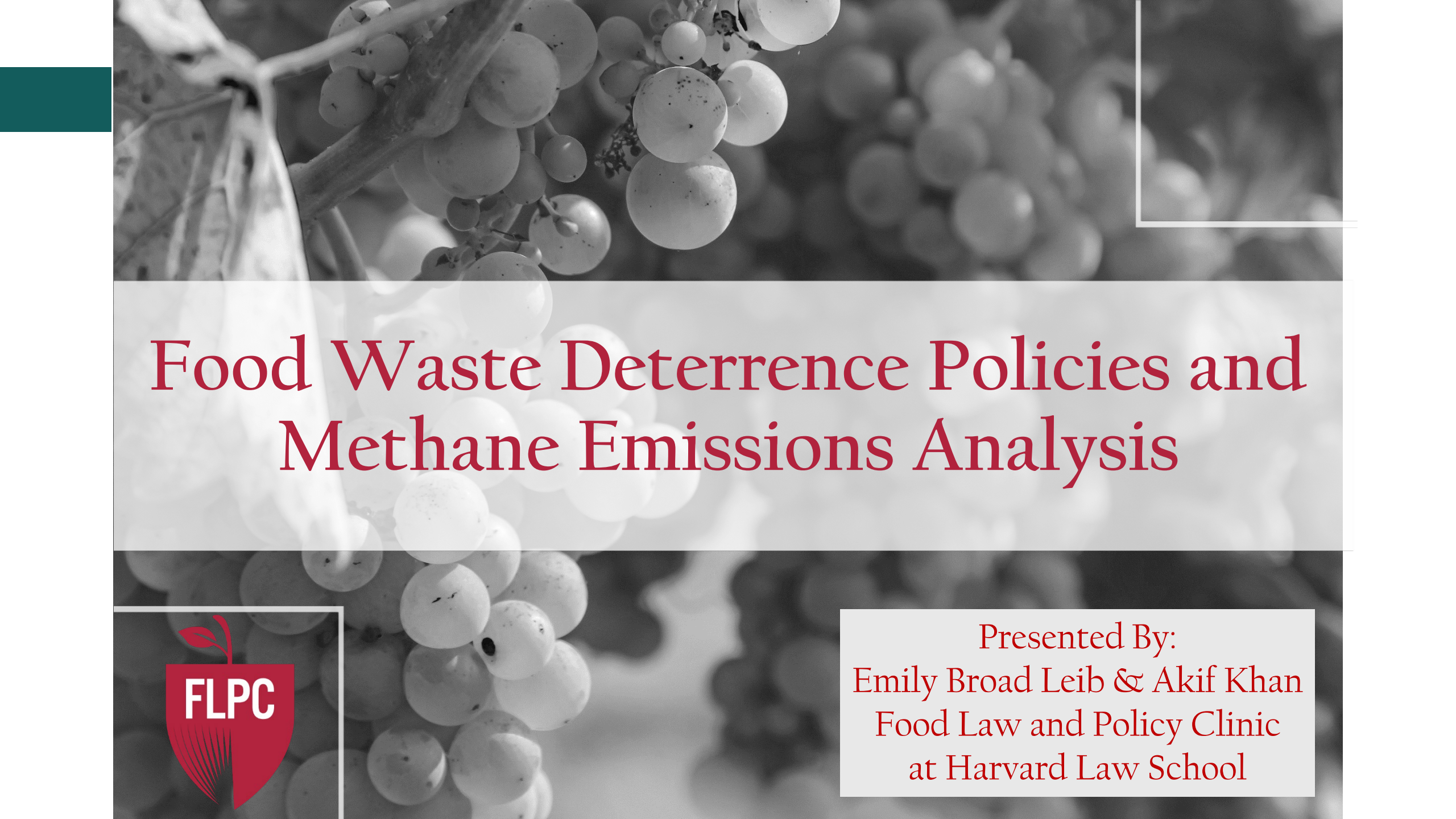
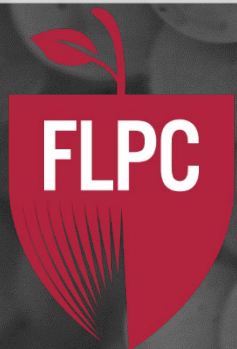
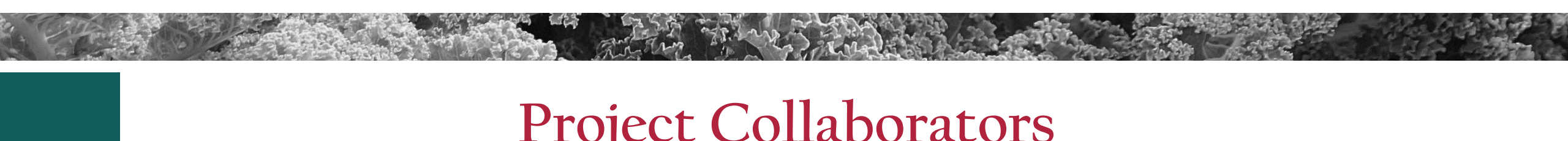




