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Reducing Georgia's Carbon Footprint in Beneficial and Equitable Ways: Details about 7 high-impact climate solutions for Georgia

DRAWDOWN GA

www.DrawdownGA.org

Marilyn A. Brown, PhD, NAE, NAS, CEM
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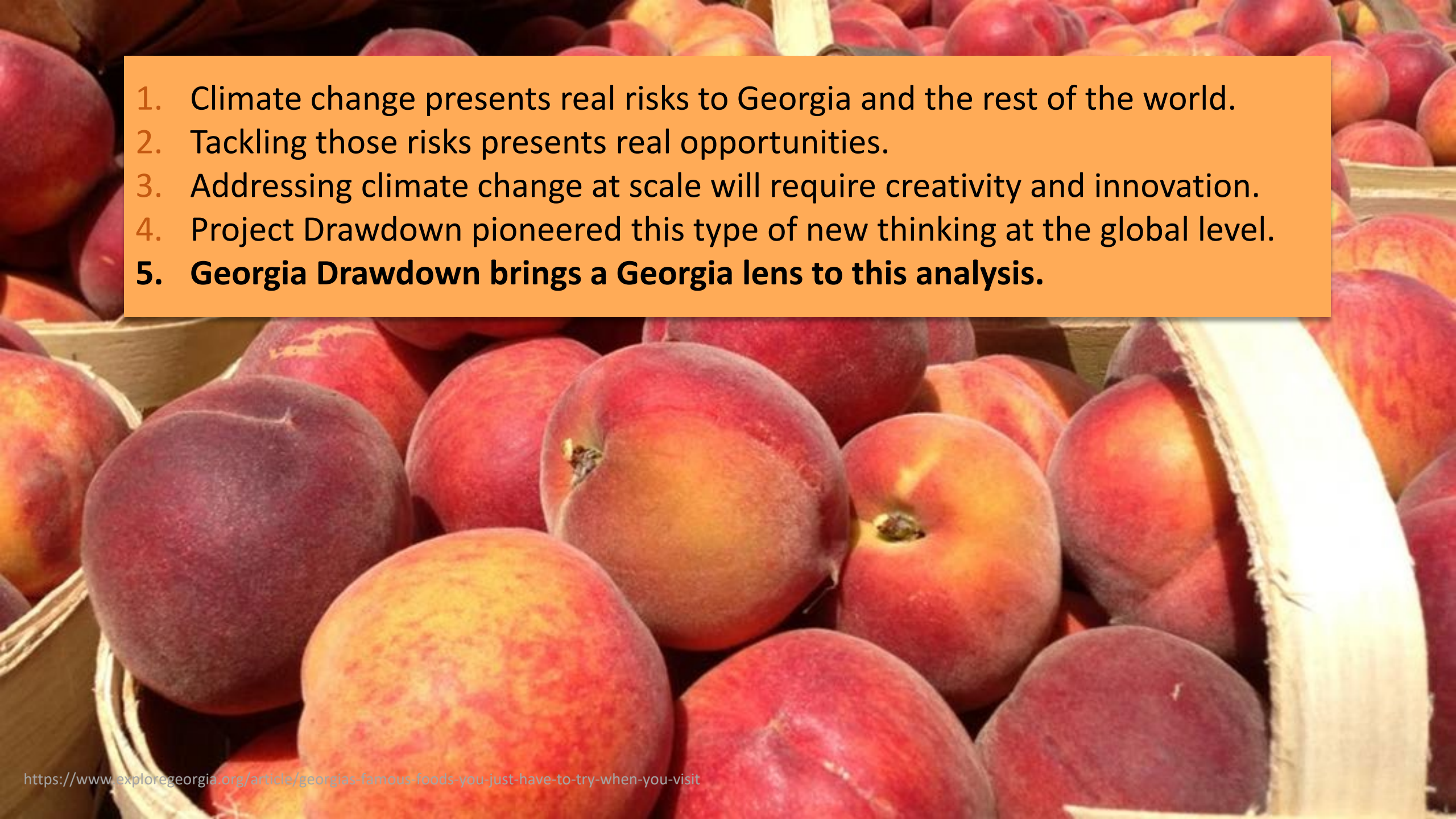
Presentation to the Atlanta Chapter of the Citizens' Climate Lobby, January 23, 2021

Drawdown Georgia Builds on a History of Multi-University Collaboration on Climate Change



1. Climate change presents real risks to Georgia and the rest of the world.
2. Tackling those risks presents real opportunities.
3. Addressing climate change at scale will require creativity and innovation.
4. Project Drawdown pioneered this type of new thinking at the global level.
5. **Georgia Drawdown brings a Georgia lens to this analysis.**

https://www.exploregeorgia.org/article/georgias-famous-foods-you-just-have-to-try-when-you-visit

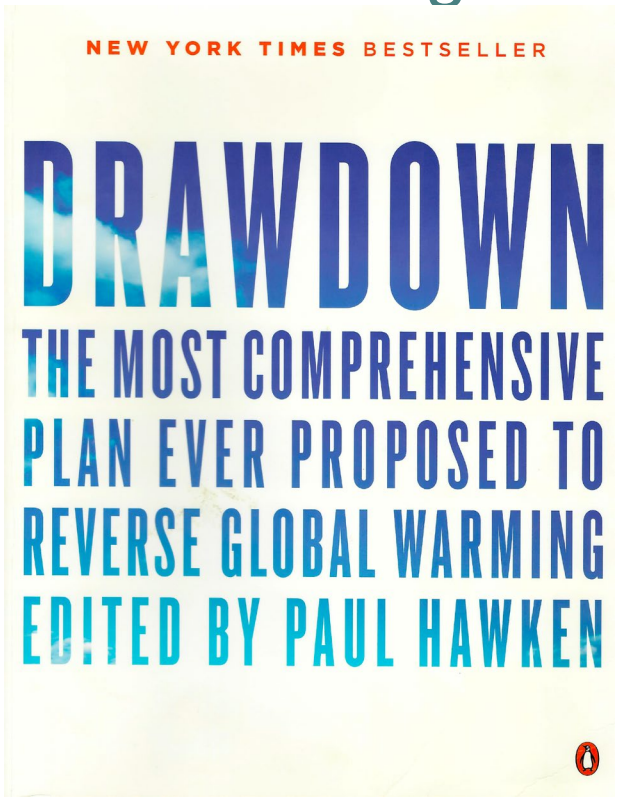
Drawdown Georgia Research Methodology and Overview of Findings

Starting Point: Project Drawdown Solutions

SOLUTION	SECTOR(S)	SCENARIO 1 *	SCENARIO 2 *
Reduced Food Waste	Food, Agriculture, and Land Use / Land Sinks	87.45	94.56
Health and Education	Health and Education	85.42	85.42
Plant-Rich Diets	Food, Agriculture, and Land Use / Land Sinks	65.01	91.72
Refrigerant Management	Industry / Buildings	57.75	57.75
Tropical Forest Restoration	Land Sinks	54.45	85.14

Which are best for Georgia?

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



We Also Examined Climate Goals of Other States

25 U.S. Governors have committed to meeting the goals of the Paris Climate Agreement.

North Carolina by Executive Order in 2018:

- Creation of the Climate Change Interagency Council
- Major Goals:
  - **2025:** Reduce GHG emissions by 40% of 2005 levels
  - **2025:** Reach 80,000 zero-emission vehicles registered
  - **2025:** Reduce energy consumption per square foot in state-owned buildings by at least 40% below 2002-2003 levels.
  - **2030:** Reduce electric power GHG emissions by 70% of 2005 levels
  - **2050:** Attain carbon neutrality for energy generation

Louisiana by Executive Order in 2020: no details yet

And We Listened and Learned from Others

We designed a down-select system:

- Is the solution technology & market ready for Georgia?

and

- Is there sufficient local experience and available data?

and

- Can the solution reduce 1 $MTCO_2e$ annually by 2030?

