

Anaerobic Digestion Facilities: Operators' Perspectives on Siting and More

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THE IMPORTANCE OF REDUCING

FOOD WASTE

and the work we do here...

FOOD FULL CIRCLE





Content

- 1 The impact of food waste
- 2 Our work summarized
- 3-4 EAE and Agri-Cycle metrics
- 5 How the operation works
- 6 How/Why food is wasted
- 7 Food waste scale & highest use
- 9-12 Program details and social justice



"We do this not because it is easy, but because we thought it would be easy."

01

Impacts of food waste

HUNGRY PEOPLE

WATER AND LAND USE

**LANDFILLING FOOD WASTE
PRODUCES METHANE**

**METHANE IS 40x BETTER AT
TRAPPING HEAT THAN CO₂**

**TRAPPING HEAT IN THE
ATMOSPHERE CAUSES
*"GREENHOUSE GAS EFFECT"***



02

How does it work?



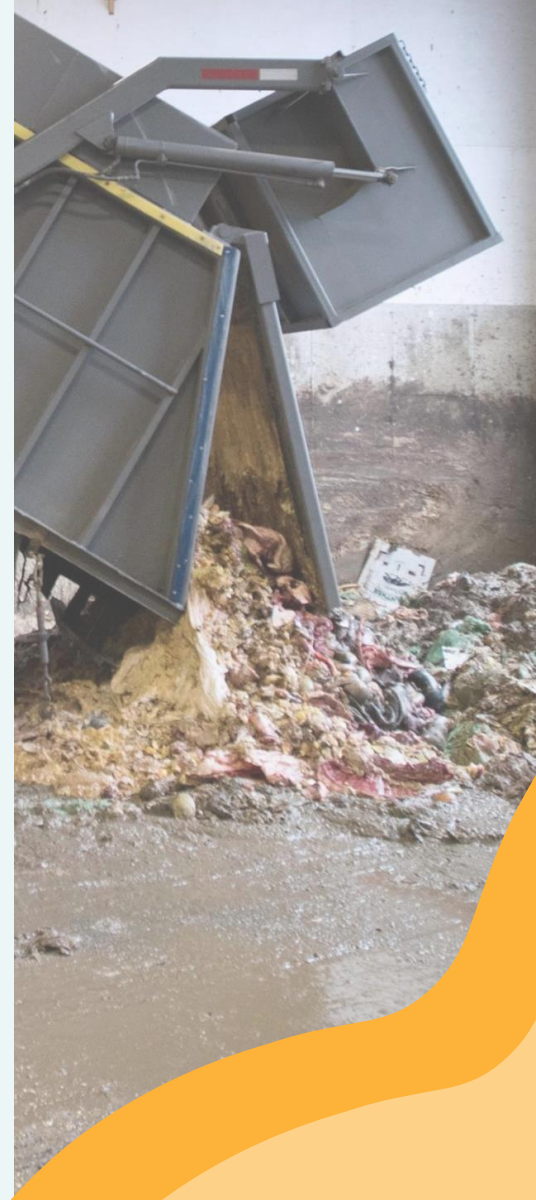
We collect food waste.
(liquids, solids, and packed food waste)



Process it via Anaerobic Digestion.
(In Exeter, and many other locations)



Electricity and fertilizer are produced.
(Instead of harmful greenhouse gasses)



03

eae 
exeter agri-energy



Top 5
Largest dairy ADs
in the USA



80,000
Tons of food
waste annually



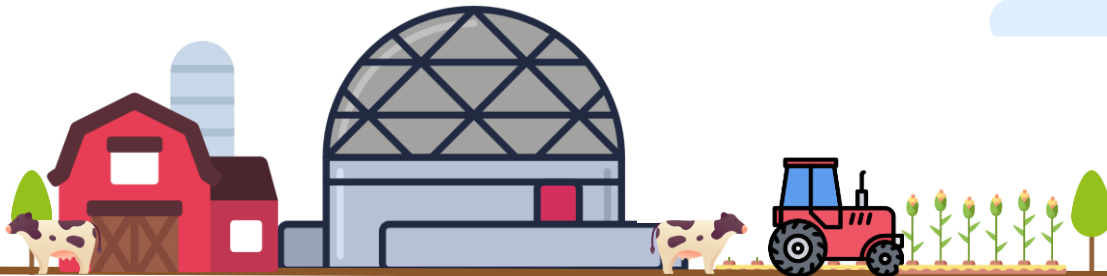
3,000,000
Gallons of
capacity



1,000
Milking head
of cows



3,500
Acres of land



04

Offsets & Impact



Tons of Food Waste Daily

300 +

Established in 2012



Totes Tipped (2017 – 2023)

1,372,227



Gallons Hauled (2017 – 2023)

19,886,246



Gallons of Gasoline Offset Annually

3,443,865

BASED ON EPA WARM MODEL



Homes Powered Annually

4,525

05



COLLECTION BODIES



LIQUID TANKERS



53 FT BOX TRAILERS



LIVE LOAD TRAILERS



ROLL OFF CONTAINERS

COUNTLESS STRATEGIC PARTNERS



DIVERSE COLLECTION FLEET

06

CONSUMER PSYCHOLOGY

Grocery stores are designed to make consumers purchase MORE.