Food Waste Deterrence Policies and Methane Emissions Analysis

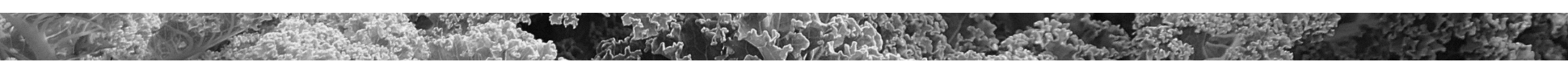


Presented By:
Emily Broad Leib & Akif Khan
Food Law and Policy Clinic
at Harvard Law School



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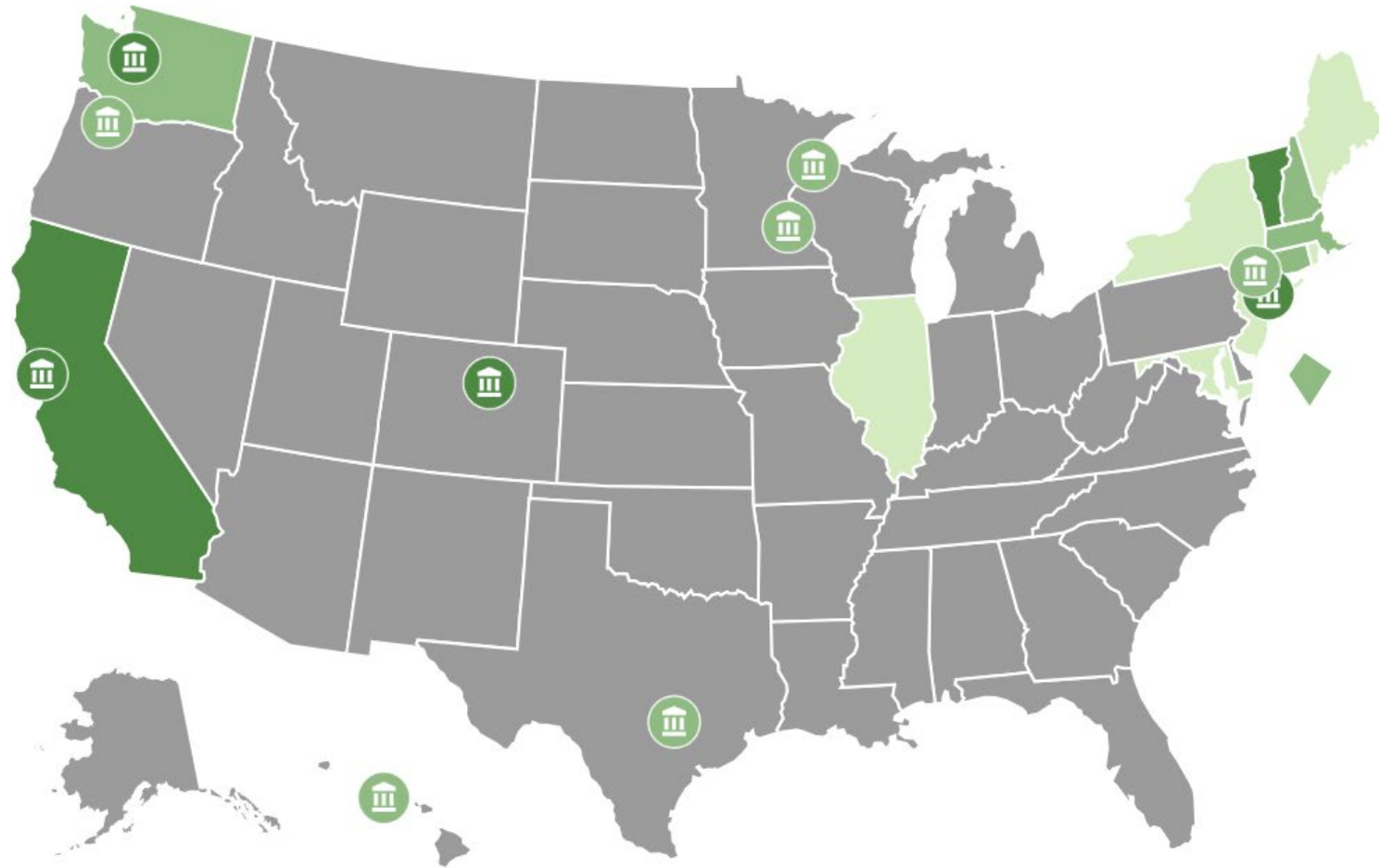