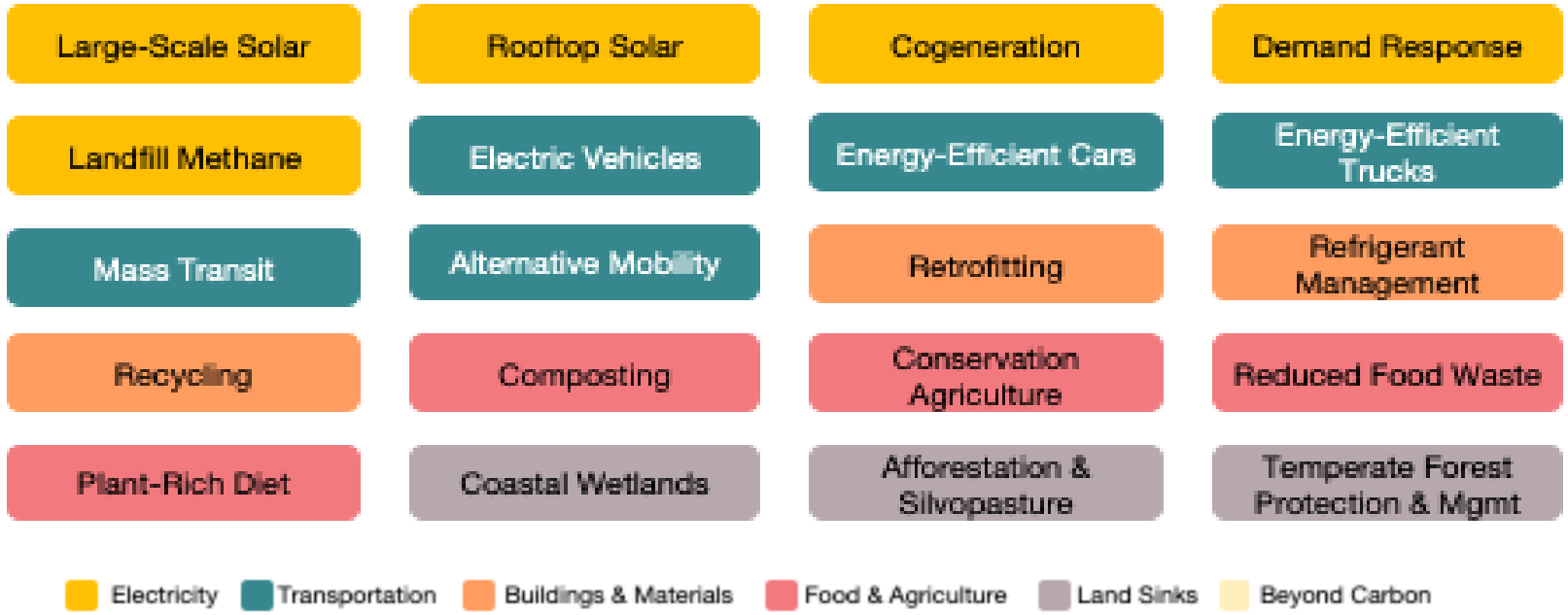
and

- Is the solution cost-competitive?

We designed a down-select system:

- The 20 remaining “high-impact” solutions were identified for further analysis.
- Some of the original 100 solutions were combined with similar technologies into broader, higher-impact approaches.
- We also asked: What are the “beyond carbon” issues?

Result = 20 High-Impact Solutions



20 Drawdown Georgia Solutions for 2030

Electricity

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

Transportation

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

Food & Agriculture

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

Buildings & Materials

- ***Retrofitting Buildings***
- Refrigerant Management
- Recycling

Land Sinks

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

5. What are their “beyond carbon” issues?

What does 1 megaton of carbon reduction look like?

Rooftop Solar:
295,000 new 5 KW home solar systems by 2030


Photo Credit: Solar Crowdsource
https://www.solarcrowdsource.com/how-it-works-solarize/


Photo Credit – Food Well Alliance
https://www.foodwellalliance.org/communitybased-composting

Composting:
Divert ~2 million tons of organic waste from landfilling to composting by 2030

Alternative mobility:
Eliminate 2.5% of car trips


Photo Credit: Atlanta Journal-Constitution
https://www.ajc.com/news/local/gridlock-guy-safety-tips-for-cyclists-and-motorists-sharing-the-roads/

Drawdown Scenarios of the 20 High-Impact Solutions

Technical Potential: Maximum realistic application without regard to cost or other impacts, up to hard limits on resources such as available land and materials.

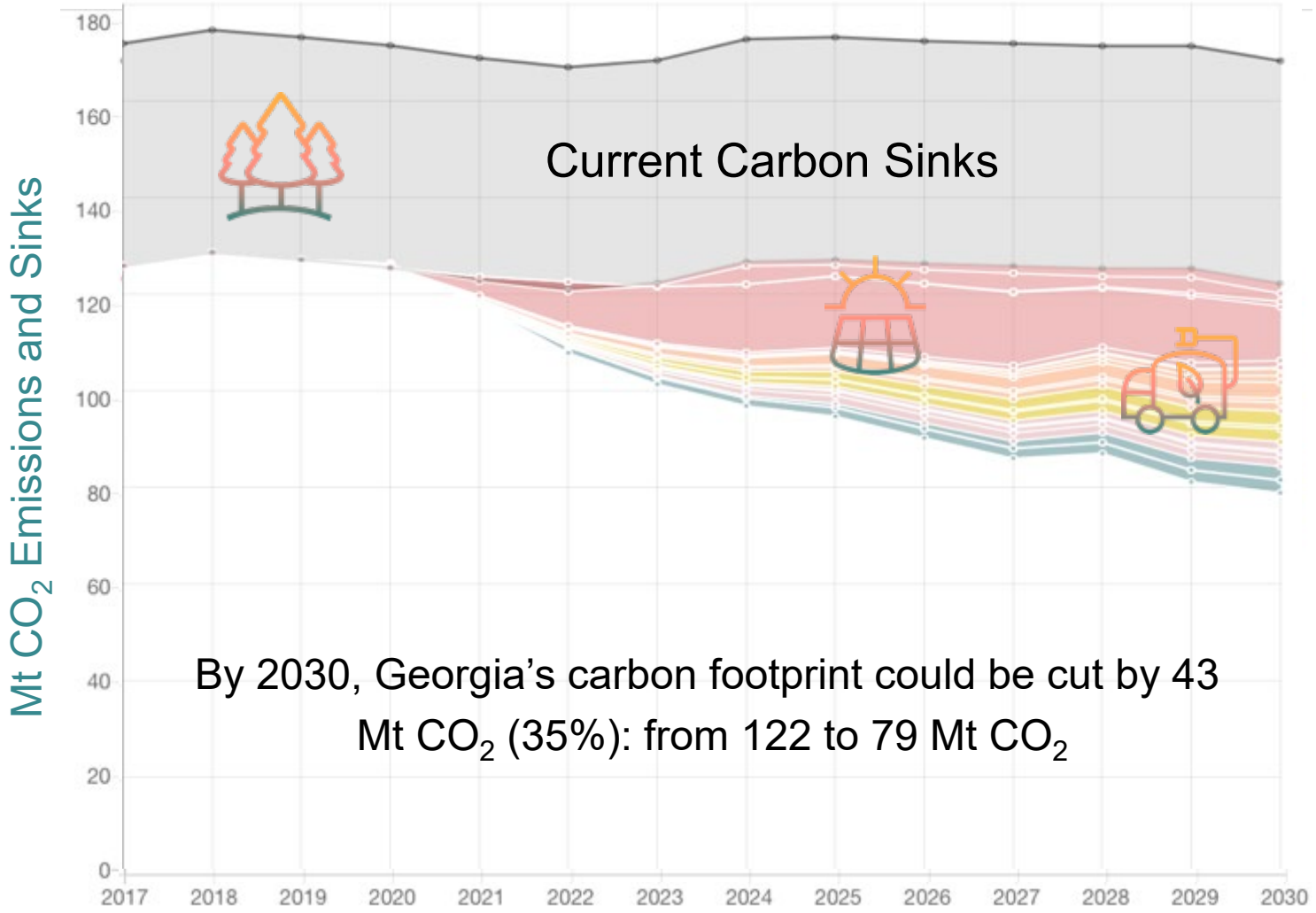
- Recycling 95% of disposed recyclable materials
- Covering 100% of south-facing + flat rooftops with solar panels.

Achievable Potential: A realistic scenario that considers costs, impacts, and stakeholder acceptance, but consistent with a greater commitment to success.

- EVs are 15% of new sales by 2030
- Growing large-scale solar from 1 to 11% of electricity.