This results in impulse buying, and *35%-45% of food wasted* buying more than we need.

RESIDENTIAL

TRANSPORTATION LOSS

Because consumers expect to have blueberries and tomatoes in December, foods are forced to travel more miles than ever before. A fraction of the products do not survive the journey as a result.

5-10% of food wasted

INSTITUTIONS

LABELLING

Date labelling is confusing. "Best by", "Expired by", and "Sell by". They all mean different things, and there are no federal standards for this language for consumers to go by.

25-35% of food wasted

RESTAURANTS

SHELF MANAGEMENT

Overstocking shelves, particularly with produce, results in more damaged food AND sacrificing a large portion of the product solely for presentation. Think apple pyramids.

5-10% of food wasted

PROCESSORS & MANUFACTURERS

SERVING STYLE

Buffet style and tray usage prompt people to take as much as possible.. resulting in plate waste. Studies suggest each student produces 3 ounces of FPW (food plate waste) per meal...

GROCCERS

07



PROGRAM DETAILS

- **All Food Waste** – *Packaged or Separated*
 - Every area/department participates.
- **Supporting Highest Use**
 - Reduction and donation with signage, emphasis, and resources.
- **Proactive Program Maintenance**
 - Participation metrics monitored and triggers outreach to store management.
 - Scorecard
 - Quarterly surveys



STANDARDIZATION



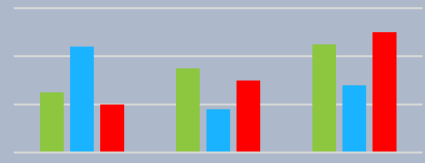
- Single Point of Language
- Multiple Standardized Processes
- Bilingual Signage

SITE SPECIFIC SOPs

SIGNAGE



REPORTING



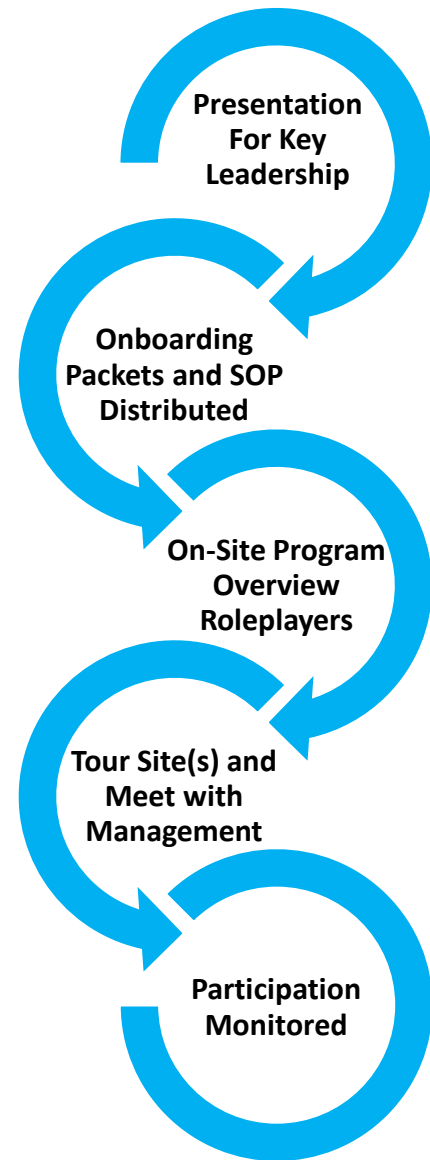
AR DS AFO
 ■ Donation ■ AD ■ Trash

CONTAINERS



10 ONBOARDING

- **Concise Onboarding Packet and SOP**
 - Thorough Q&A for all roleplayers
- **Best Practices For Impact AND Savings**
 - Donations, reduction and loss prevention
 - Refrigeration
 - Bulk-loss management
 - Other cost savings
- **Issue Monitoring**
 - Low participation triggers
 - Recurring education and outreach



