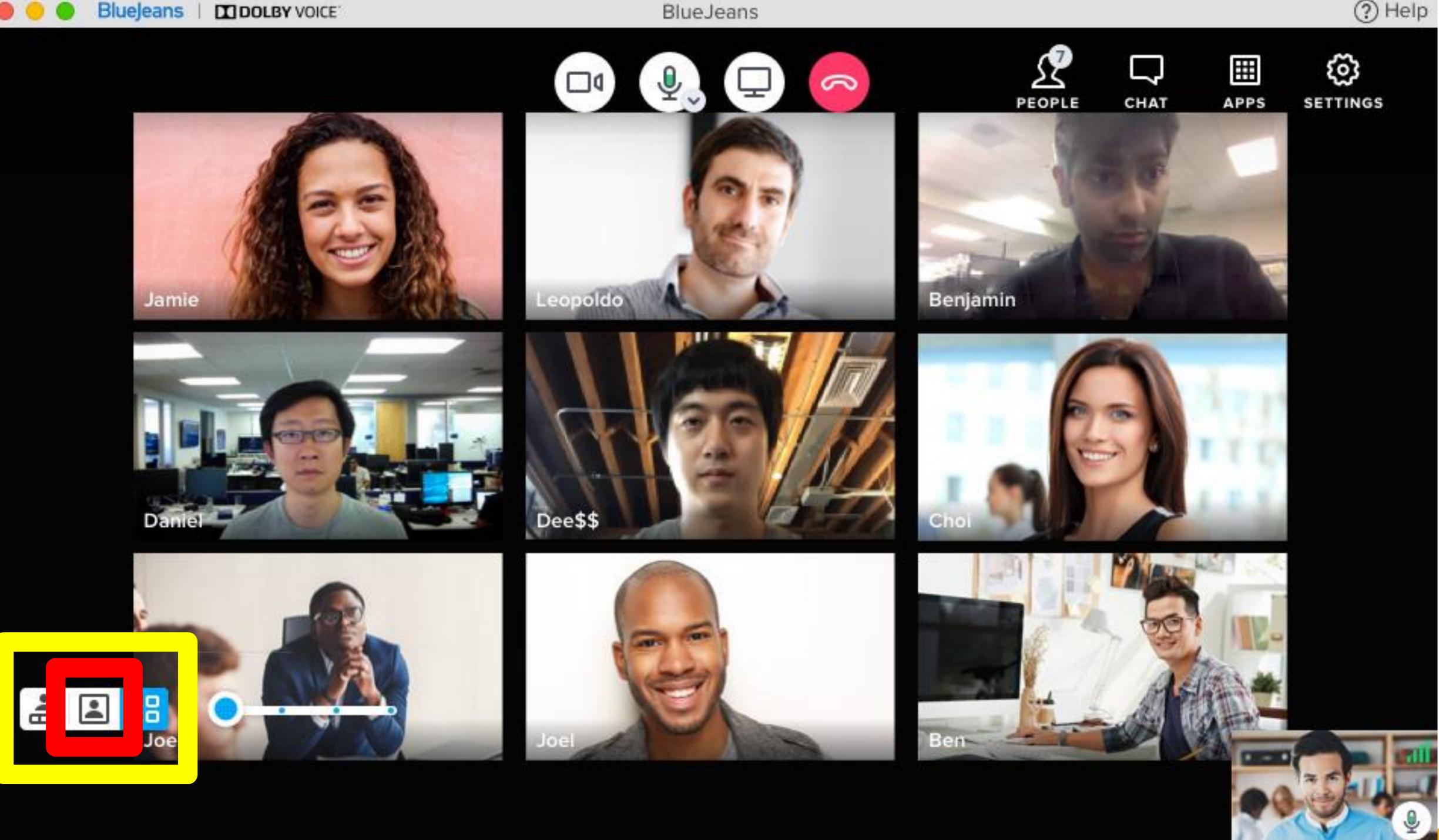




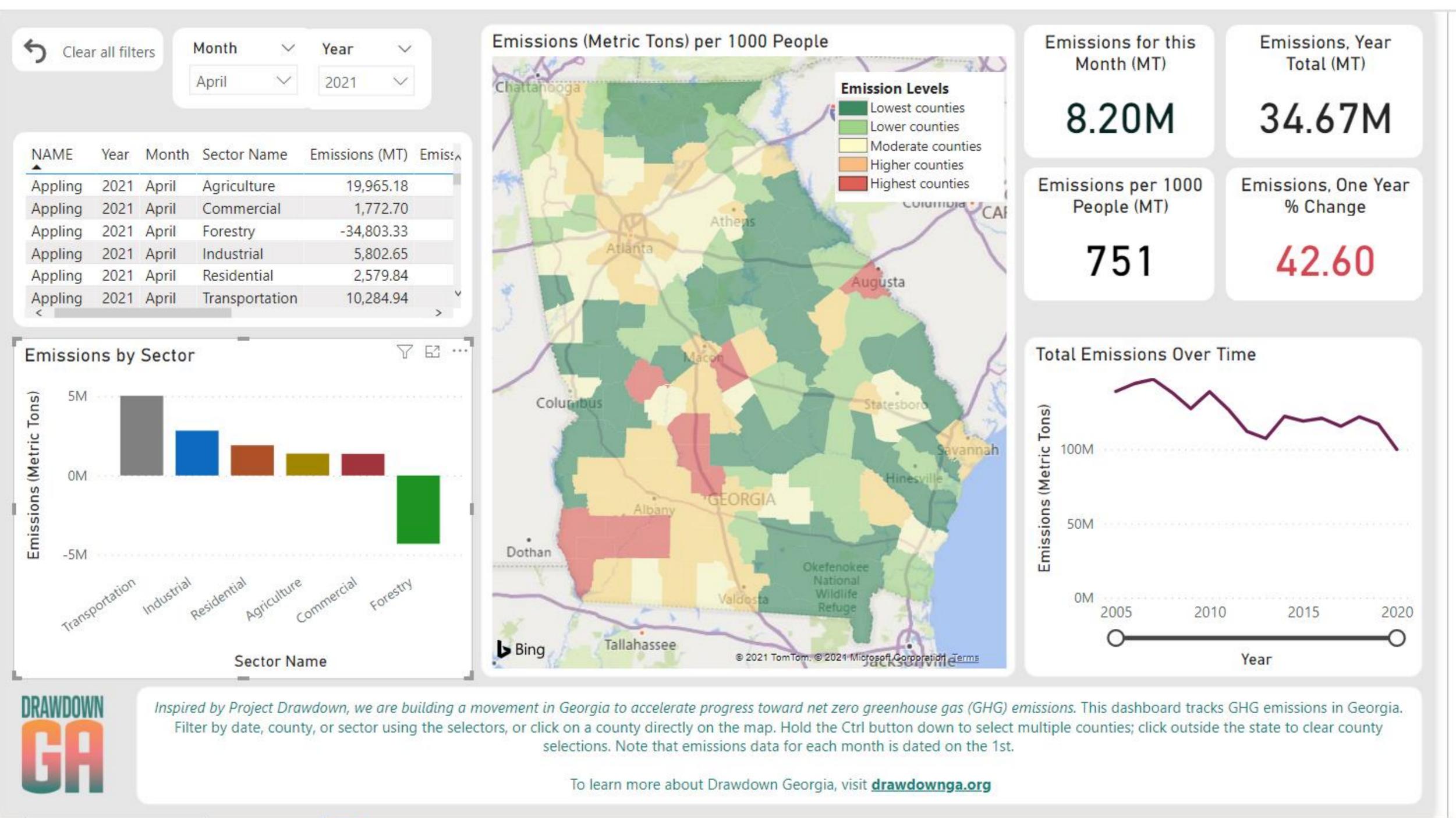












## Why geospatial tracking and visualization?

- 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.



