

County Emission Update & Zoo Anerobic Digester Study

Sustainability Task Force – July 28, 2022

Presented by:

Sarah Knott, Climate Action Intern

Gordie Bennett, Sustainability Director

Department of Administrative Services
Facilities Management Division



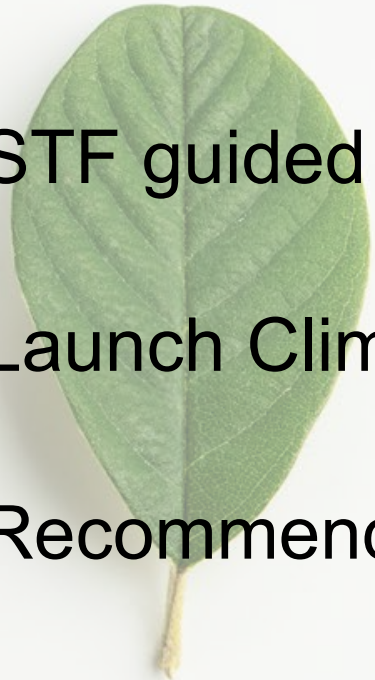
Introduction – Sarah Knott

- Marquette U. Senior - Environmental Studies
- Climate Action Intern for Summer 2022
- Greenhouse gas emissions inventory
- Zoo anerobic digester study



Emissions Update - Background

- Achieve carbon neutral operations by 2050
- First-ever emission inventory in 2020
- STF guided planning framework in 2021
- Launch Climate Action 2050 Plan in Sept. 2022
- Recommending Energetics as consultant



Emissions Update - Methods

- Local Government Operations Protocol
- Operational control approach
- Estimated emissions w/ ICLEI ClearPath
- Assumptions & limitations:
 - AR5 emissions factors and 100-year GWP values
 - Vehicle classes based on MPGs not weights
 - Fleet fuel use estimated from MPGs and VMTs
 - De minimis emissions: refrigerants & landfills



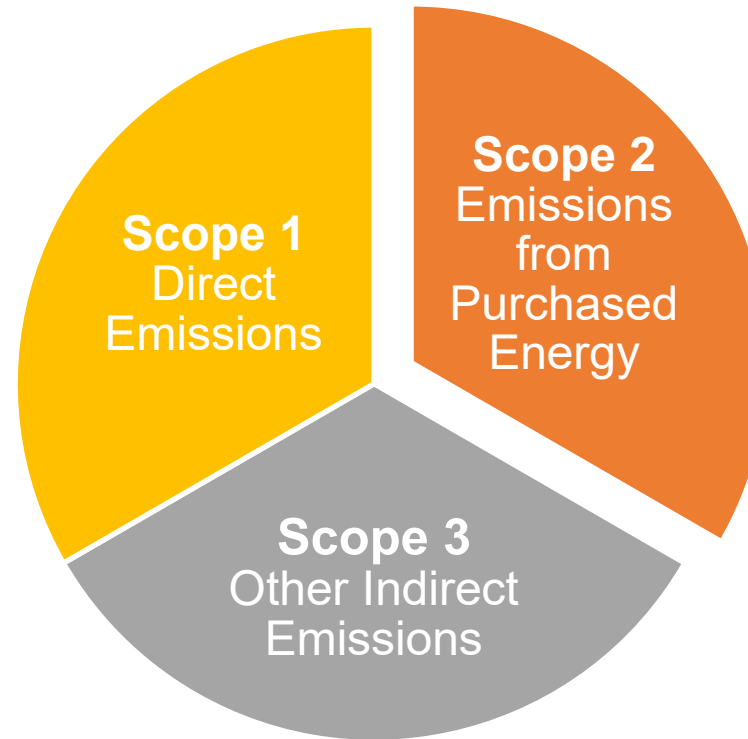
Emissions Update – Activity Data

Scope 1

- Natural gas
- Refrigerants
- Diesel generators
- Fleet vehicles & equipment
- Transit vehicles & equipment

Scope 2

- Purchased electricity
- District steam – County Grounds
- District steam – Downtown
- District cooling – County Grounds