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FOOD
WASTE
RECYCLING

Reduction
and
donation
support

Rendering
and meat
vendor
consolidation



Participation
tracking

Large
volume loss
support

Distribution
center
support

**VALUE
BEYOND
THE
TOTES**



OBLIGATION TO PROMOTE HIGHER USE PATHWAYS

- emphasize onboarding
- integrated into all comm.
- data analytics



RESOURCES FOR REDUCTION & DONATIONS

- donation network
- signage (multilingual)
- education materials



POLICY ENACTMENT AND SUPPORT

- food waste bans
- labeling
- grant fund cosigning



NAVIGATE DIFFICULT TOPICS

- consumer virticism
 - compostable-ware
- dumpster diving
- geopolitics

FOOD WASTE & SOCIAL JUSTICE



CONTACT



CONTACT



NEWMOA



AGRI-CYCLE

ME DIRECTLY

REGISTRATION





Anaerobic Digestion

Operators Perspectives and Siting

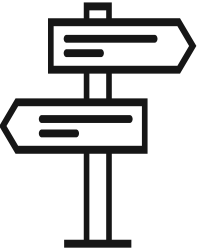


Complete Organics Recycling Campus In The Northeast, U.S.



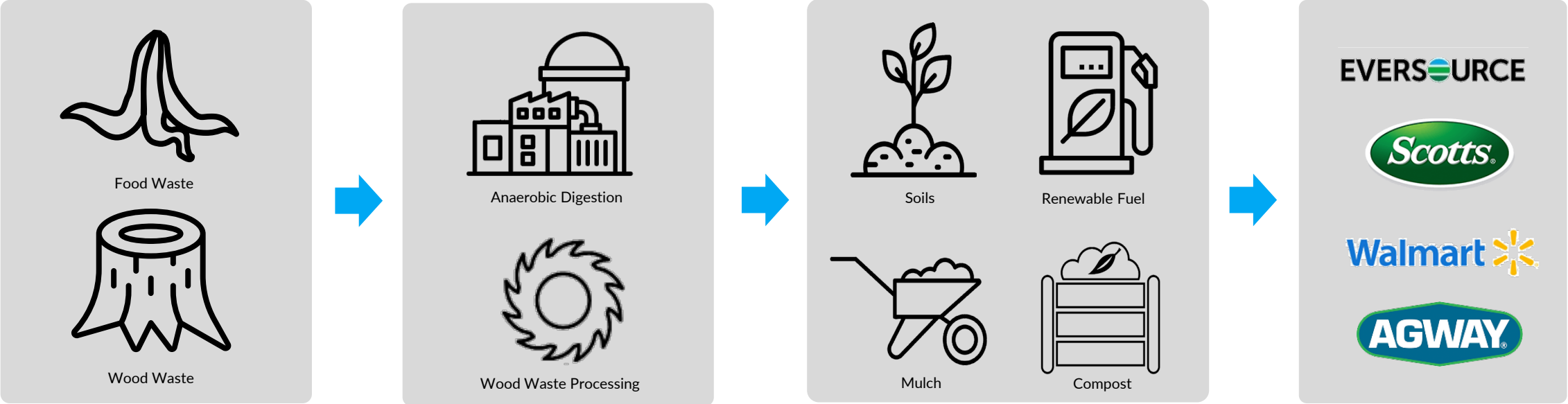
Landfills across the Northeast, U.S. continue to limit capacity and close at a rapid pace. As disposal capacity tightens, disposal rates are rising driving a legislative and regulatory emphasis on recovering recyclable materials from the waste stream. QBP & SFP's combined platform are the alternative to landfilling in the Northeast, U.S. The current business, on one campus, targets 40% of the waste stream that can be recycled; food waste and green waste. The platform, people and businesses are ready for enhanced utilization and scaling to become the leading organic waste recycling team in the Northeast, U.S.

Our Process & Feedstocks



Organic Waste Recycling

- [Quantum Biopower](#) & [Supreme Forest Products](#).
- Our campus is operated by two companies that process organic materials.



40,000 tons/year of food waste and ~200,000 tons/year of wood waste processed on campus

Waste is turned into materials and electrons in the form of energy and soil amendments.

Energy and materials are sold to our partners.

Anaerobic Digestion



SOUTHINGTON, CT

Digester Facts

- Recycled 110,000 tons of food waste since 2017.
- Produce renewable electricity for the Town of Southington.
- Nationally recognized recycling facility.
- Many write-ups in New York Times, Hartford Courant, Biocycle.

Operation

- Thermophilic reaction – 128F
- Depackaging facility + robust means of treating food waste.



40,000 Tons

Yearly food waste processing capacity.

10,700 MWh

Annual energy output.

5,080 Tons

Yearly offset of CO2 emissions.

8,000 Tons

Compost and soil amendments.



Operations

- Permitted under CT DEEP Volume Reduction Permit (Solid Waste).
- CT DEEP NSR (Air Permit)
- Litany of additional state/local permits
- Key to our success – Education.
- Spent a substantial amount of time with local and State stakeholders to educate on our processes and the nature of our business.
- 30 month permitting process, 12 month build timeline, 12 months commissioning.