## **Our general strategy**

- Identify recent annual or monthly data sources for Georgia statewide emissions, including EPA's State Inventory Tool

  - EIA's Open Data API
  - US-DOT's Traffic Trends monthly VMT plausible indicator variables
- Allocate the statewide totals to individual counties with
- Interpolate annual data to monthly data when needed
- Avoid proprietary data
- Avoid data that is specific to a single state



### **Transportation data sources**

- 1. EIA API monthly gasoline and distillate fuel deliveries 2. US DOT-FHWA monthly Traffic Volume Trends with a. Georgia vehicle miles traveled (VMT) subdivided by b. Urban arterials, rural arterials, and local roads 3. US DOT-FHWA Highway Performance Monitoring System (HPMS) road

- - network GIS dataset
- 4. Census urbanized areas GIS dataset 5. Census county boundaries GIS dataset



## **Transportation overall strategy**

- Download statewide monthly EIA motor gasoline (MG) and distillate fuel (DF) deliveries
- 2. Apply EIA  $CO_2$  coefficients to calculate  $CO_2$  emissions
- 3. Download monthly DOT Traffic Volume Trends (TVT)
- 4. Use TVT to divide emissions into shares for urban arterials (UAs), rural arterials (RAs), and local roads (LRs)
- 5. Use HPMS to calculate each county's share of
  - statewide VMT on UAs, RAs, and LRs
- 6. Apply county shares to statewide emissions in
  - the three road categories, and sum by county



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U. S. Department of Transportation

**Federal Highway** Administration

Office of Highway Policy Information

#### **TRAFFIC VOLUME** TRENDS

#### August 2021

Travel on all roads and streets changed by +8.3% (+21.0 billion vehicle miles) for August 2021 as compared with August 2020. Travel for the month is estimated to be 273.8 billion vehicle miles.

The seasonally adjusted vehicle miles traveled for August 2021 is 261.1 billion miles, an +8.5% (+20.4 billion vehicle miles) increase over August 2020. It also represents -2% decline (-5.2 billion vehicle miles) compared with July 2021.

Cumulative Travel for 2021 changed by +12.2% (+224.4 billion vehicle miles). The Cumulative estimate for the year is 2,068.8 billion vehicle miles of travel.

Estimated Vehicle-Miles of Travel by Region - August 2021 - (in Billions)

NORTHEAST NORTH CENTRAL OF WEST 60.5 37.7 8.4% 60.2 7.3% 8.4% 59.2 Stor and 56.1 10.0% NG 7.5% 90 SOUTH SOUTH GULF ATLANTIC