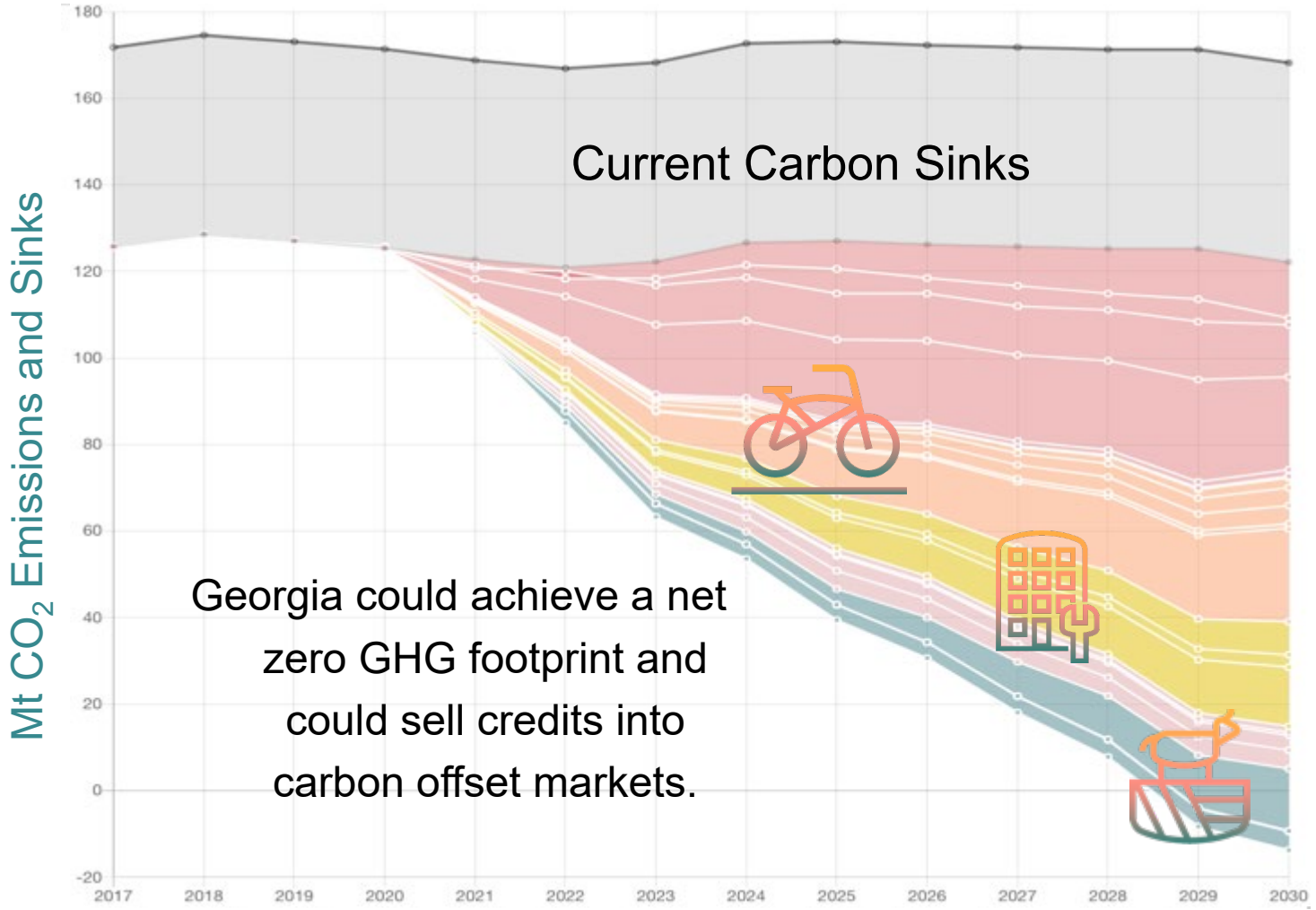
Baseline Forecast: The “no new action” scenario – status quo with slow change and continued trends.

Wedge Diagram – Achievable Potential



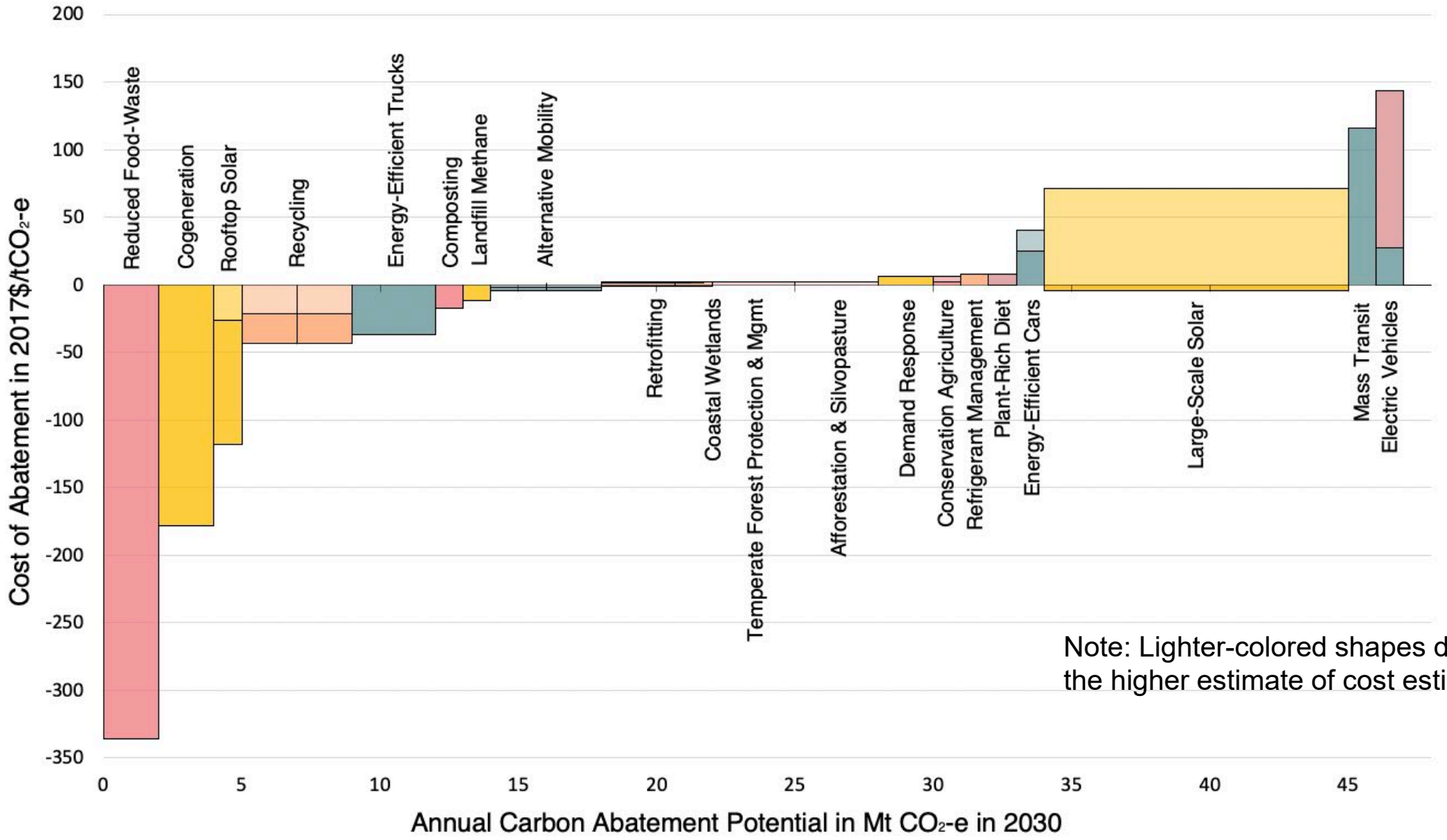
- Shows annual Mt CO_2 reductions relative to the Baseline (black) and current carbon sinks.
- Includes baseline annual sequestration (grey) at 46 Mt CO_2 per year from Georgia's natural carbon sinks
- All 20 solutions are set to their achievable potential
- The carbon impact of electric vehicles is enhanced by solar power

Wedge Diagram – Technical Potential



- All 20 solutions are set to their technical potential
- Carbon emission reductions overshoot zero by 11% in 2030.
- More carbon is sequestered than emitted in GA by 2025
- Retrofitting impacts are still large, even with low-carbon electricity.