We turn leaves, yard waste, and residuals from the digester into compost and soils

We recycling green waste (stumps, brush, leaves, grass) into bark mulch and soils.

The Anaerobic Digester turns food waste into energy. It also produces leftover materials that go to composting.

Facility Siting & Footprint



Siting

- +/- 5 acres
- Compact footprint
- Vertical tanks and steel building
- Quiet - inaudible from 100 ft.
- No odors – reverse air capture system
- Less than 30 trucks/day
- Its all about the operations team. Nice presentations at town hall sometimes don't correlate to a well run operation. Operations is where facility owners and permit issuers should always focus.

Compost & Soil Production

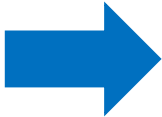


- Developed a 100% Organic Compost Blend Product
- Worked for 36 months to design an organic compost blend
- Excellent organic source of organic N/P/K

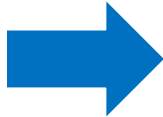


Digestate residuals

Organic N: 6%
Organic P: 2.5%
Organic Potassium: .5%

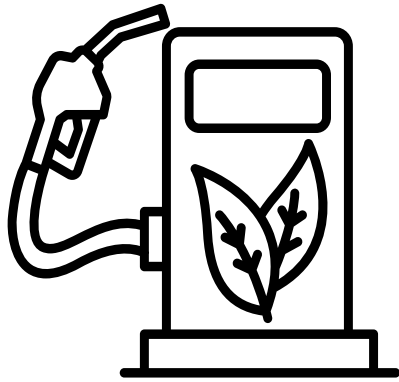


Finished Compost



Grow Study

2-3X growth compared to regular compost
Stronger plant rooting and leaf vigor



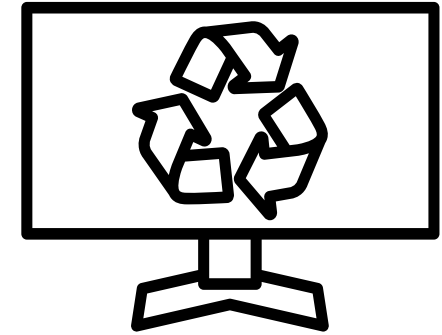
Renewable Natural Gas

Creating RNG as a transition fuel to lessen our demand on traditional fossil fuels. RNG production from recycled food scraps.



Sustainable Aviation Fuel

Partnering with companies and technology groups to decarbonize large transportation segments like aviation.



Waste Technology

Working with our academic partners to advance technology in critical need areas, ie. forever chemical sequestration/destruction, advance material processing.



Thank You

Brian Paganini
Vice President – Quantum Biopower





Bioenergy Devco transforms organic food waste into renewable energy and healthy soils, empowering states, communities, and companies to accelerate their environmental and decarbonization goals.

OUR FACILITIES

Maryland Bioenergy Center

THE MARYLAND BIOENERGY CENTER is located on the Maryland Food Center Authority campus, home to the region's largest food processors and distributors.



LOCATION: Jessup, MD

FEEDSTOCKS: 110,000 tons/year of food residuals, FOG, and other similar organics

GAS PRODUCTION: 310,000 MMBtu/year

Process



Innovation at Scale

While the science remains the same, the process can take many shapes.