#### Change in Traffic as compared to same month last year.

#### Region Northe Connec Maine

Stations         2020         Change         Stations         2020         Change         Stations         2020         Change           Northeast         -	Table	- 4. Chan	ges on Urban	Arterial Road	s by Region	and State*	*		Page 5
Number of Stations         2021 (Preliminary)         2020 (Preliminary)         Percent (Revised)         Number of Stations         2020 (Revised)         Percent (Revised)         Number of Stations         Percent (Revised)			Aug	ust			Ju	ily	
Stations         P2021 Participant Part Part Part Part Part Part Part Par			Vehicle-Mile	s (Millions)					
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Maryland         37         3,540         3,307         7.1         37         3,795         3,531         7.5           North Carolina         36         4,790         4,428         8.2         40         5,098         4,485         13.3           South Carolina         50         1,987         1,807         1.10         363         3,936         3,948         12.3           Virginia         11         581         545         51.6         11.1         680         632         7.5.3           Subtotal         31,308         28,361         10.4         32,541         28,733         13.3           North Cartral         10         2,161         2,407         7.0         48         4,651         4,355         6.6           Indiana         27         917         849         8.1         24         925         851         8.6           Iowa         27         917         849         8.1         24         925         8.55         5.5           Michigan         48         4,51         4,049         9.9         10         4,525         4,126         9.7           Minesota         10         2,161         2,044         <	Florida	127	10,212	9,064	12.7	129	10,782	9,203	17.2
$\begin{array}{c c c c c c c c c c c c c c c c c c c $	Georgia		5,704	5,185	10.0		5,525		11.9
South Carolina         50         1,997         1,802         10.3         52         2,119         1,889         12.           Virginia         369         3,751         3,359         11.7         363         3,936         3,499         12.           West Virginia         11         581         545         6.6         11         680         632         7.5           Subtotal         28,361         10.4         10.4         32,541         28,733         13.           North Central         29         2,776         2,579         7.6         26         2,962         2,780         7.3.           Iowa         27         917         849         8.1         24         925         851         8.6           Kansas         17         936         893         4.9         17         936         885         5.5           Michigan         48         4,451         4,049         9.9         50         4,525         4,126         9.7.           Minsouri         63         2,713         2,433         8.8         63         2,691         2,458         9.5.           North Dakota         111         160         149         7.6		37		3,307		37		3,531	7.5
Virginia         369         3,751         3,359         11.7         363         3,936         3,498         12.           West Virginia         11         581         545         6.6         11         680         632         7.3           North Central	North Carolina	36	4,790	4,428	8.2	40	5,098	4,485	13.7
West Virginia         11         581         545         6.6         11         680         632         7.5           Subtolal         33,308         28,361         10.4         7.5         32,541         22,733         13.           Illinois         49         4,590         4,287         7.0         4.8         4,651         4,355         6.6           Indiana         29         2,776         2,579         7.6         2.6         2,982         2,780         7.3           Iowa         27         917         849         8.1         2.4         925         851         8.6           Kansas         17         936         893         4.9         17         936         885         5.6           Michigan         48         4,451         4,049         9.9         50         4,525         4,126         9.7           Missouri         63         2,713         2,493         8.8         63         2,691         2,458         9.5           North Dakota         11         100         149         7.6         11         182         17.6         3.3           Subtotal         2         2,6751         2,4703 <td< td=""><td>South Carolina</td><td>50</td><td>1,987</td><td>1,802</td><td>10.3</td><td>52</td><td>2,119</td><td>1,889</td><td>12.2</td></td<>	South Carolina	50	1,987	1,802	10.3	52	2,119	1,889	12.2
Subtotal         31,308         28,361         10.4         -         32,541         28,733         13.           North Central         - </td <td>Virginia</td> <td>369</td> <td>3,751</td> <td>3,359</td> <td>11.7</td> <td>363</td> <td>3,936</td> <td>3,498</td> <td>12.5</td>	Virginia	369	3,751	3,359	11.7	363	3,936	3,498	12.5
North Central         Image: Constraint of the const	West Virginia	11	581	545	6.6	11	680	632	7.5
Illinois         49         4,590         4,287         7.0         48         4,651         4,355         6.6           Indiana         29         2,776         2,579         7.6         26         2,982         2,780         7.3           Iowa         27         917         849         8.1         24         925         851         866           Kansas         17         936         893         4.9         17         936         885         5.8           Michigan         48         4,451         4,049         9.9         50         4,525         4,126         9.7           Missouri         63         2,713         2,493         8.8         63         2,691         2,458         9.5           North Dakota         11         160         149         7.6         11         182         176         3.3           Ohio         96         4,899         4,549         7.7         98         4,994         4,623         8.0           South Dakota         4         226         16         9.3         4         227         205         10.0           Wisconsin         91         2,313         2,099	Subtotal		31,308	28,361	10.4		32,541	28,733	13.3
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	North Central								
$\begin{array}{c c c c c c c c c c c c c c c c c c c $	Illinois	49	4,590	4,287	7.0	48	4,651	4,355	6.8
Kansas         17         936         893         4.9         17         936         885         5.8           Michigan         48         4,451         4,049         9.9         50         4,525         4,126         9.7           Misnesota         10         2,161         2,044         5.7         12         2,397         2,197         9.1           Missouri         63         2,713         2,493         8.8         63         2,691         2,458         9.5           Nebraska         19         599         563         6.4         19         634         589         7.7           Ohio         96         4,899         4,549         7.7         98         4,994         4,623         8.0           South Dakota         4         236         216         9.3         4         227         205         10.           Subtobal         2         2,751         24,770         8.0         27,595         25,460         8.4.9           Akasas         6         1,258         1,114         5.6         98         2,241         2,053         9.2           Arkanasa         6         1,258         1,496         9.3 <td>Indiana</td> <td>29</td> <td>2,776</td> <td>2,579</td> <td>7.6</td> <td>26</td> <td>2,982</td> <td>2,780</td> <td>7.3</td>	Indiana	29	2,776	2,579	7.6	26	2,982	2,780	7.3
$\begin{array}{c c c c c c c c c c c c c c c c c c c $	Iowa	27	917	849	8.1	24	925	851	8.6
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	Kansas	17	936	893	4.9	17	936	885	5.8
Missouri         63         2,713         2,493         8.8         63         2,691         2,458         9.5           Nebraska         19         599         563         6.4         19         634         589         7.7           North Dakota         11         160         149         7.6         111         182         176         3.3           Ohio         96         4,899         4,549         7.7         98         4,994         4,623         8.0           South Dakota         4         236         216         9.3         4         227         205         10.0           Wisconsin         91         2,751         24,770         8.0         27,595         25,640         8.4           Subtotal         26,751         24,770         8.0         2,759         25,640         8.4           Arkansas         6         1,258         1,114         5.4         7         1,389         1,291         7.6           Kentucky         20         1,636         1,496         9.3         20         1,486         1,340         100           Louisiana         13         2,122         1,992         6.5         12	Michigan	48	4,451	4,049	9.9	50	4,525	4,126	9.7
Nebraska         19         599         563         6.4         19         634         589         7.7           North Dakota         11         160         149         7.6         11         182         176         3.3           Ohio         96         4,899         4,549         7.7         98         4,994         4,623         8.0           South Dakota         4         226         216         9.3         4         227         205         10.0           Wisconsin         91         2,313         2,099         10.2         94         2,451         2,215         10.0           Subtoal         26,751         24,770         8.0         27,955         25,460         8.4           South Guif         20         1,636         1,496         9.3         20         1,486         1,340         10.0           Louisiana         13         2,122         1,992         6.5         12         2,020         1,833         10.0           Missispipi         25         1,010         966         4.5         26         1,111         1,007         10.0           Oklahoma         23         1,611         1,558         3.4	Minnesota	10	2,161	2,044	5.7	12	2,397	2,197	9.1