For the set of 20 “achievable” solutions in 2030: Total benefits exceed total costs



Note: Lighter-colored shapes document the higher estimate of cost estimates

Phase 2 Short List of Solutions

	Achievable CO_2 Reduction ($MtCO_2e$)	Net Private Cost (in $/$tCO_2$)	Rationale for short list based on 2030 CO_2 reduction potential and net private costs
Rooftop Solar	1.0	-178 to -26	Favorable economics and large technical potential
Utility-Scale Solar	12.2	-3.9 to 71	Low private costs and large achievable potential
Energy-Efficient Trucks	3.3	-37	Significant achievable CO_2–e reductions, and savings
Electric Vehicles	1.4	27 to 144	Declining costs and expanding CO_2–e reductions over time
Retrofitting Buildings	2.6	-0.9 to 2	Significant achievable potential at a relatively low cost
Reduced Food Waste	1.8	-336	The least-cost solution
Afforestation & Silvopasture	2.8	2	Significant achievable potential at a relatively low cost

Electricity Generation

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

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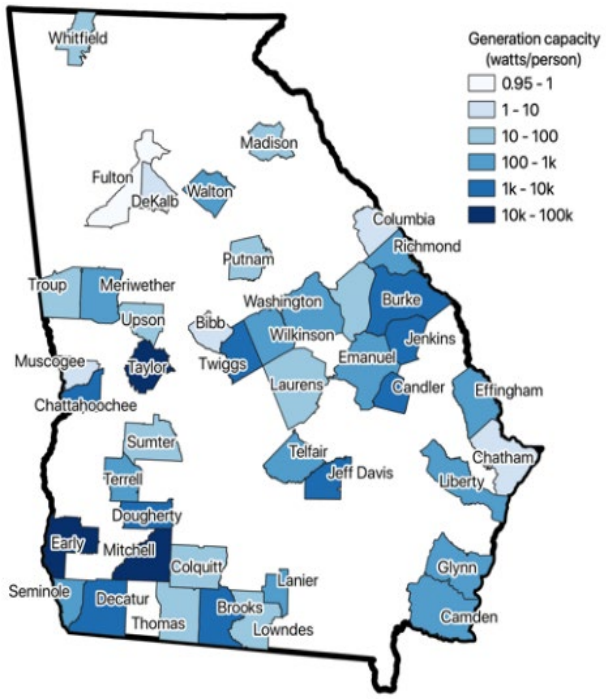
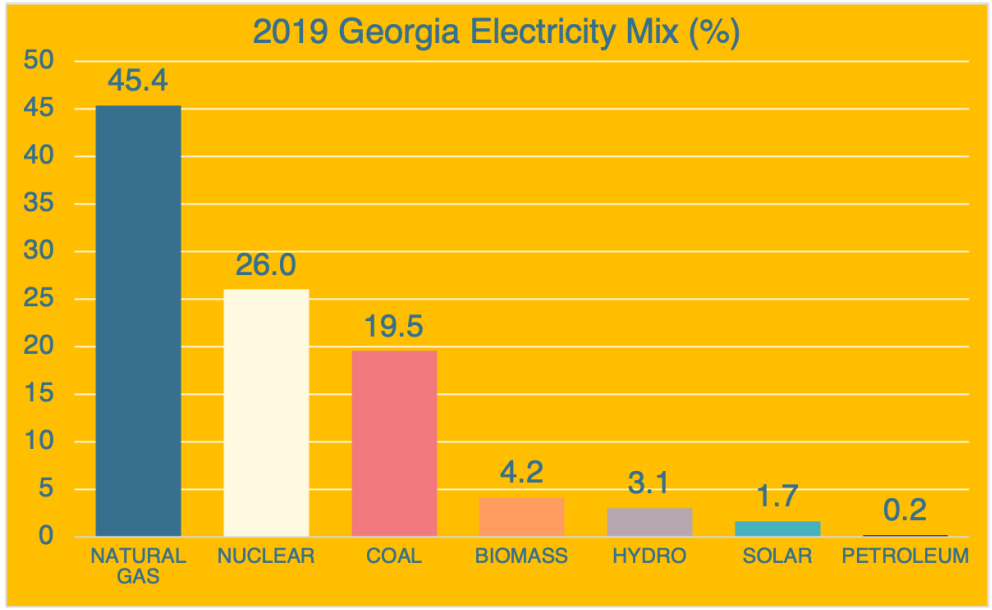
Silicon Ranch/Green Power EMC, 55 MW System

Large-Scale Solar: Existing Capacity and Potential Scenarios



Large-scale solar benefits rural Georgia



Net present value in the achievable case ranges from a savings of $5 to a cost of $60 per tCO_2

Technical Potential

21.4 Mt CO_2 annual reduction

Achievable Potential

11.2 MtCO_2 annual reduction by 2030

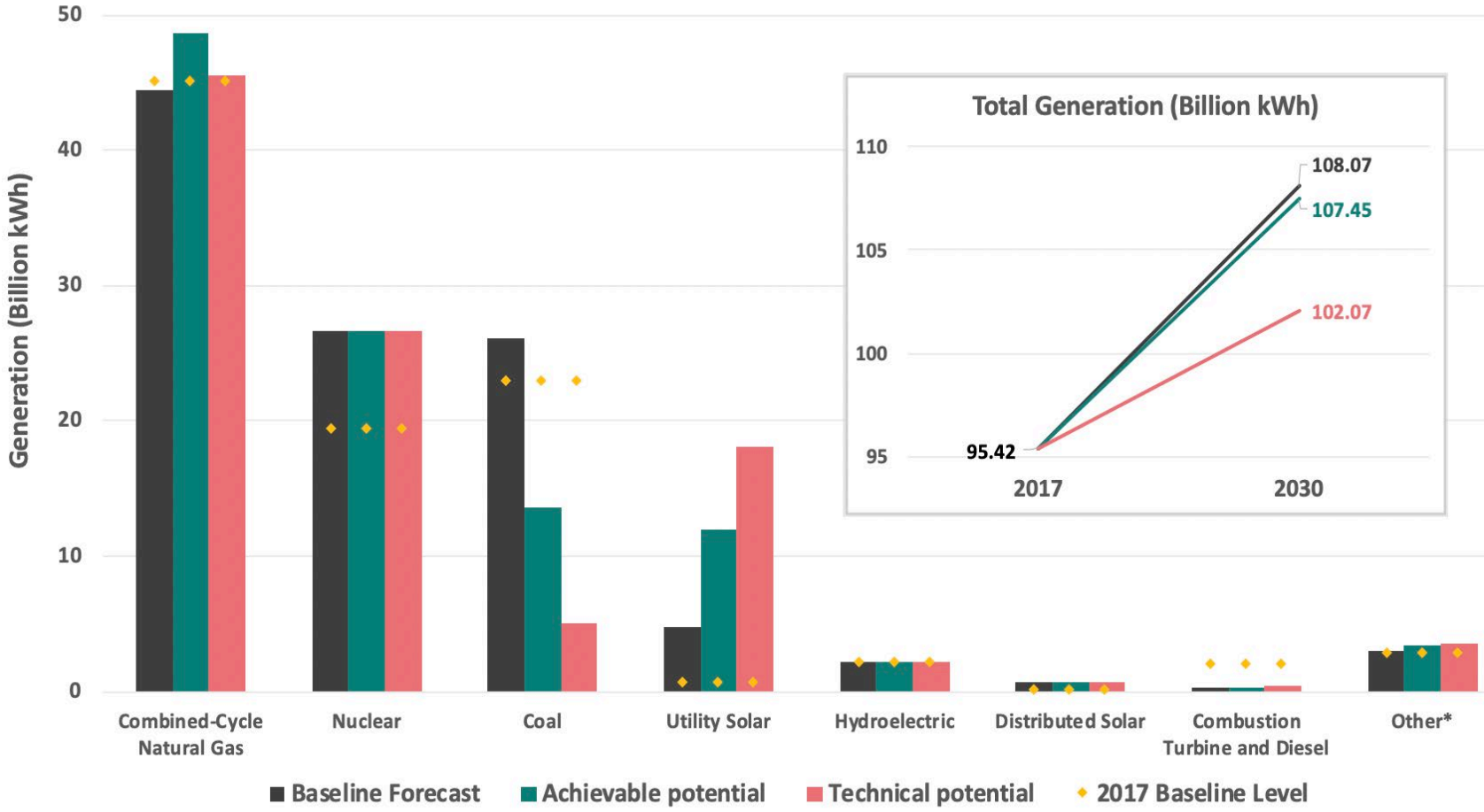
One Megaton Potential

Ten new 100-MW utility-scale solar installations and 36 new 5-MW community solar projects