Urban Digestion

Rural Digestion

Co-digestion

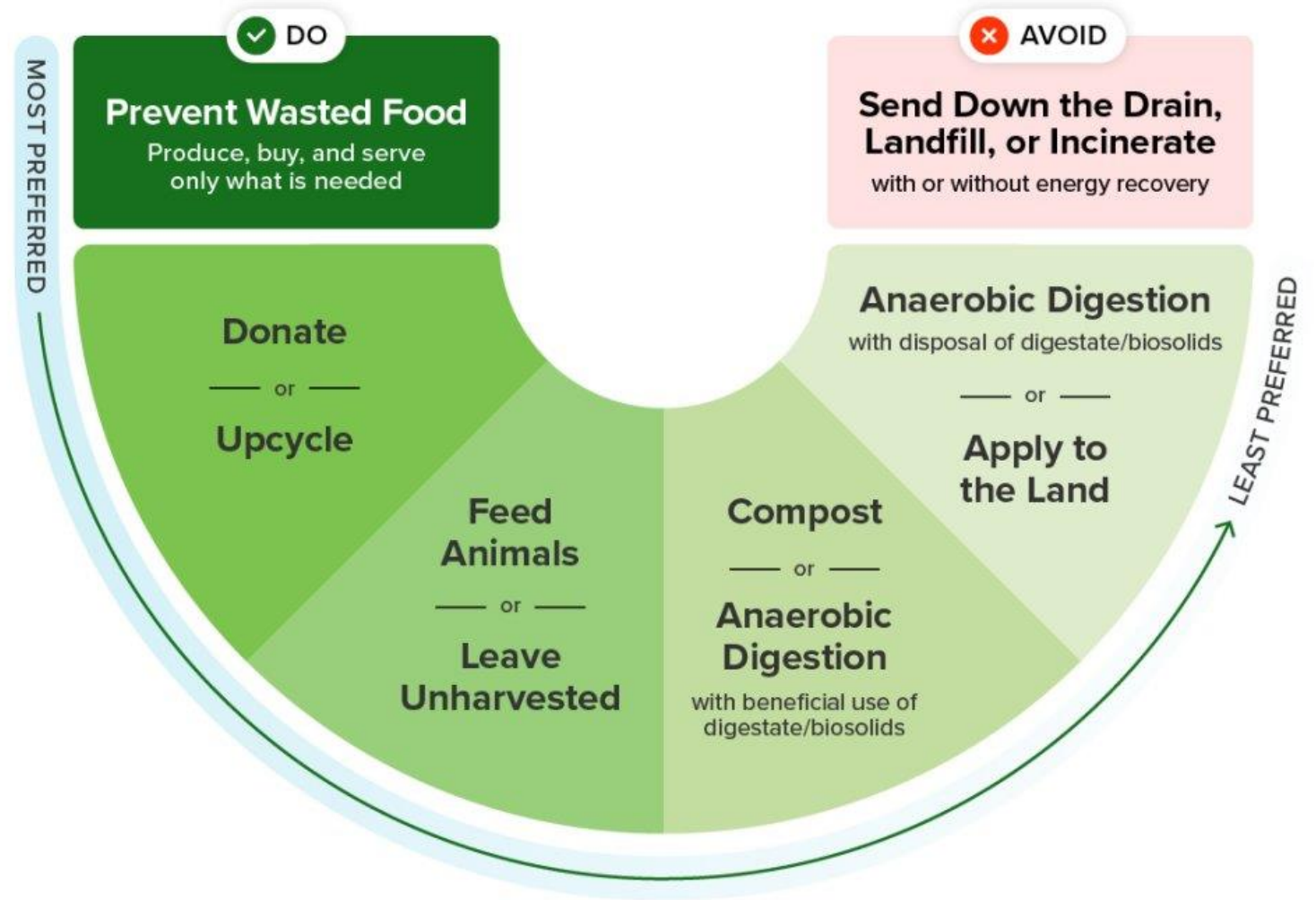


Wasted Food Scale

How to reduce the environmental impacts of wasted food

Organic Waste Diversion

What you put in determines what you get out



October 2023



Unsustainable Waste Management Solutions

Landfill

- Nearing capacity
- Bans on disposal of organics
- Continued increase in average tipping fees, rising ~3% annually since 2016
- Un-captured landfill gas venting CO₂ and methane into the atmosphere
- Leachate leaks cause groundwater pollution