North Dakota         11         160         149         7.6         11         182         176         3.3           Ohio         96         4,899         4,549         7.7         98         4,994         4,623         8.0           South Dakota         4         236         216         9.3         4         227         205         10.           Wisconsin         91         2,313         2,099         10.2         94         2,451         2,215         10.           Subtotal         26,751         24,770         8.0         27,595         25,460         8.4           Arkansas         6         1,258         1,194         5.4         7         1,389         1,291         7.6           Kentucky         20         1,636         1,496         9.3         20         1,486         1,340         100.           Louisiana         13         2,122         1,992         6.5         12         2,020         1,833         10.           Mississippi         25         1,010         966         4.5         26         1,111         1,007         10.           Oklahoma         23         1,611         1,558         3.4 <td>Missouri</td> <td>63</td> <td>2,713</td> <td>2,493</td> <td>8.8</td> <td>63</td> <td>2,691</td> <td>2,458</td> <td>9.5</td>	Missouri	63	2,713	2,493	8.8	63	2,691	2,458	9.5
Ohio         96         4,899         4,549         7.7         98         4,994         4,623         8.0           South Dakota         4         236         216         9.3         4         227         205         10.0           Wisconsin         91         2,313         2,099         10.2         94         2,451         2,215         10.0           Subtotal         26,751         24,770         8.0         27,595         25,460         8.4           Alabama         103         2,230         2,111         5.6         98         2,241         2,053         9.2           Arkansas         6         1,258         1,194         5.4         7         1,389         1,291         7.6           Kentucky         20         1,636         1,496         9.3         20         1,486         1,340         100           Louisiana         13         2,122         1,992         6.5         122         2,020         1,833         100           Mississippi         25         1,010         966         4.5         26         1,111         1,007         100           Kentucky         29         3,250         3,076         5	Nebraska	19	599	563	6.4	19	634	589	7.7
South Dakota         4         236         216         9.3         4         227         205         10.4           Wisconsin         91         2,313         2,099         10.2         94         2,451         2,215         10.5           Subtotal         26,751         24,770         8.0         27,595         25,460         8.4           South Guif         103         2,230         2,111         5.6         98         2,241         2,053         9.2           Arkansas         6         1,258         1,194         5.4         7         1,389         1,291         7.6           Kentucky         20         1,636         1,496         9.3         20         1,486         1,340         100           Louisiana         13         2,122         1,992         6.5         12         2,020         1,833         100           Mississippi         25         1,010         966         4.5         26         1,111         1,007         10.0           Oklahoma         23         1,611         1,558         3.4         22         1,701         1,560         9.0           Tennessee         29         3,250         3,076	North Dakota	11	160	149	7.6	11	182	176	3.3
South Dakota         4         236         216         9.3         4         227         205         10.           Wisconsin         91         2,313         2,099         10.2         94         2,451         2,215         10.           Subtoal         26,751         24,770         8.0         27,595         25,460         8.4           South Guif	Ohio	96	4,899	4,549	7.7	98	4,994	4,623	8.0
Subtotal         26,751         24,770         8.0         27,595         25,460         8.4           Alabama         103         2,230         2,111         5.6         98         2,241         2,053         9.2           Arkansas         6         1,258         1,194         5.4         7         1,389         1,291         7.6           Kentucky         20         1,636         1,496         9.3         20         1,486         1,340         10.0           Louisiana         13         2,122         1,992         6.5         12         2,020         1,833         10.0           Oklahoma         23         1,611         1,558         3.4         22         1,701         1,560         9.0           Tennessee         29         3,250         3,076         5.7         24         3,893         3,630         7.3           Texas         79         13,514         12,126         11.4         79         13,847         11.961         15.5           Subtotal         2         2,674         2,382         12.2         104         3,150         2,820         11.4           Arizona         72         2,674         2,382	South Dakota	4	236	216	9.3	4	227	205	10.9
Subtotal         26,751         24,770         8.0         27,595         25,460         8.4           Alabama         103         2,230         2,111         5.6         98         2,241         2,053         9.2           Arkansas         6         1,258         1,194         5.4         7         1,389         1,291         7.6           Kentucky         20         1,636         1,496         9.3         20         1,486         1,340         100           Louisiana         13         2,122         1,992         6.5         12         2,020         1,833         100           Oklahoma         23         1,611         1,558         3.4         22         1,701         1,660         9.0           Tennessee         29         3,250         3,076         5.7         24         3,893         3,630         7.3           Texas         79         13,514         12,126         11.4         79         13,847         11.961         15.5           Subtotal         2         2,674         2,382         12.2         104         3,150         2,820         11.4           Arizona         72         2,674         2,382	Wisconsin	91	2,313	2,099	10.2	94	2,451	2,215	10.7
South Gulf         Image: Constraint of the second sec	Subtotal		26,751		8.0		27,595	25,460	8.4
Arkansas         6         1,258         1,194         5.4         7         1,389         1,291         7.6           Kentucky         20         1,636         1,496         9.3         20         1,486         1,340         10.0           Louisiana         13         2,122         1,992         6.5         12         2,020         1,833         10.0           Mississippi         25         1,010         966         4.5         26         1,111         1,007         10.0           Oklahoma         23         1,611         1,558         3.4         22         1,701         1,560         9.0           Tennessee         29         3,250         3,076         5.7         24         3,893         3,630         7.3           Texas         79         13,514         12,126         11.4         79         13,847         11,961         15.5           Subtotal         2         26,631         24,519         8.6         27,688         24,675         12.           West         7         2,674         2,382         12.2         104         3,150         2,820         11.1           Arizona         72         2,674	South Gulf								
Kentucky         20         1,636         1,496         9.3         20         1,486         1,340         10.           Louisiana         13         2,122         1,992         6.5         12         2,020         1,833         10.           Mississippi         25         1,010         966         4.5         26         1,111         1,007         10.           Oklahoma         23         1,611         1,558         3.4         22         1,701         1,560         9.0           Tennessee         29         3,250         3,076         5.7         24         3,893         3,630         7.3           Texas         79         13,514         12,126         11.4         79         13,847         11,961         15.5           Subtotal         26,631         24,519         8.6         27,688         24,675         11.5           West         72         2,674         2,382         12.2         104         3,150         2,820         11.           Colorado         35         2,821         2,573         9.6         34         2,461         2,225         10.           Hawaii         52         450         349         <	Alabama	103	2,230	2,111	5.6	98	2,241	2,053	9.2
Kentucky         20         1,636         1,496         9.3         20         1,486         1,340         10.           Louisiana         13         2,122         1,992         6.5         12         2,020         1,833         10.           Mississippi         25         1,010         966         4.5         26         1,111         1,007         10.           Oklahoma         23         1,611         1,558         3.4         22         1,701         1,560         9.0           Tennessee         29         3,250         3,076         5.7         24         3,893         3,630         7.3           Texas         79         13,514         12,126         11.4         79         13,847         11,961         15.5           Subtotal         26,631         24,519         8.6         27,688         24,675         12.5           West         72         2,674         2,382         12.2         104         3,150         2,820         11.           Colorado         35         2,821         2,573         9.6         34         2,461         2,225         10.           Hawaii         52         450         349         <				-			-		7.6
$\begin{array}{c c c c c c c c c c c c c c c c c c c $	Kentucky	20		-	9.3	20	-		10.9