Food Waste Deterrence Policies (FWDP)

A universe of laws or policies that aims to reduce food waste and increase food recovery by making food waste financially burdensome for food waste generators (e.g., businesses, institutions, households, and other entities that create food waste), including:

- Organic waste disposal bans
- Mandatory recycling laws
- Food donation requirements
- Waste disposal surcharges or landfill taxes
- Pay-as-you-throw policies
- Food waste tax penalties

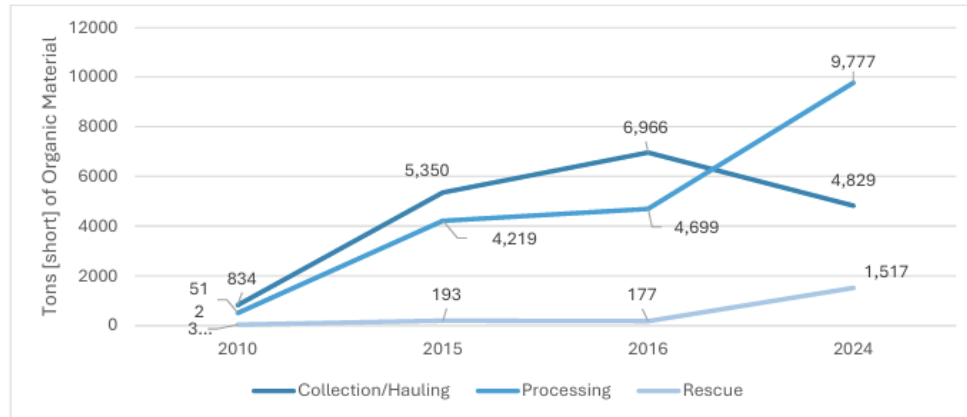
FWDP in the United States



<https://policyfinder.refed.org/>

Examples of FWDP Research

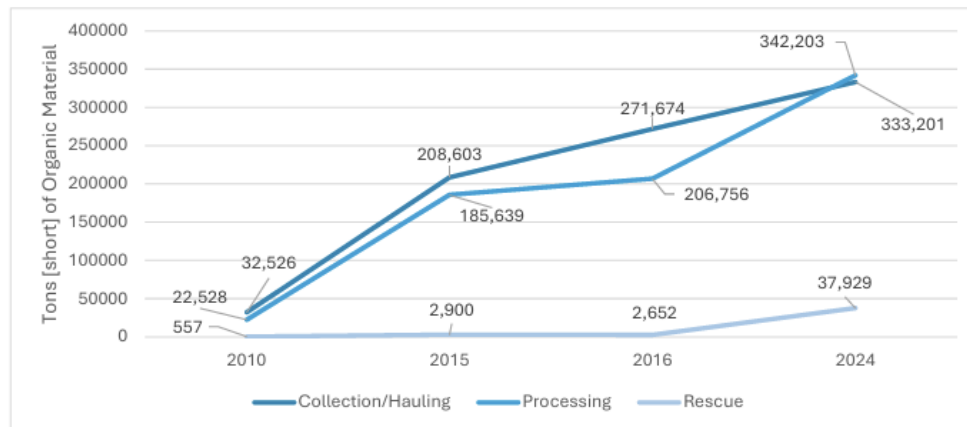
Figure 6. Average Annual Tonnage of Food Received by Industry Segment, 2010-2024



Note: 2016 is an estimate of tonnage (survey done July 2016 - asked for projected total 2016 tonnage)

Source: Data from survey, compiled by ICF.