Large-Scale Solar: Achievable Potential

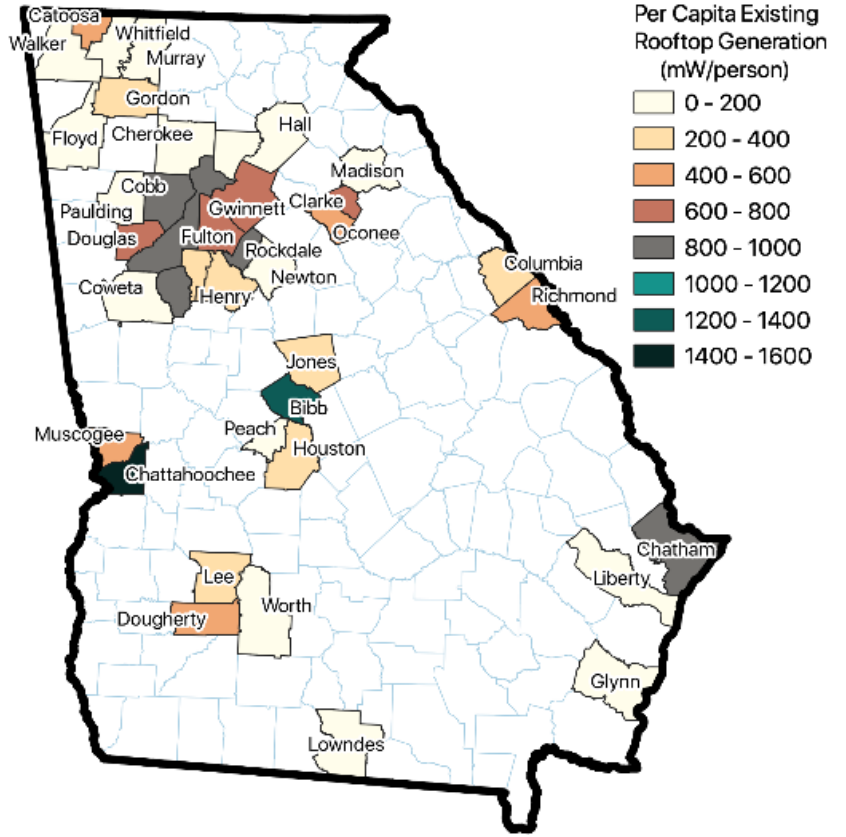
Jekyll Island, 1 MW Community Solar System

The Ray along Georgia Route 85



Large-Scale Solar Displaces Coal

Rooftop Solar: Existing Capacity and Potential Scenarios



Rooftop solar benefits urban Georgia

5,858 kW existing installed rooftop capacity

Technical Potential

12.1 Mt CO_2 annual reduction

Achievable Potential

1.0 MtCO_2 annual reduction by 2030 (0.55 Mt CO_2 residential)

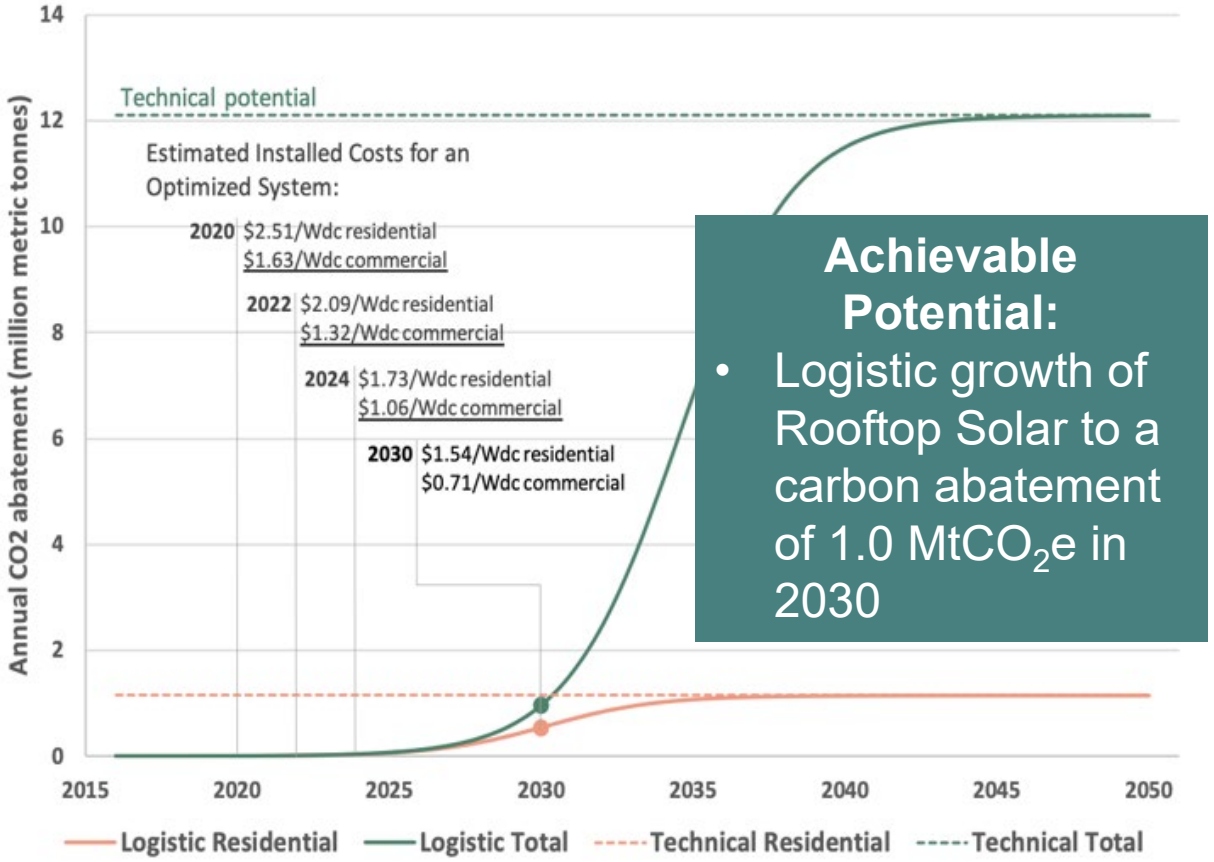
One Megaton Potential

295,000 new 5-kW home solar. systems

Net present value (NPV) in the achievable case ranges from a savings of $44 to a cost of $795 per million t$CO_2$

Rooftop Solar Achievable Potential: A megaton of carbon reductions is possible by 2030, and building owners with solar panels would save money

Net present savings in the achievable case range from $26 to $178 per tCO_2



Achievable Potential:

- Logistic growth of Rooftop Solar to a carbon abatement of 1.0 $MtCO_2e$ in 2030