Mississippi         25         1,010         966         4.5         26         1,111         1,007         10.           Oklahoma         23         1,611         1,558         3.4         22         1,701         1,560         9.0           Tennessee         29         3,250         3,076         5.7         24         3,893         3,630         7.3           Texas         79         13,514         12,126         11.4         79         13,847         11,961         15.           Subtotal         26,631         24,519         8.6         27,688         24,675         12.           West         72         2,674         2,382         12.2         104         3,150         2,820         11.           Alaska         57         201         176         14.2         54         205         184         11.           California         101         19,188         17,524         9.5         92         20,389         17,829         14.4           Colorado         35         2,821         2,573         9.6         34         2,461         2,225         10.           Hawaii         52         450         349         2					6.5	12	-		10.2
Oklahoma         23         1,611         1,558         3.4         22         1,701         1,560         9.0           Tennessee         29         3,250         3,076         5.7         24         3,893         3,630         7.3           Texas         79         13,514         12,126         11.4         79         13,847         11,961         15.5           Subtotal         26,631         24,519         8.6         27,688         24,675         12.           West         72         2,674         2,382         12.2         104         3,150         2,820         11.           Alaska         57         201         176         14.2         54         205         184         11.           Arizona         72         2,674         2,382         12.2         104         3,150         2,820         11.           California         101         19,188         17,524         9.5         92         20,389         17,829         14.4           Colorado         35         2,821         2,573         9.6         34         2,461         2,225         10.           Hawaii         52         450         349				-			-		10.3
Tennessee         29         3,250         3,076         5.7         24         3,893         3,630         7.3           Texas         79         13,514         12,126         11.4         79         13,847         11,961         15.5           Subtotal         26,631         24,519         8.6         27,688         24,675         12.           West         72         2,674         2,382         12.2         104         3,150         2,820         11.4           Alaska         57         201         176         14.2         54         205         184         11.           Arizona         72         2,674         2,382         12.2         104         3,150         2,820         11.4           Colorado         35         2,821         2,573         9.6         34         2,461         2,225         10.0           Hawaii         52         450         349         29.0         51         434         344         26.5           Idaho         76         524         488         7.2         75         554         497         11.5           Montana         14         285         280         2.1         1									9.0
Texas         79         13,514         12,126         11.4         79         13,847         11,961         15.5           Subtotal         26,631         24,519         8.6         27,688         24,675         12.6           West         72         201         176         14.2         54         205         184         11.6           Alaska         57         201         176         14.2         54         205         184         11.6           Arizona         72         2,674         2,382         12.2         104         3,150         2,820         11.4           Colorado         35         2,821         2,573         9.6         34         2,461         2,225         10.0           Hawaii         52         450         349         29.0         51         434         344         26.5           Idaho         76         524         488         7.2         75         554         497         11.6           Montana         14         285         280         2.1         13         316         300         53           New Mexico         8         669         598         12.0         19	Tennessee	29		-	5.7	24	-		7.3
Subtotal         26,631         24,519         8.6         27,688         24,675         12.           Alaska         57         201         176         14.2         54         205         184         11.4           Arizona         72         2,674         2,382         12.2         104         3,150         2,820         11.4           California         101         19,188         17,524         9.5         92         20,389         17,829         14.4           Colorado         35         2,821         2,573         9.6         34         2,461         2,225         10.4           Hawaii         52         450         349         29.0         51         434         344         26.4           Idaho         76         524         488         7.2         75         554         497         11.4           Montana         14         285         280         2.1         13         316         300         5.3           New Mexico         8         669         598         12.0         19         792         683         16.4           Oregon         43         1,508         1,421         6.1         42 <td></td> <td></td> <td></td> <td>-</td> <td></td> <td></td> <td></td> <td></td> <td>15.8</td>				-					15.8
West         Image: Section of the				-					12.2
Alaska5720117614.25420518411.4Arizona722,6742,38212.21043,1502,82011.4California10119,18817,5249.59220,38917,82914.4Colorado352,8212,5739.6342,4612,22510.4Hawaii5245034929.05143434426.4Idaho765244887.27555449711.4Montana142852802.1133163005.3New dexico866959812.01979268316.4Oregon431,5081,4216.1421,5451,40410.4Utah-1,6091,4828.6-1,5291,38410.4									
Arizona722,6742,38212.21043,1502,82011.7California10119,18817,5249.59220,38917,82914.7Colorado352,8212,5739.6342,4612,22510.7Hawaii5245034929.05143434426.7Idaho765244887.27555449711.7Montana142852802.1133163005.3Nevada361,1931,08510.0371,2421,10012.7Oregon431,5081,4216.1421,5451,40410.7Utah-1,6091,4828.6-1,5291,38410.7	Alaska	57	201	176	14.2	54	205	184	11.5
California10119,18817,5249.59220,38917,82914.Colorado352,8212,5739.6342,4612,22510.0Hawaii5245034929.05143434426.0Idaho765244887.27555449711.0Montana142852802.1133163005.3Nevada361,1931,08510.0371,2421,10012.0New Mexico866959812.01979268316.0Oregon431,5081,4216.1421,5451,40410.0Utah-1,6091,4828.6-1,5291,38410.0									11.7
Colorado352,8212,5739.6342,4612,22510.4Hawaii5245034929.05143434426.4Idaho765244887.27555449711.4Montana142852802.1133163005.3Nevada361,1931,08510.0371,2421,10012.4New Mexico866959812.01979268316.4Oregon431,5081,4216.1421,5451,40410.4Utah-1,6091,4828.6-1,5291,38410.4				-					14.4
Hawaii5245034929.05143434426.4Idaho765244887.27555449711.4Montana142852802.1133163005.3Nevada361,1931,08510.0371,2421,10012.4New Mexico866959812.01979268316.4Oregon431,5081,4216.1421,5451,40410.4Utah-1,6091,4828.6-1,5291,38410.4				-					10.6
Idaho765244887.27555449711.4Montana142852802.1133163005.3Nevada361,1931,08510.0371,2421,10012.4New Mexico866959812.01979268316.4Oregon431,5081,4216.1421,5451,40410.4Utah-1,6091,4828.6-1,5291,38410.4				-					26.4
Montana         14         285         280         2.1         13         316         300         5.3           Nevada         36         1,193         1,085         10.0         37         1,242         1,100         12.4           New Mexico         8         669         598         12.0         19         792         683         16.4           Oregon         43         1,508         1,421         6.1         42         1,545         1,404         10.4           Utah         -         1,609         1,482         8.6         -         1,529         1,384         10.4									11.6
Nevada         36         1,193         1,085         10.0         37         1,242         1,100         12.0           New Mexico         8         669         598         12.0         19         792         683         16.0           Oregon         43         1,508         1,421         6.1         42         1,545         1,404         10.0           Utah         -         1,609         1,482         8.6         -         1,529         1,384         10.0									
New Mexico         8         669         598         12.0         19         792         683         16.0           Oregon         43         1,508         1,421         6.1         42         1,545         1,404         10.0           Utah         -         1,609         1,482         8.6         -         1,529         1,384         10.0									
Oregon         43         1,508         1,421         6.1         42         1,545         1,404         10.4           Utah         -         1,609         1,482         8.6         -         1,529         1,384         10.4									
Utah - 1,609 1,482 8.6 - 1,529 1,384 10.									
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washington /0 3,030 2,852 /.2 /2 3,2/9 2,952 11.		70		-		- 70			
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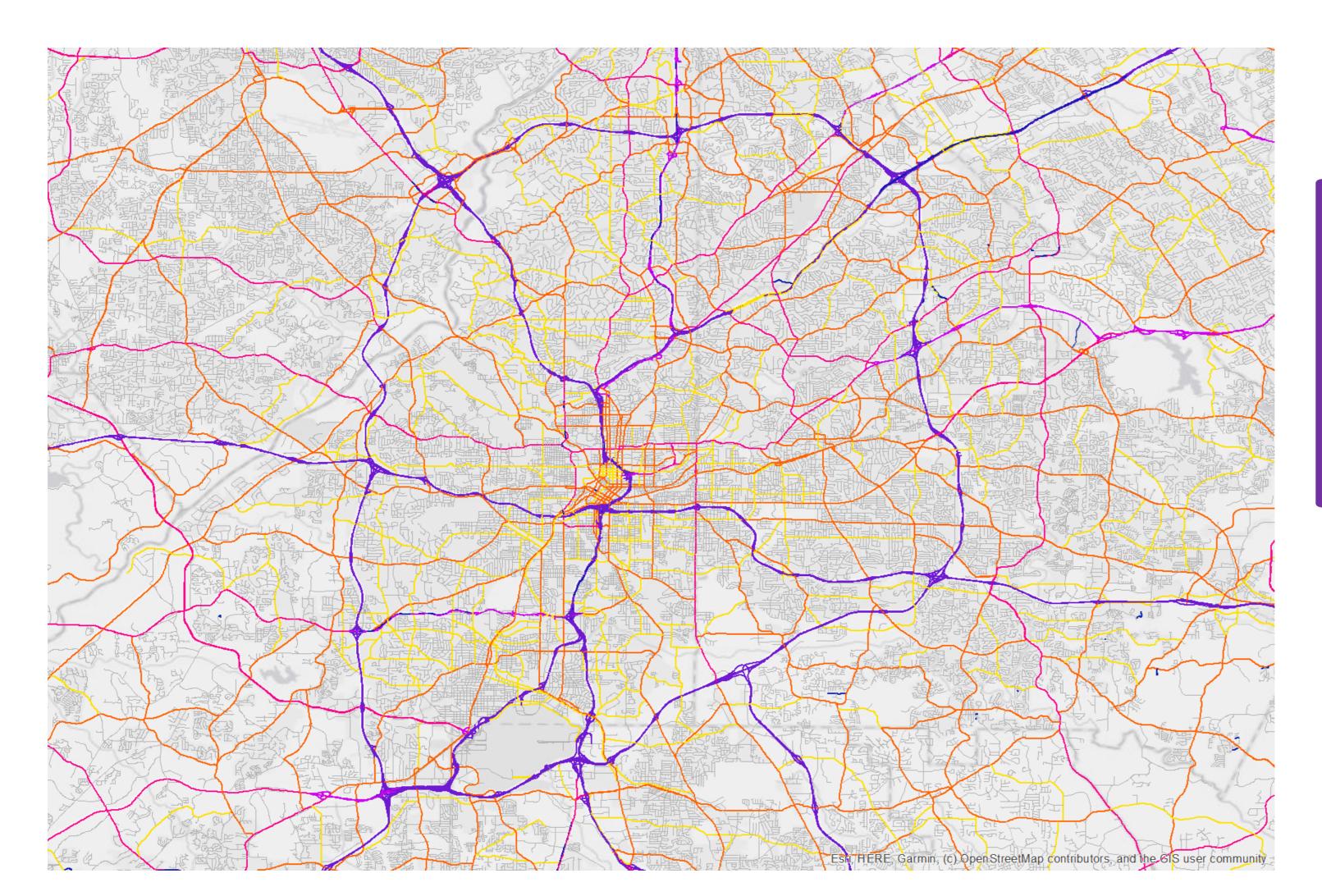
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	Table - 4. Chan	ges on Urban	Arterial Road	ls by Regior	n and State*	*		Page 5
		August			July			
		Vehicle-Miles (Millions)			Vehicle-Miles (Millions)			
Region and State	Number of Stations	2021 (Preliminary)	2020	Percent Change	Number of Stations	2021 (Revised)	2020	Percent Change
Northeast					i i			1
Connecticut	15	1,911	1,812	5.5	16	1,976	1,804	9.5
Maine	22	269	239	12.6	22	297	255	16.6
Massachusetts	194	4,117	3,723	10.6	194	4,177	3,730	12.0
New Hampshire	68	565	519	8.9	67	550	498	10.5
New Jersey	61	4,403	4,012	9.7	97	4,455	3,839	16.0
New York	63	6,296	6,004	4.9	60	6,308	5,766	9.4
Pennsylvania	34	4,487	4,102	9.4	34	4,603	4,169	10.4
Rhode Island	28	571	487	17.3	27	502	466	7.7
Vermont	12	133	116	13.9	11	134	118	13.5
Subtotal		22,752	21,014	8.3		23,002	20,645	11.4
South Atlantic								
Delaware	10	493	455	8.3	13	429	409	4.8
District of Columbia	3	250	216	15.7	3	177	148	19.7
Florida	127	10,212	9,064	12.7	129	10,782	9,203	17.2
Georgia	128	5,704	5,185	10.0	131	5,525	4,938	11.9
Maryland	37	3,540	3,307	7.1	37	3,795	3,531	7.5
North Carolina	36	4,790	4,428	8.2	40	5,098	4,485	13.7
South Carolina	50	1,987	1,802	10.3	52	2,119	1,889	12.2
Virginia	369	3,751	3,359	11.7	363	3,936	3,498	12.5
West Virginia	11	581	545	6.6	11	680	632	7.5
Subtotal		31,308	28,361	10.4		32,541	28,733	13.3