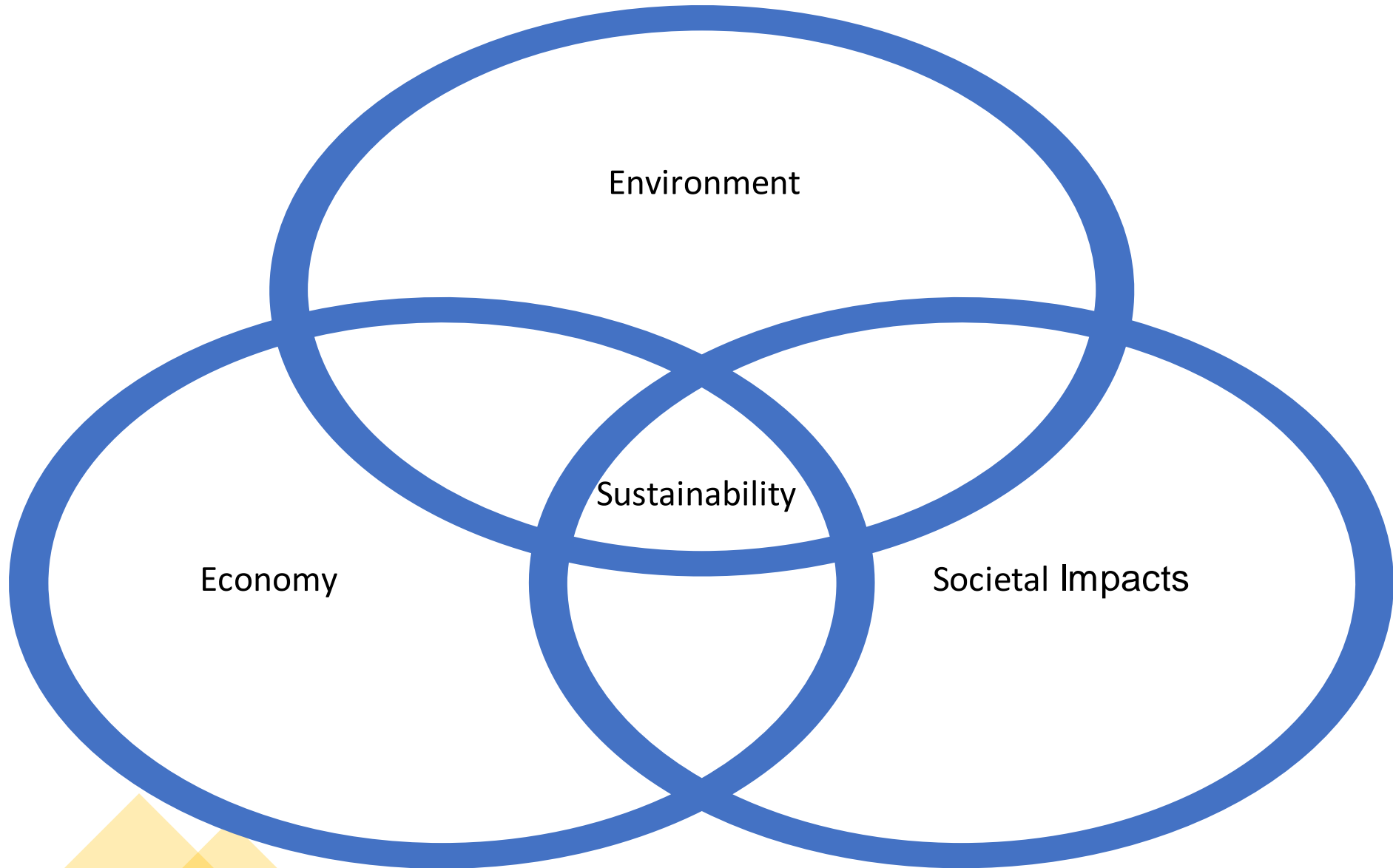
Land application

- Offensive odors and pathogen risk
- Increasing public opposition
- Limited amount of waste that can be applied
- Excess nutrients pollute soils and waters, killing wildlife

Incineration

- Aging plants and costly maintenance
- No new sites built since the 1990s
- Air pollution from incineration disproportionality impacts low-income communities where facilities are located





Environment

- Due to the rapid climate impacts and increased attention environmental legislation is proliferation at federal and state levels.
 - Air Quality
 - Water Quality
 - Soil Quality



Economy

- Grants to support organics recycling industry will create multiple new associated industries in AD and composting facilities, as well as hauling and transfer stations. Each of these sub-industries will bring new revenue streams, and jobs while building resiliency.
- Legislating Fertilizer independence- Much of the commercial fertilizer used in the US is imported.
- Legislating Renewable Energy Diversity- Capturing and refining methane gas is a continuous energy source with a reliability rate of 95%. The average reliability rate for solar power is 25% and 35% for wind power
- Legislating procurement practices for government agencies to include recycled content.