Figure 7. Estimated Total Tonnage of Food Received by Industry Segment, 2010-2024



MassDEP Organic Waste Ban Econ. Analysis (2025)

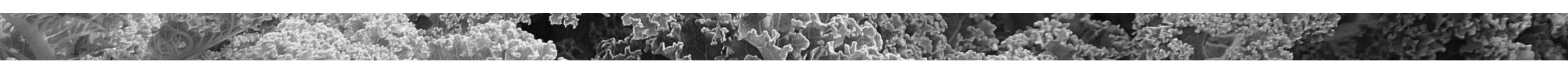
ENVIRONMENTAL POLICY

Of the first five US states with food waste bans, Massachusetts alone has reduced landfill waste

Fiorentia Zoi Anglou^{1*}, Robert Evan Sanders², Ioannis Stamatopoulos¹

Diverting food waste from landfills is crucial to reduce emissions and meet Paris Agreement targets. Between 2014 and 2024, nine US states banned commercial waste generators—such as grocery chains—from landfilling food waste, expecting a 10 to 15% waste reduction. However, no evaluation of these bans exists. We compile a comprehensive waste dataset covering 36 US states between 1996 and 2019 to evaluate the first five implemented state-level bans. Contrary to policy-makers' expectations, we can reject aggregate waste reductions higher than 3.2%, and we cannot reject a zero-null aggregate effect. Moreover, we cannot reject a zero-null effect for any other state except Massachusetts, which gradually achieved a 13.2% reduction. Our findings reveal the need to reassess food waste bans using Massachusetts as a benchmark for success.

Science (2024)

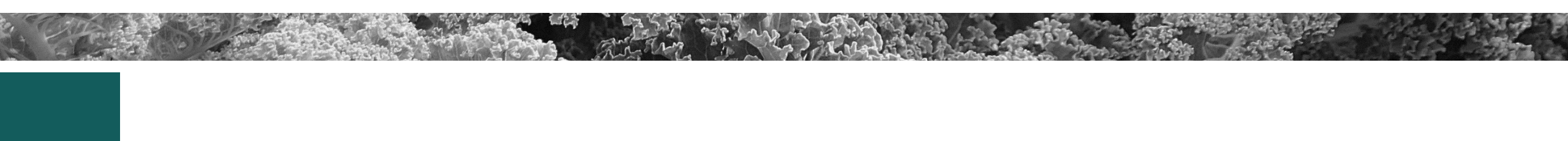


Our Project



Goals of Our Research Project

- Map the current state of food waste deterrence policy adoption and implementation in the United States from 2011-2026, along with scoring policy strength through multiple policy components;
- Study the impacts and effectiveness of food waste deterrence policies in different states; and
- Evaluate the connection between current methane emissions data and food waste deterrence policies.



Food Waste Deterrence Policies (FWDP) Database



Comparing FWDPs

California:

- Covered commercial food waste generators must donate edible food to food recovery agencies and recycle the remaining food scraps.
- *Covered entities: certain supermarkets, grocery stores, and restaurants; food service providers; food distributors; hotels; large venues and large events; state agencies; local education agencies*
- In addition, every California business must subscribe to organic waste hauling service or haul their own organic waste

Cal. Code Regs. Tit. XIV, § 18981.1-18998.4

Massachusetts:

- Any entity, excluding a residence, that produces more than 1/2 ton of commercial organic waste in a given week must separate the organic waste and ensure proper recycling.
- *Commercial Organic Material: food material and vegetative material from any entity that generates more than one-half ton of those materials for solid waste disposal per week, but excludes material from a residence.*