## HPMS by functional class



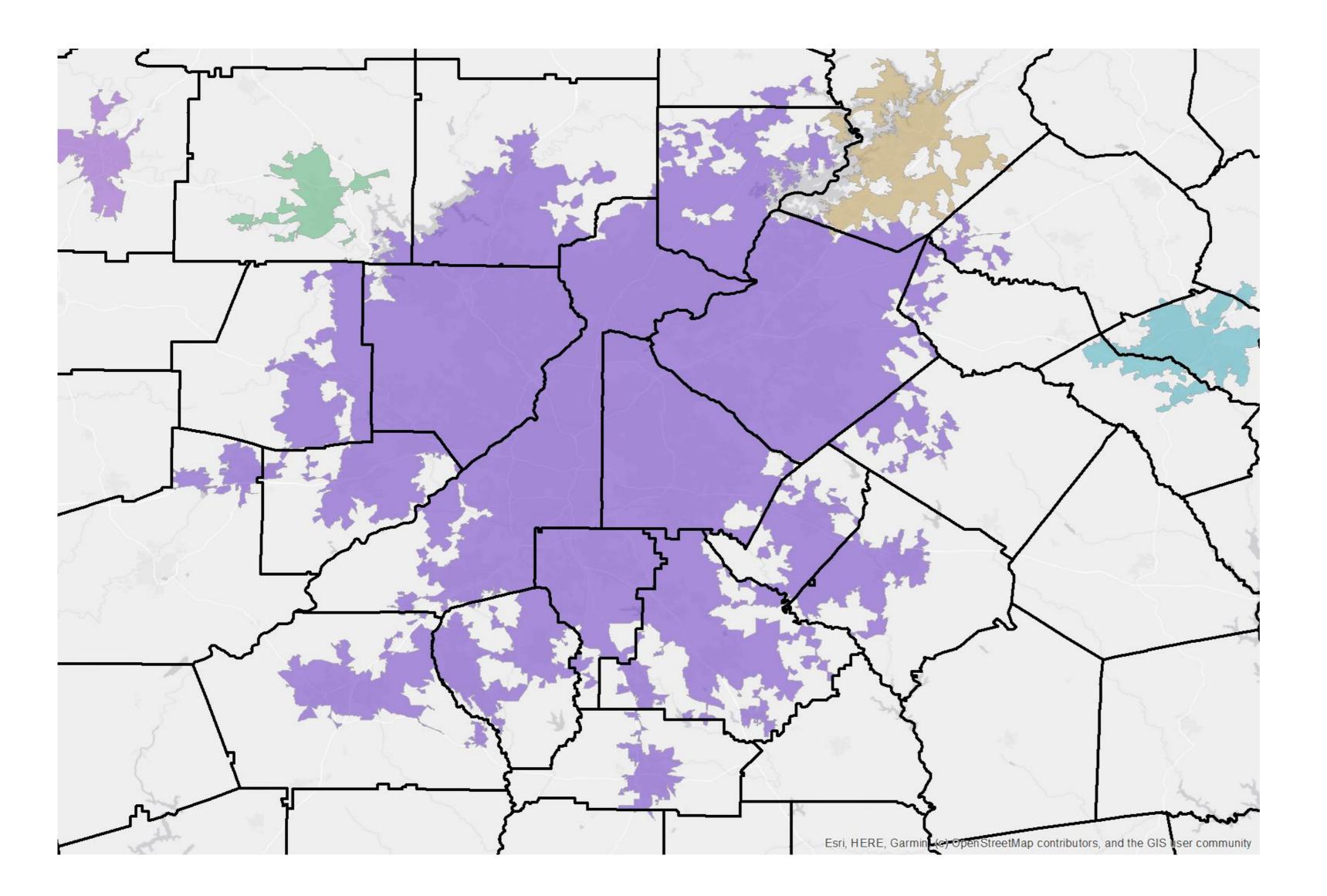


	_		
Code		Code	Description
	Γ	1	Interstate
2			Principal Arterial – Other Freewa
			Expressways
		3	Principal Arterial – Other
		4	Minor Arterial
	5	Major Collector	
		6	Minor Collector
		7	Local