Transportation

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

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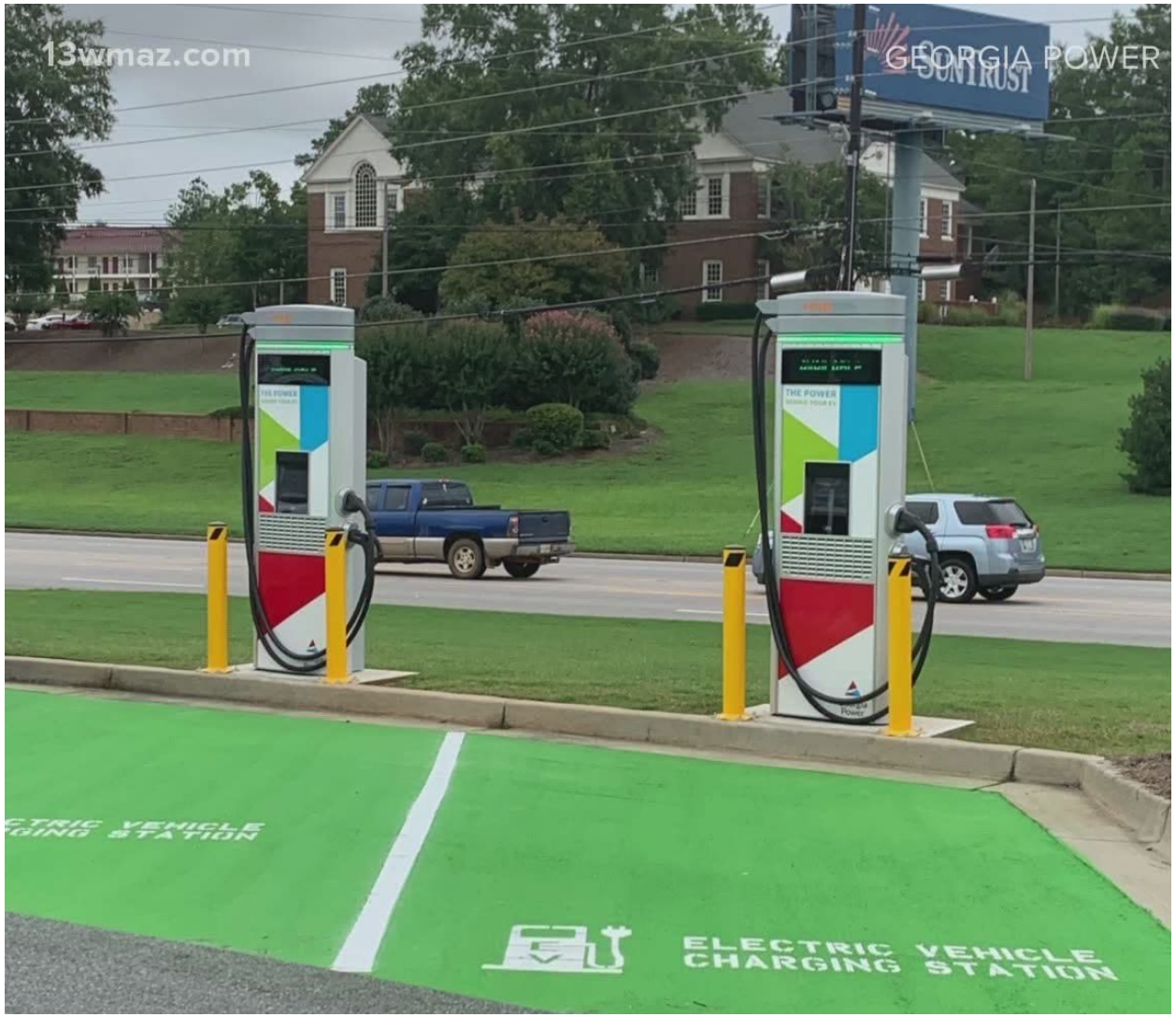
Electric Vehicles: Potential Scenarios



Technical Potential

35% of new car sales in 2030 = 2.3 Mt CO_2 reduction

Achievable Potential

1.4 MtCO_2 annual reduction by 2030

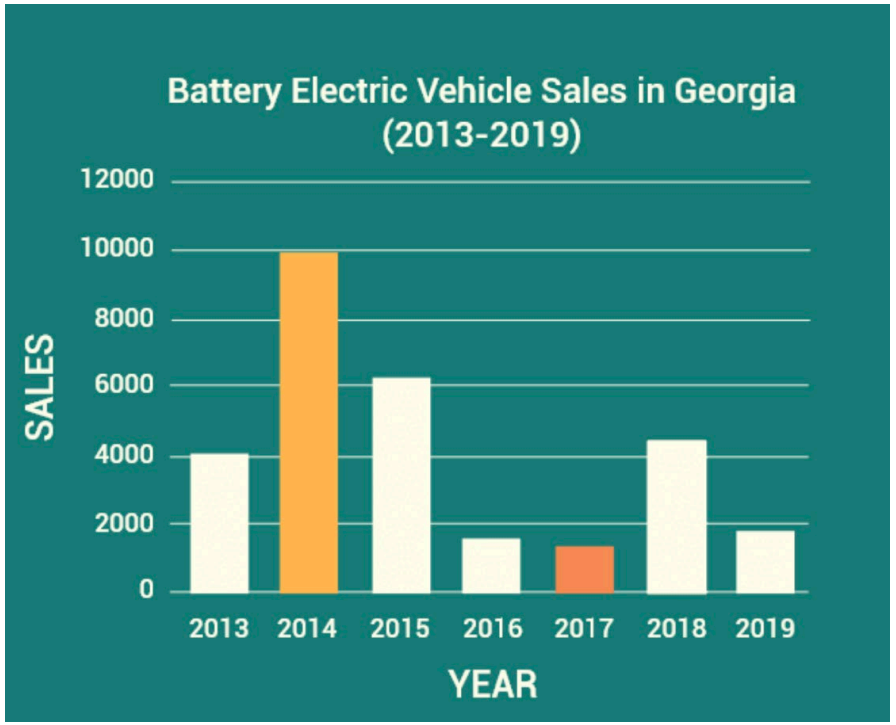
One Megaton Potential

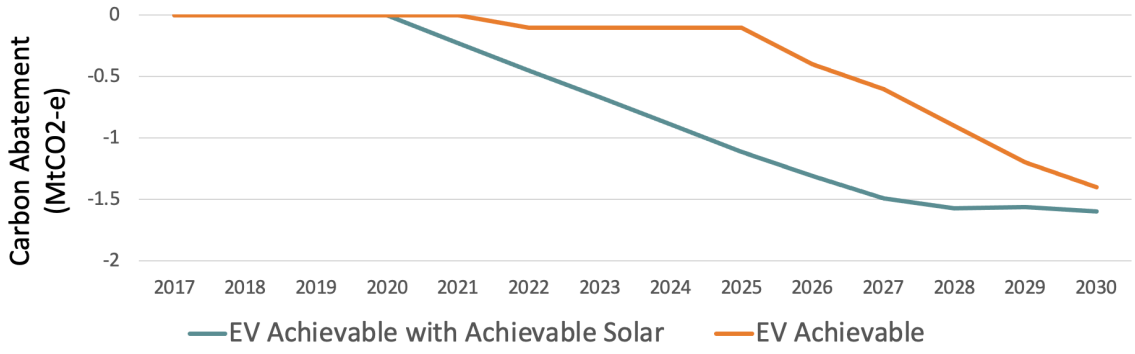
Replace 250,000 gasoline-powered vehicles with EVs

Electric vehicles are 50% less carbon intensive than conventional vehicles.

Adoption rate and carbon intensity of the grid will dictate overall impact from this solution

Achievable Potential of EVs Grows with Clean Electricity





Achievable Potential:

Approximately 310,000 EVs in Georgia's Light Duty Vehicle Fleet, and accounting for 15% of new LDV sales in 2030

Net present costs in the achievable case ranges from $27 to $144 per tCO_2

The "achievable" scenario could save an additional 0.2 $MtCO_2e$ in 2030 when combined with the achievable potential for large-scale solar.

Retrofitting Buildings: Potential Scenarios

Technical Potential

13.7 Mt CO_2 annual reduction

Achievable Potential

2.6 MtCO_2 annual reduction by 2030

One Megaton Potential

Retrofit 20% of Georgia's homes to save 20% of energy annually

Net present value in the achievable case ranges from a saving of $0.85 to a cost of $2 per t$CO_2$

This scenario could save 0.7 MtCO_2e less in 2030 when combined with the achievable potential for large-scale solar.

Food & Agriculture Systems

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

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Reduced Food-Waste: Potential Scenarios

- ~2.1 million tons of food waste in Georgia
- ~30-40% of food is wasted in retail and consumer levels.
- Reuse of food via food banks reduces the food waste to some extent (up to 5%)
- Key obstacles include limited communication between food supply and demand, consumer behavior, lack of awareness, poor labeling and limited storage capacity.
- Data-Driven food waste reduction solutions are critical to reduce food wastes

Net present savings in the achievable scenario of $336 per tCO_2

Technical Potential

50% reduction of food waste = 4.5 Mt CO_2 annual reduction by 2030

Achievable Potential

20% reduction of food waste = 1.8 MtCO_2 annual reduction by 2030

One Megaton Potential

12% reduction of food waste

+ More job creation
+ Cost saving
+ Less food insecurity
+ Less air and water pollutions
+ Food donation tax benefits

Strategies to reduce food wastes

Red = Atlanta Community Food Bank

Source: foodbanknega.org

~2.1 million tons of food waste in Georgia

- **Prevent**
  - Consumer education campaign
  - Standardized date labelling
  - Optimal packaging
  - Produce specifications
- **Recover**
  - Donations policies
  - Donation storage facilities
- **Recycle**
  - Research & Innovation
  - Waste tracking and analytics