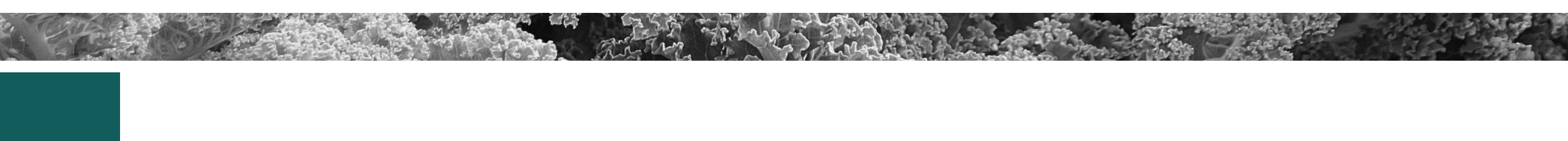
310 Mass. Code Regs. 19.017; 310 Mass. Code Regs. 19.006

Our State-Level FWDP Database

State	Type of FWDP	Original Phased Implementation?	Version 1 Policy Strength Level	Version 1 Passed	Version 1 Effective	Version 1 Volume Threshold	Version 1 Type of Waste	Version 1 Distance Exemption?
<u>California</u>	Mandatory organics recycling	Yes	Moderate	September 28, 2014	April 1, 2016	8 cubic yards/week	organic waste	No
	Donation Requirement	Yes	Moderate	November 3, 2020	January 1, 2022		edible food	No
<u>Connecticut</u>	Mandatory organics recycling	Partially	Weak	October 1, 2011	January 1, 2014	104 tons/year	organic waste	Yes
<u>District of Columbia</u>	Disposal ban	Yes	Weak	December 22, 2020	January 1, 2023		comercial food waste	No
	Donation Requirement	Yes	Weak	December 22, 2020	January 1, 2023		edible food	No
<u>Illinois</u>	Mandatory organics recycling	No	Weak	August 9, 2024	January 1, 2025		organic waste	No
<u>Maine</u>	Mandatory organics recycling	Yes	Weak	June 24, 2025	July 1, 2030	2 tons/week	food waste	Yes

Our Policy Adoption and Implementation Timeline

	2011			2012												2013							
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug
<u>CA Recycling</u>																							
<u>CA Donation</u>																							
<u>CT</u>	V1 PASS																						
<u>D.C. Recycling</u>																							
<u>D.C. Donation</u>																							
<u>IL</u>																							
<u>MD</u>																							
<u>MA</u>																							
<u>NH</u>																							
<u>NJ</u>																							
<u>NY Recycling</u>																							
<u>NY Donation</u>																							
<u>RI</u>																							
<u>VT</u>																							
<u>WA</u>																							