## Local Roads Arterials

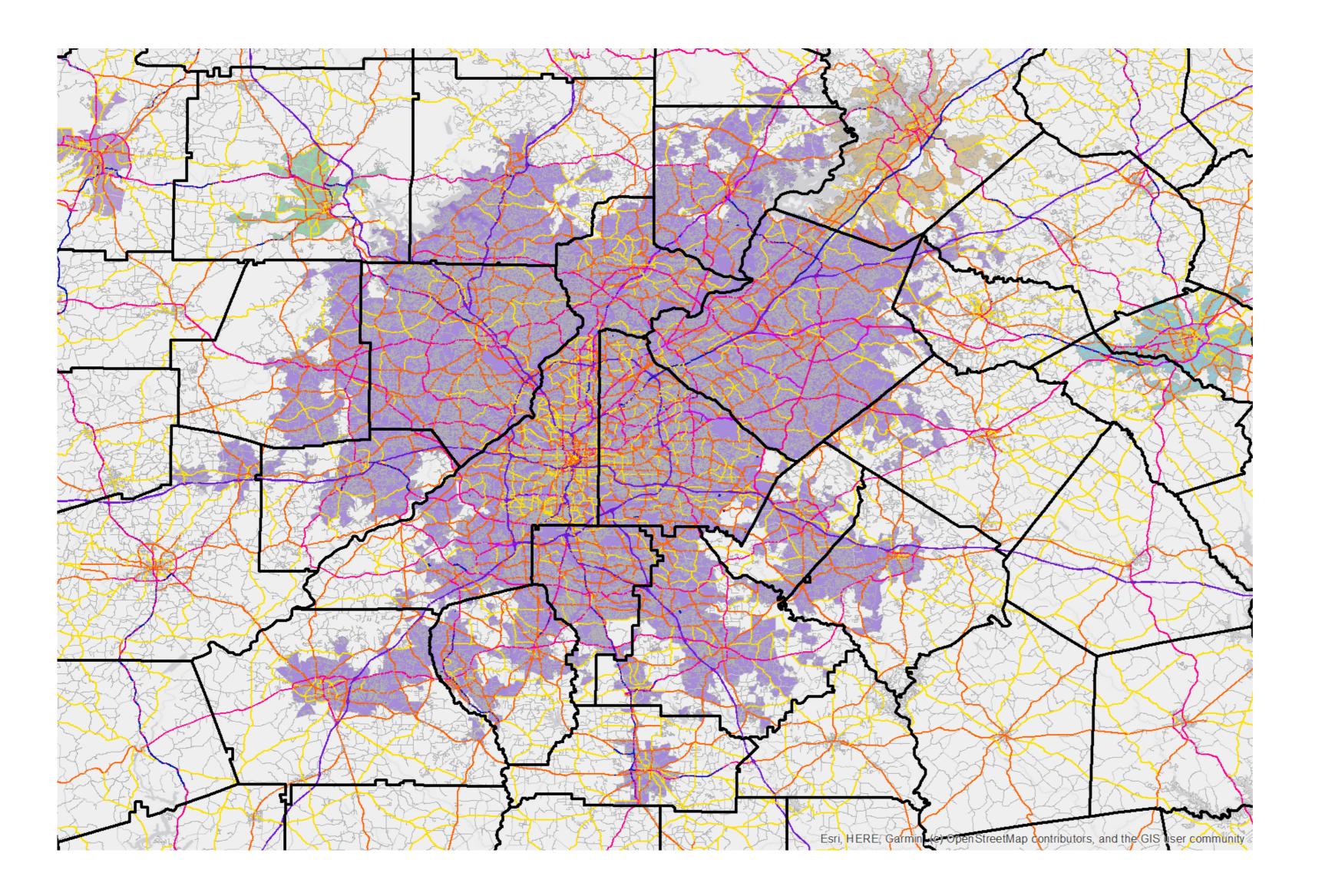


## Census urbanized areas (1)





### Census urbanized areas (2)



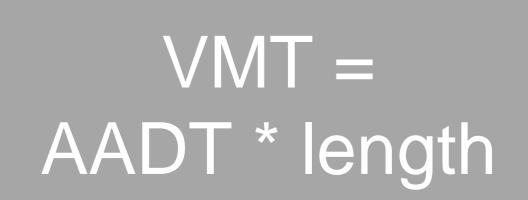


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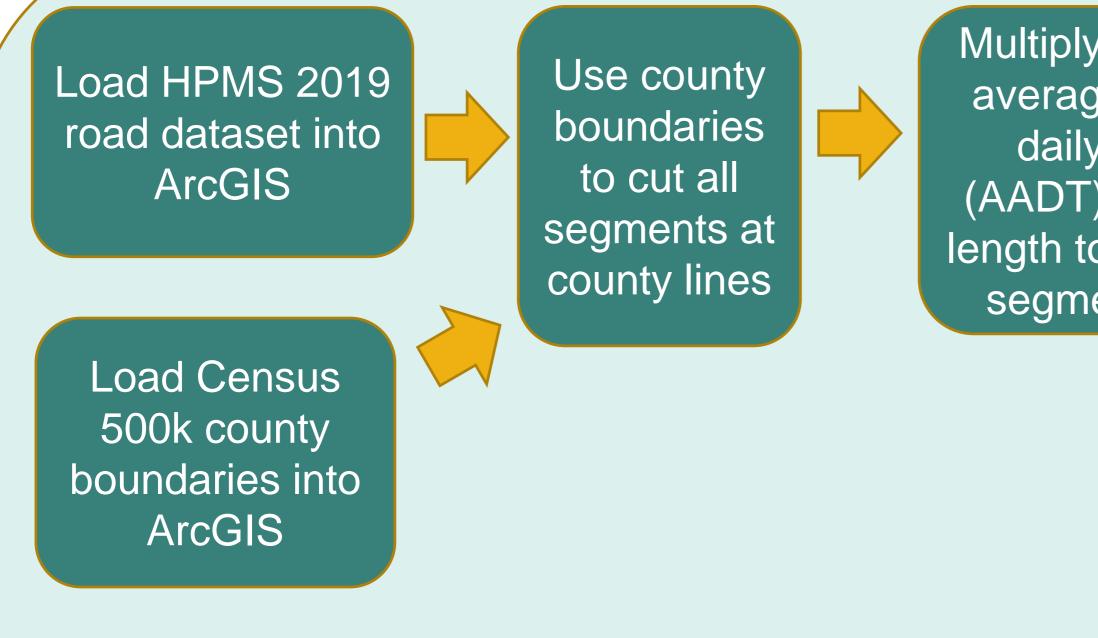
## HPMS by average annual daily traffic (AADT)







## **Transportation calculations**



Download EIA monthly MG and DF deliveries Using historic EIA data calculate transportation share of DF

Multiply segment average annual daily traffic (AADT) times its length to calculate segment VMT