Societal Impacts

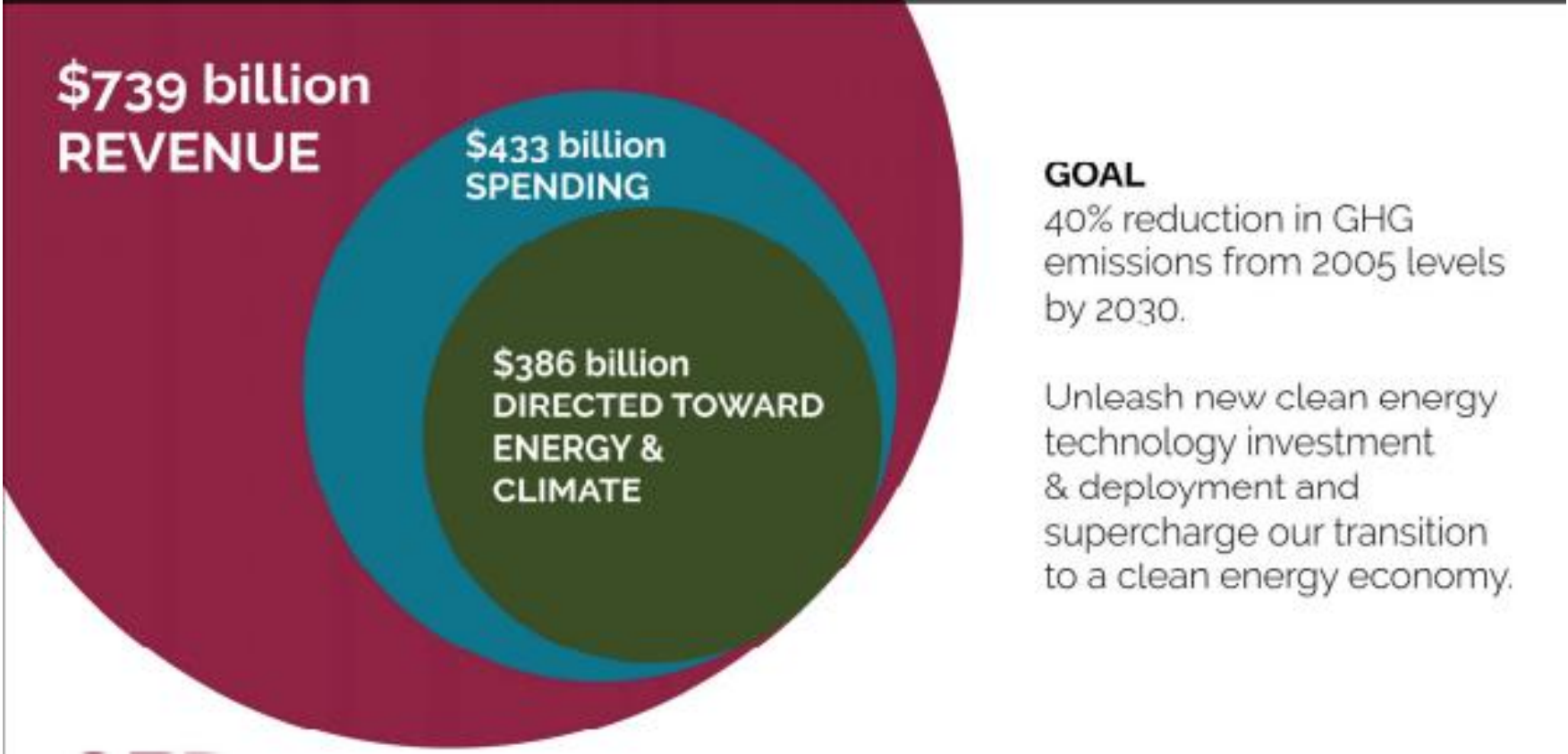
- **Community Health:** Diverting organic materials from landfills and incinerators mitigates societal impacts of the existing waste industry.
- Legislative and Regulatory EJ concepts need to be based on potential improvements to existing processes.
- Implementing new technologies can improve the soil, air, and water
 - Water- land applications, mitigating agricultural runoff and recycling the water for beneficial reuse locally in region
 - Air-Reducing the release of GHG impacting the climate.
 - Soil Health- Critical for vegetative growth and control of heat island impacts.

Federal Action

- **U.S. Methane Emissions Reduction Action Plan** identified reducing food waste in landfills as an Administration action to reduce methane emissions.
- **Recent EPA report** estimates that Of the 66 million tons of wasted food, 75 percent are landfilled or combusted. An estimated one percent is managed by anaerobic digestion. They have set a goal of a 50% recycling rate by 2030.
- **The USDA Climate Smart Agriculture and Forestry Strategy** is set to achieve complementary goals supporting the reduction of methane emissions.