Methane Emissions Analysis



Sources of Methane Data

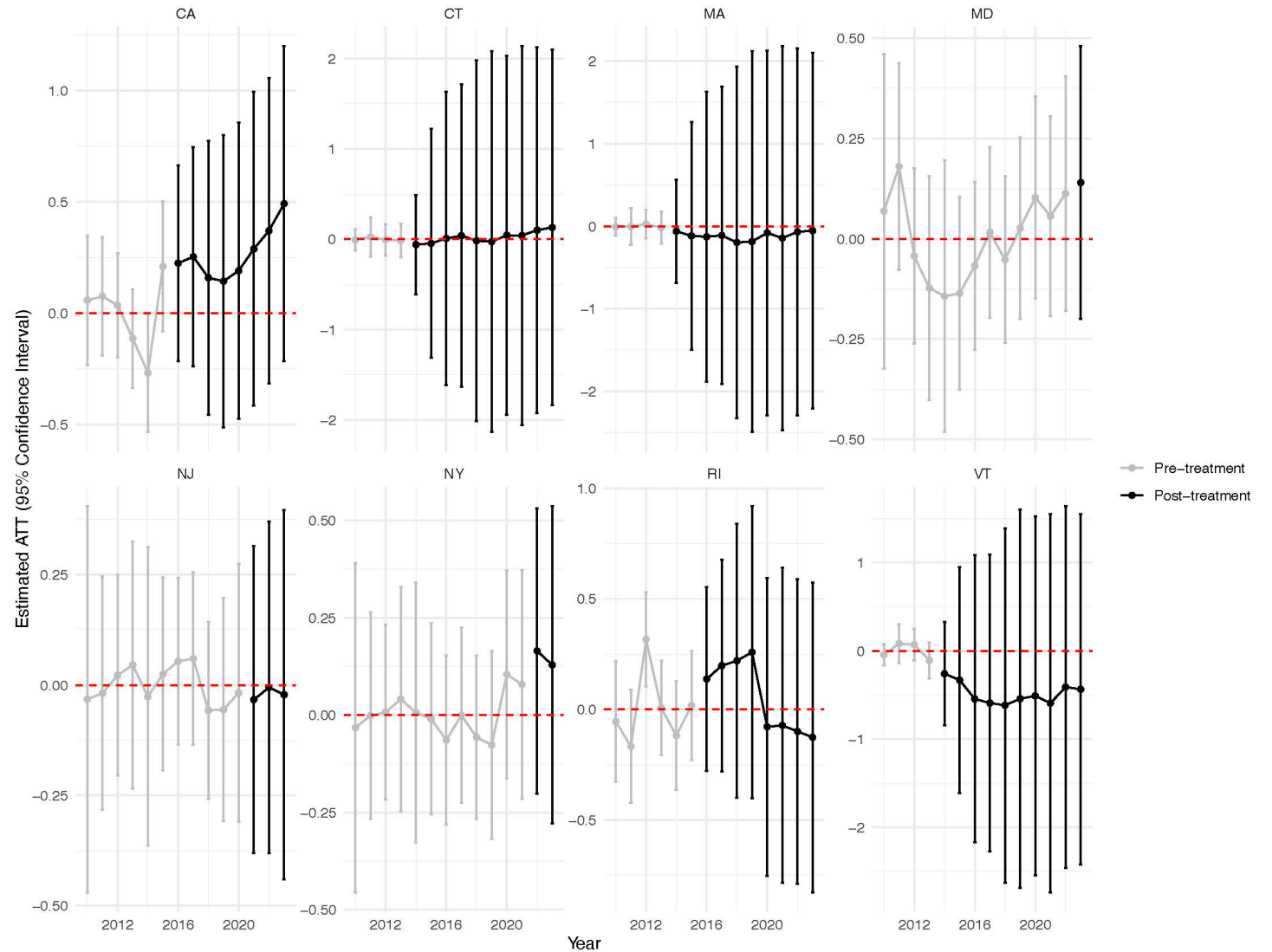
For this project, we used both *self-reported emissions data* and *satellite-based emissions data* as two complementary sources of landfill-based methane emissions data.

1. The self-reported emissions data come from U.S. EPA Greenhouse Gas Reporting Program data from 2010-2023.
2. Satellite data come from combining satellite observations (measuring atmospheric methane concentrations) with spatially allocated sector-specific inventories from the EPA Greenhouse Gas Inventory.
 - Two sets of satellite-based methane emissions data were needed to cover the years 2010-2017 and then 2019-2024, though each dataset had a different spatial resolution and relied on different satellite instruments.

Results

The estimated average treatment effects on GHGRP-reported methane emissions from each treated state (2010-2023).