Sum VMT by county and three road classes: UAs, RAs, and LRs

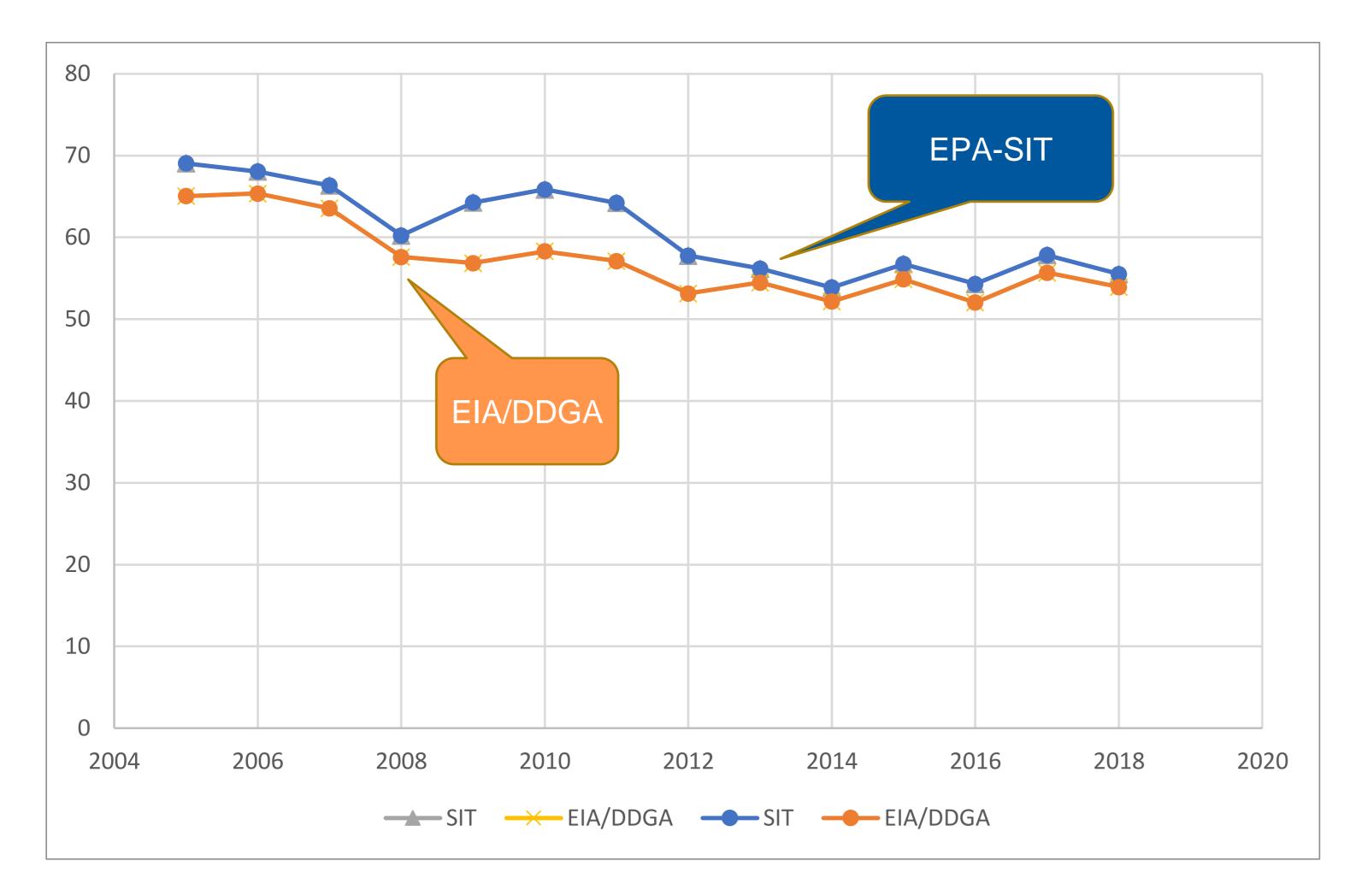
Calculate each county's VMT share for each road class Use county road shares to allocate statewide emissions

Apply CO<sub>2</sub> coefficients to calculate statewide CO<sub>2</sub> emissions

Divide emissions into three road classes by statewide VMT



## Georgia transportation emissions in millions of metric tons





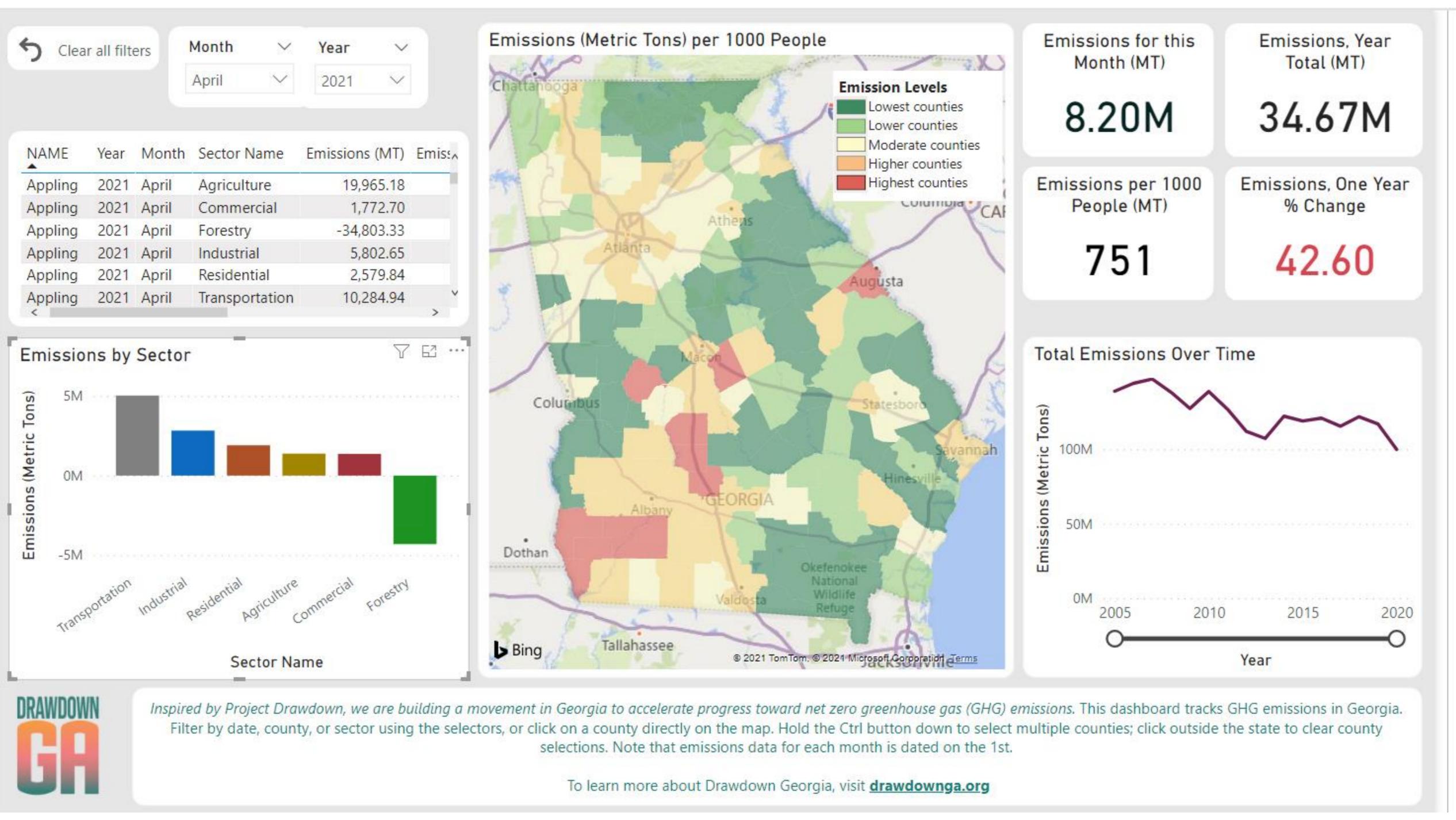
Transportation questions and discussion

#### A few of our questions

**1.** Would it be possible to allocate  $CO_2$  emissions not at the VMT not activate) drawdown solutions?



## emission point location, but at decision point locations where people, firms, and government agencies actually make choices to activate (or







One more seminar next Friday from 10:00am to 11:00am:

 Forests, Food, and Farms Oct. 29<sup>th</sup> – 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







For more about Drawdown Georgia:
 <u>www.drawdownga.org</u>
 For more about Drawdown Georgia research program:
 <u>https://cepl.gatech.edu/projects/Drawdown-Georgia</u>

## THANKS

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











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