20% reduction by 2030

Revised from: http://ReFed.com

Data-driven food waste reduction solutions are critical

Land Sinks

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

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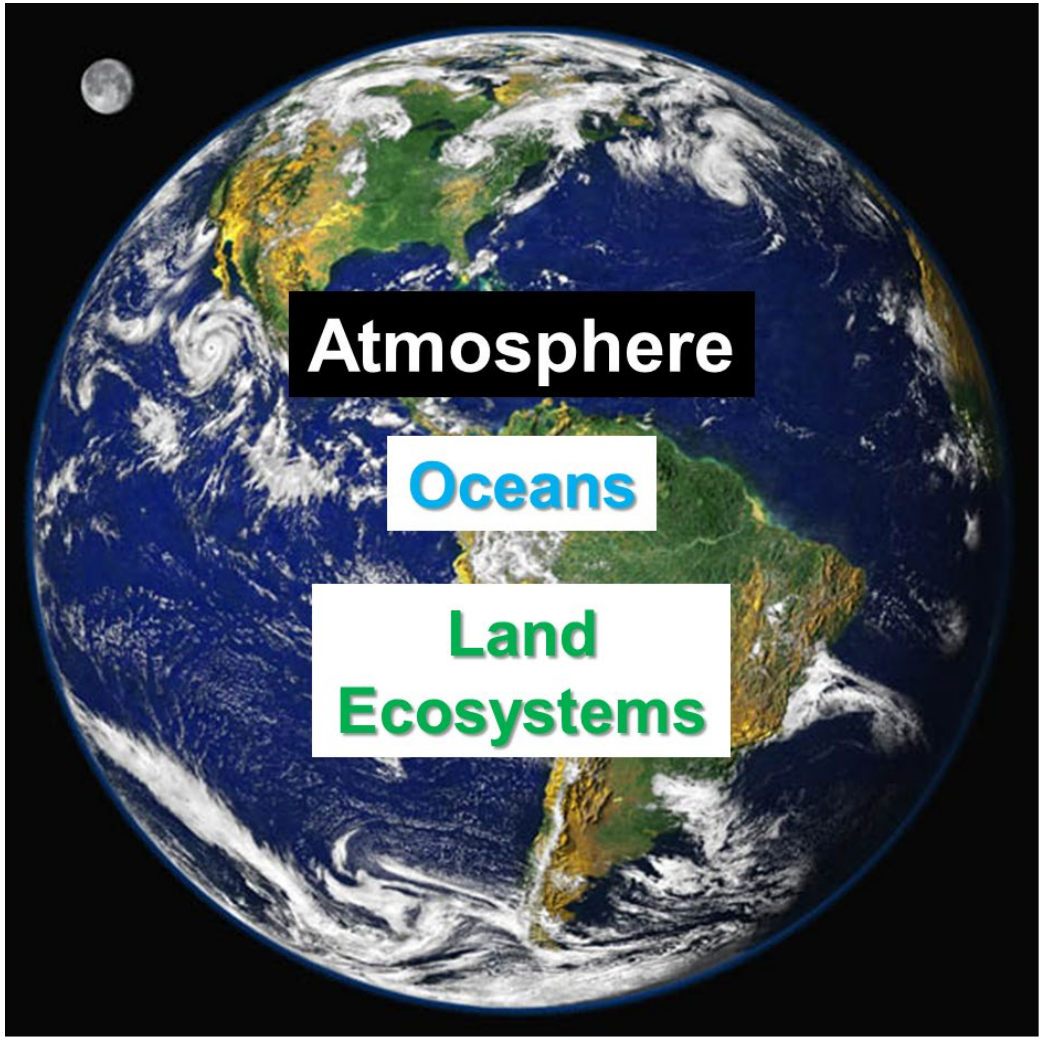
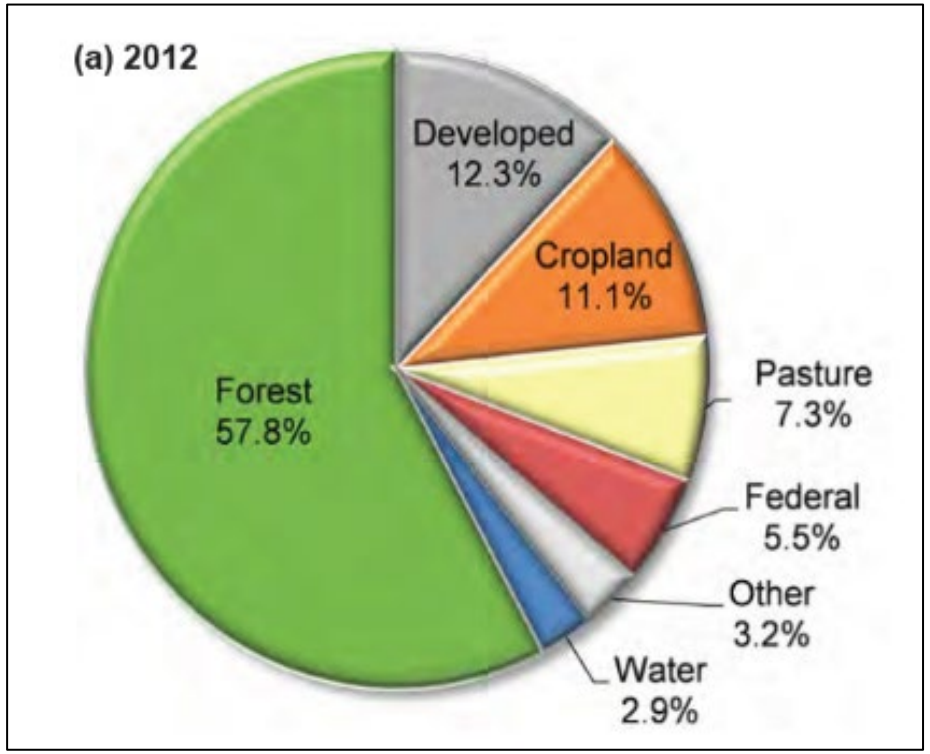


NASA

Land Use in Georgia



Afforestation & Silvopasture: Potential Scenarios

Technical Potential

14.3 Mt CO_2 annual reduction (plant 100% of current pasture lands with mixed hardwood & loblolly pine)

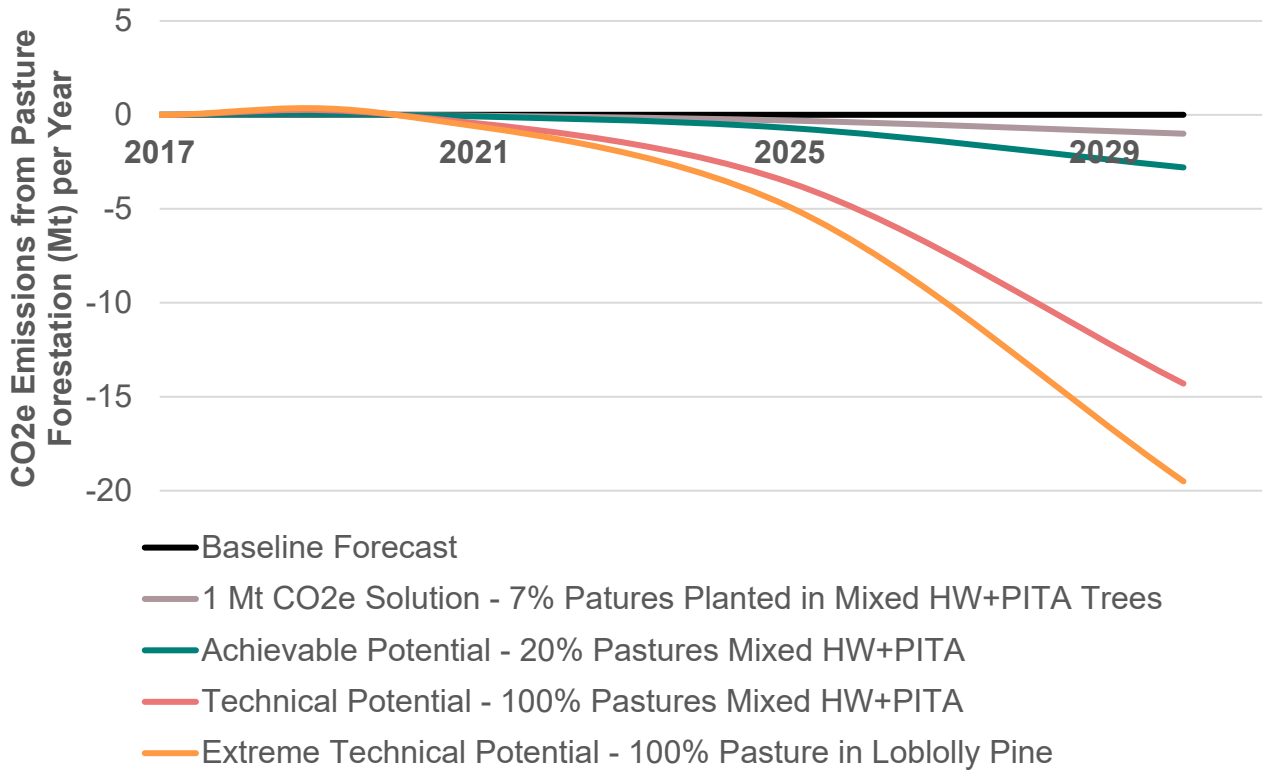
Achievable Potential

2.8 MtCO_2 annual reduction by 2030 (plant 20%)

One Megaton Potential

Plant 7% of current pasture lands with mixed hardwood & loblolly pine

Afforestation & Silvopasture: Achievable Potential



Achievable Potential:

Planting 20% of current Pasture lands with mixed tree species (loblolly pine + hardwoods) stores **2.8 $MtCO_2$** per year by 2030. Uses staggered tree planting half in 2020-2021 timeframe; half around 2025. Includes CO_2e stored in trees and soil.