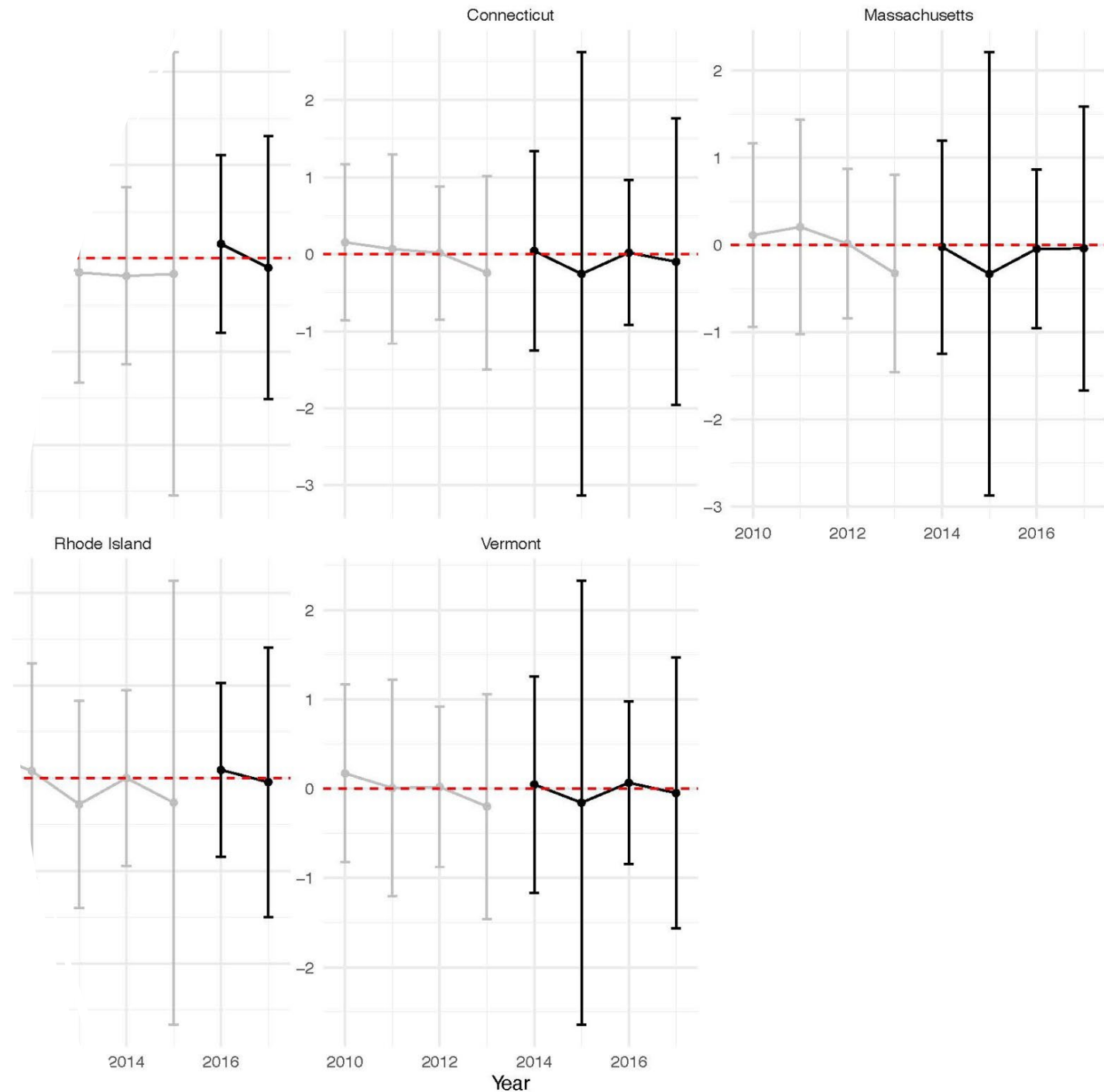
- Pre-treatment estimates shown in gray, post-treatment estimates in black.
- Dashed red line indicates null effect.

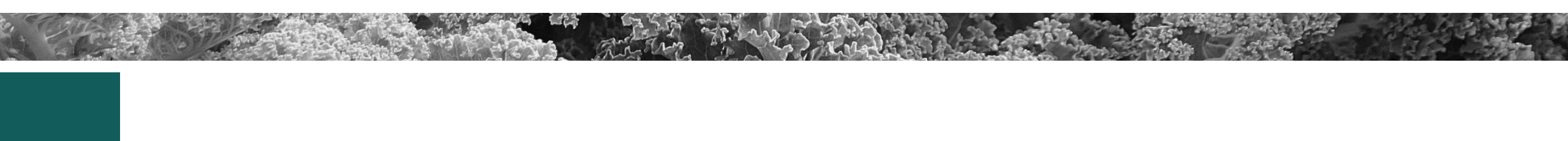


Results

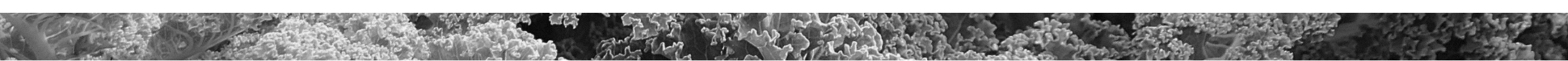
The estimated average treatment effects on satellite-based methane emissions from each treated state (2010-2017).