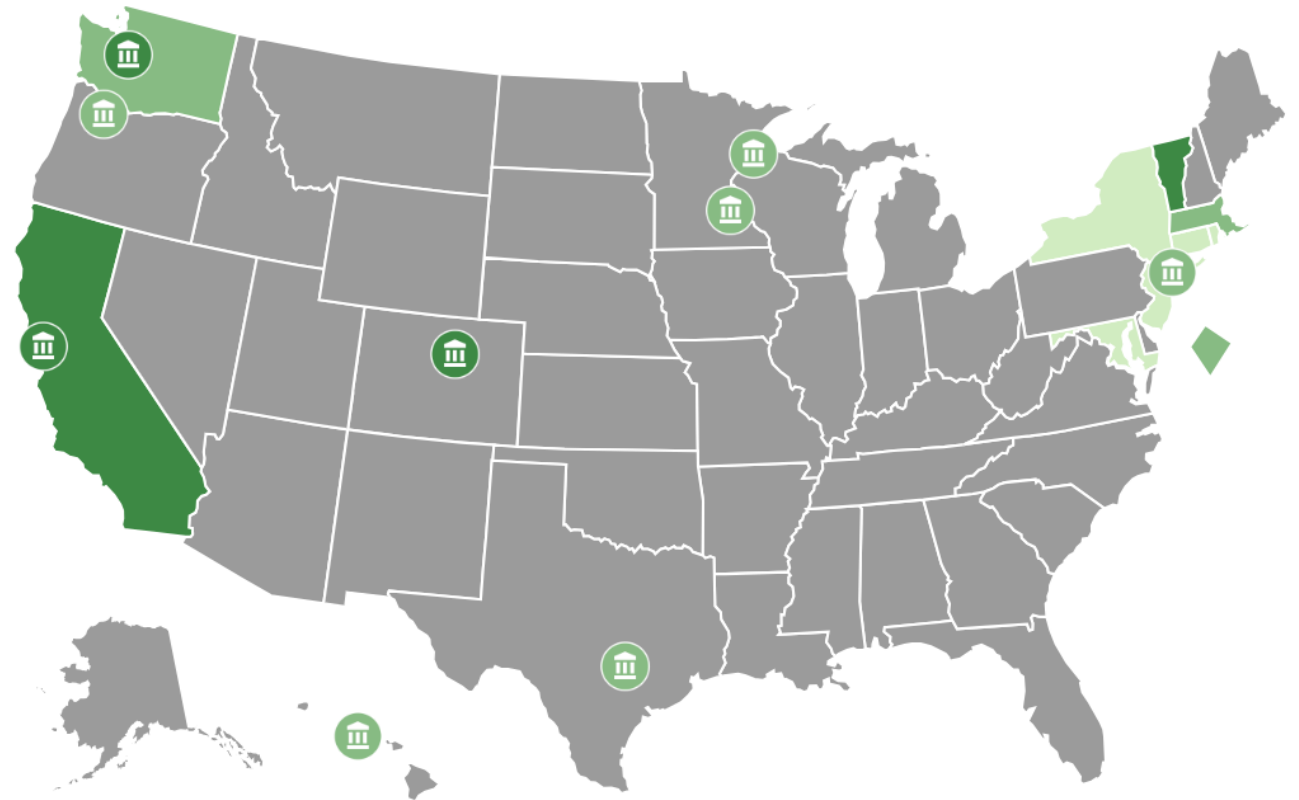


Inflation Reduction Act directs \$386 billion toward and Climate goals



State Momentum for Waste Diversion

- A growing number of states are adopting waste diversion policies at the state and municipal level.



-Municipal Policy

Shaded Green - State Policy

*Map source: Refed.org

2017- HB 170- Organic Materials Diversion and Infrastructure –

Requires MDE to assemble a workgroup to make recommendations regarding the diversion and recycling of organic material from refuse disposal.

2019- HB510- Organics Recycling –

Defines the terms “anerobic digestion”, “organics recycling”, and “organics recycling facility” to the Environment Article. Prohibiting the owner or operator of a refuse disposal system from accepting loads of separately collected organic waste for disposal unless the owner or operator provides for the organics recycling of the organic waste.

2021- HB264 - Organics Recycling and Waste Diversion –

Requires generators of large quantities of “food residuals” to separate the food residuals from other solid waste and ensure that the food residuals are diverted to an organics recycling facility.





- **2022 -HB566 - School Waste Disposal Infrastructure**

Requires the Interagency Commission on School Construction (IAC) to adopt regulations that require a local school system to **include waste disposal infrastructure in the design.** “Waste disposal infrastructure” is defined as (1) a place for the disposal of trash, recyclables, and food scraps and a sink for liquid waste in new schools.

- **2023- HB586- State Procurement Purchasing Preferences**

Requiring each unit of State government to give **preference to products produced from recycled and organic materials** when purchasing compost, mulch, or other soil amendments; and generally relating to the procurement of compost, mulch, aggregates and soil amendments.



What are Other states doing?

Connecticut

Requires select entities that produce over 26 tons of organic waste per year, including supermarkets, resorts, and conference centers, to separate food waste at an organic waste facility

Massachusetts

Has an organic waste ban that covers any business that generates more than one ton of food waste per week with no exceptions to the ban based on proximity to a processing facility



New Jersey

Requires all food waste producers that generate 52 or more tons of food waste per year to separate and dispose of organic material in a food waste recycling facility. Requires that businesses producing up to 2 tons of food waste per week must either donate leftover food or dispose of food waste at an organics recycling facility.

Oregon

Offers farmers a tax credit worth 15% of the market price for any crops or livestock donated to charity or a food bank that distributes food for free. The state also requires businesses that handle food to source-separate food waste and send it to a facility



Vermont

Has a universal recycling law that bans food waste from landfills and requires they be donated for human or animal consumption, or composted at a processing facility

Washington State

Has a Food Waste Reduction law to reduce food waste by 50% by 2030. Businesses generating 8 cubic yards or more of organic waste per week will be required to subscribe to an organic waste removal service and will gradually decrease leading up to 2030





Thank you.

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