Net present cost in the achievable scenario is $2 per tCO_2

+Improved health & productivity of livestock
+Biodiversity
+Improved stream water quality
- Potential slight reduction in forage availability

Beyond Carbon

- Environment
- Economy
- Public Health
- Equity

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Beyond Carbon Working Group

A 6th working group considered other societal impacts

ENVIRONMENT	EQUITY	ECONOMICS/JOBS	PUBLIC HEALTH
Air quality	Affordability	Local Economy & Employment	Premature Mortality
Water quality, quantity, and access	Workforce/Business Diversity	Input Prices/System Costs	Morbidity
Land use	Distribution of Public Health Impacts	Workforce job quality	Quality of Life
Ecosystems/ biodiversity	Accessibility of Solutions	Wages and benefits	Education
Material disposability	Cultural Fit & Way of Life	Property values / Tax Base	Public Safety
		Infrastructure requirements	

Our 20 Climate Solutions Would Create Jobs in Georgia (draft #'s)

The increased introduction of EVs can have a positive net impact on jobs, in particular for the SE automotive sector

Georgia's energy-efficiency industry employed nearly 63,000 people in 2019.* This could grow significantly with an expansion of building retrofitting, as in the "Achievable" scenario.

Cogeneration could create 1,870 – 2,410 (mostly local) jobs annually, by adding CHP systems to a subset of chemicals, textiles, paper, food processing, lumber & wood facilities in Georgia.

Forest protection and management generates jobs. Providing recreational activities at no cost to the local community and/or tourists makes this highly accessible to low-income families

Georgia's solar industry employed over 6,500 people in 2019.* This could grow by an additional 2,390 jobs (each lasting 10 years) with an expansion of rooftop solar, as in the "Achievable" scenario.

With an expansion of large-scale solar, as in the "Achievable" scenario, 20,880 jobs could be added, each lasting 10 years.

*Source: 2020 USEER Energy Employment by State Report.

Preview of Next Steps

What's next for the research team: Geospatial tracking & business engagement to activate Drawdown solutions in Georgia

1. Track the GHG Footprint of Georgia's Counties and Metro Areas

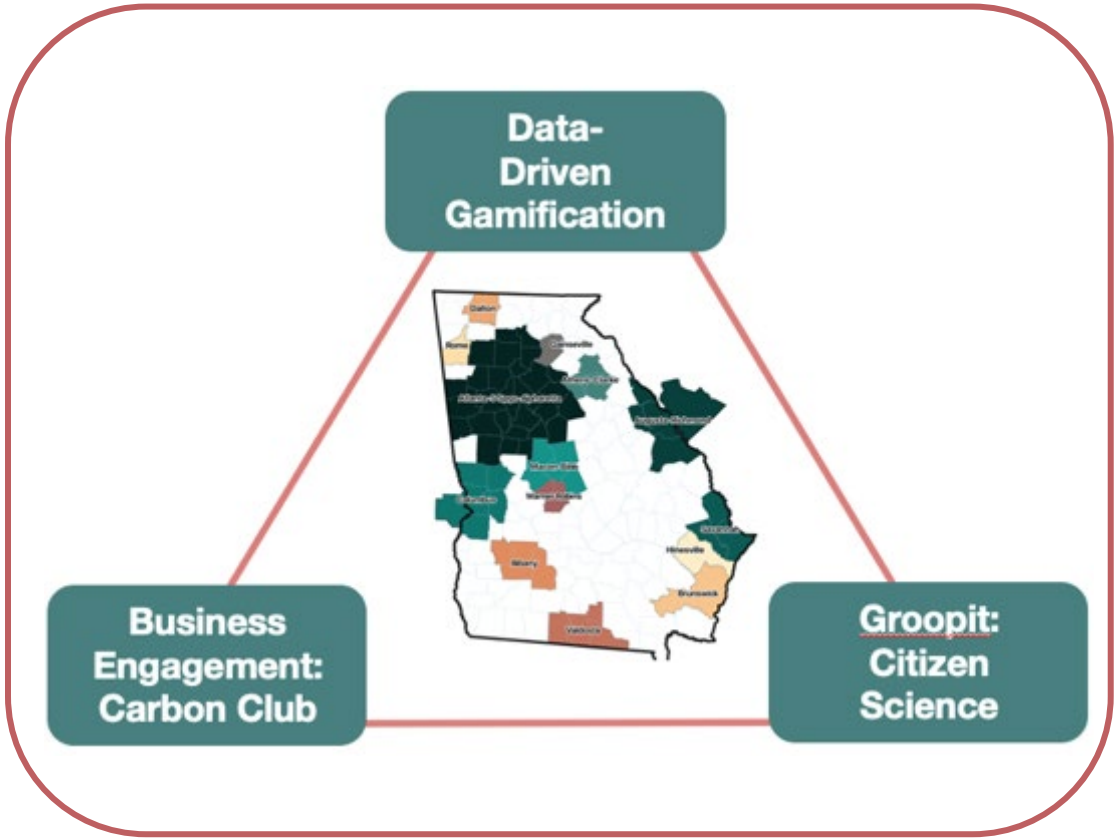
Goal: Develop a GHG tracking system (and dashboard) to activate Drawdown Georgia

2. Engage Business

Goal: Make the output of Georgia Drawdown accessible to business decision makers to stimulate interest in individual and collective commitments

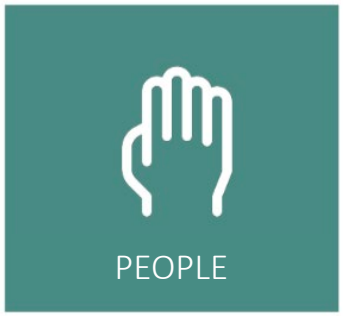
3. Evaluate, Plan and Track Activation of Five Solutions

Goal: Triangulate approaches to activate high-impact solutions in Georgia, including citizen science to help track solutions

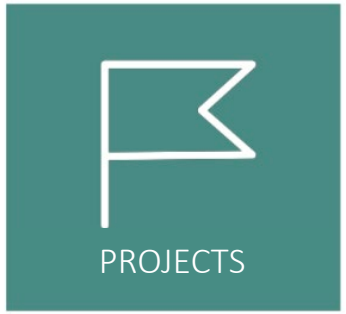


Citizen Science: Community Involvement in Drawdown Georgia

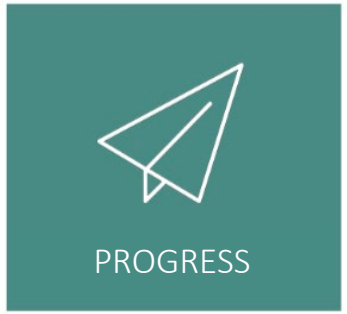
Drawdown Georgia is encouraging community involvement to demonstrate positive progress in DDGA-related projects through ‘crowdsolving’ in Groopit.



Tell the community who you are and what you are commited to do



Share any DDGA-related projects you encounter or are working on



Share snapshots as you make progress in advancing DDGA

Identify barriers and challenges as they emerge

Share best practices, learnings, results, and stories

Share news, announcements, and events

Contact: **drawdownga.org/take-action/** to register your projects!

Open Access | Published: 15 January 2021

Translating a Global Emission-Reduction Framework for Subnational Climate Action: A Case Study from the State of Georgia

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