- Pre-treatment estimates shown in gray, post-treatment estimates in black.
- Dashed red line indicates null effect.





Concerns, Questions, Next Steps



Concerns with the methane data emerged during our research

- Methane emissions from landfills are not solely attributed to organic waste, and even less so just to food waste, which adds variability into methane emissions estimates; in addition, food waste methane reductions may be offset by other increases.
- Organic waste emits methane slowly, so the impacts of organic- and food-waste deterrence are not immediately evident.
- Solid waste facility operations and methane collection practices can differ day-to-day.
- GHGRP allows facilities to choose between two methane emissions approaches, producing potential inconsistency in reported data.
- The GHGRP reporting threshold means facilities drop in and out of reporting.
- The confidence intervals in the methane emissions are wide due to the necessary estimation methods.



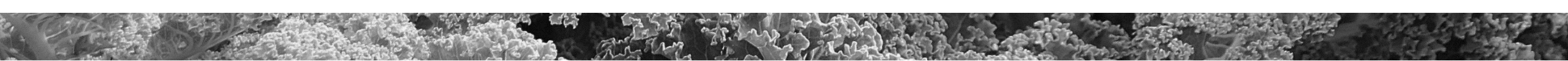
Next Steps

- As you can see from the data, we found no impact of the policies on GHGRP or satellite methane. However, we are concerned that the data is not well-suited to assess these policies.
- For now, we plan to publish:
 - The detailed tables of state food waste deterrence policies over time (to be published in Harvard dataverse)
 - A policy brief with key information about these types of policies and trends in policy evolution
- We are considering whether/how to report the results of our policy impact analysis...

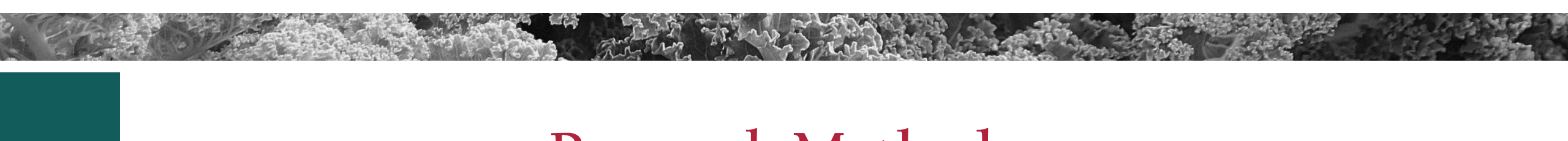


Analysis & Discussion: Options for How to Report Results

- Publish a manuscript with our null findings for both methane data sets.
 - However, we are concerned about this approach given our lack of confidence in the methane data's fitness for our use, especially the GHGRP data.
- Remove the GHGRP data from the manuscript and only report on satellite data, given that we have realized the GHGRP data has very little consistency year over year.
 - However, our concerns about raise some questions about the satellite data's fitness for our purpose
- Instead of publishing our findings, publish a perspective piece that discusses the steps we took and what we learned, and why we think these methane data sets are not well-suited to testing policy effectiveness for these policies.



Appendix



Research Methods

- Primary outcome of interest is state-level methane emissions from landfills per 100,000 individuals
- For the 2010-2017 emissions data, policy-attributable changes were estimated utilizing an extended “synthetic controls methodology”
 - Synthetic “control” states for each treated state (i.e. a state with a FWDP) were constructed using weighted emissions averages across multiple control states
 - The post-treatment emissions were compared with the synthetic control state emissions over time



Research Methods cont'd

- For the 2019-2024 emissions data (which doesn't have the necessary length of pre-treatment time for an accurate synthetic controls methodology), policy-attributable changes were estimated by applying a difference-in-differences (DiD) methods:
 - This method compares changes in methane emissions between policy-adopting and non-adopting states before and after implementation dates