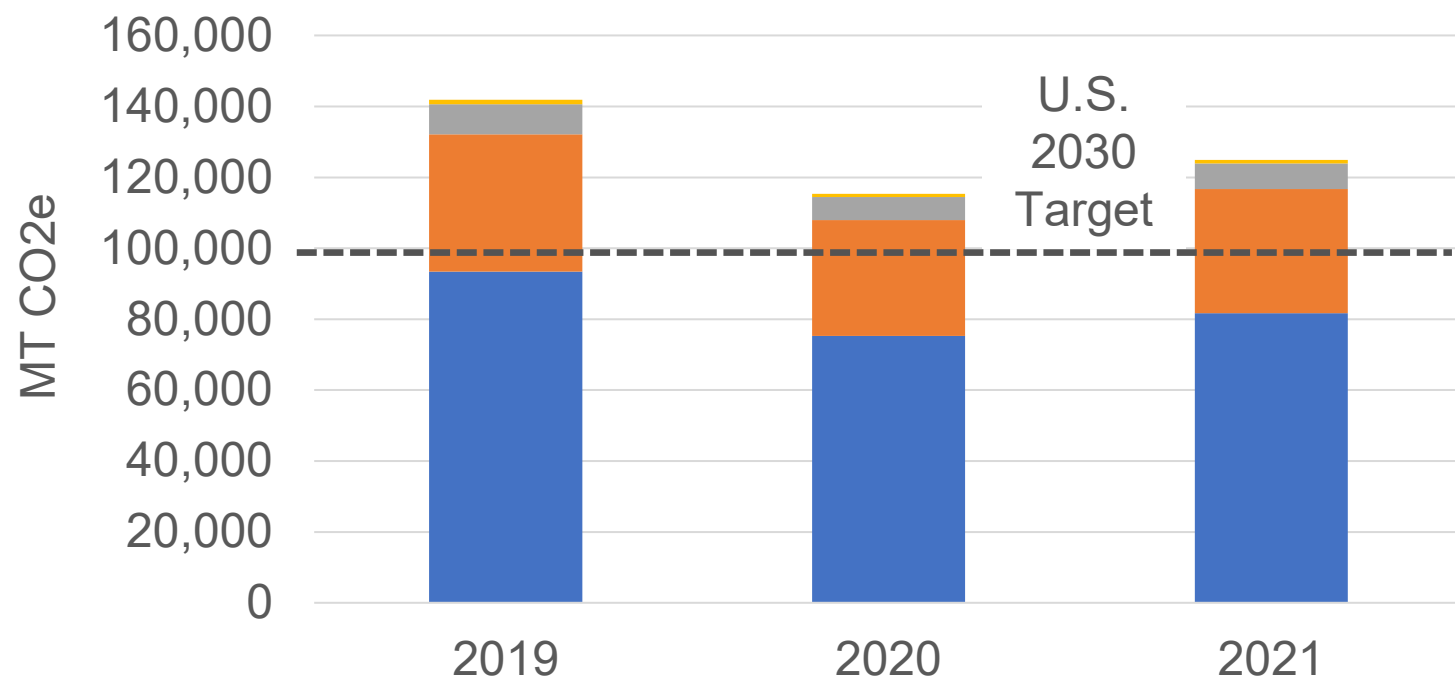
Emissions Scopes

Emissions Update – Top Sources

#	Sources	2019 Emissions (MT CO2e)	2021 Emissions (MT CO2e)	% Change
1	Purchased Electricity	52,737	46,602	-12%
2	Buses (Diesel)	38,456	34,719	-10%
3	Natural Gas	24,309	21,627	-11%
4	District Steam – Downtown	11,546	8,786	-24%
5	District Steam – County Grounds	4,220	3,866	-8%

- Same sources as previous inventory (2016-2018)
- Since 2019, each of these emissions decreased!

Emissions Update – Overall Progress



- 12% decrease in emissions from 2019-2021
- 18% additional reduction needed to achieve 2030 target for U.S. (50% below 2005 emissions)

■ Buildings & Facilities
■ Vehicle Fleet

■ Transit Fleet
■ Streetlights & Traffic Signals



Zoo Anerobic Digester Study

- Opportunity to reduce emissions?
 - Turn animal waste ('Zoo poo') to energy
 - Offset electric or natural gas use
 - Reduce landfill waste + costs



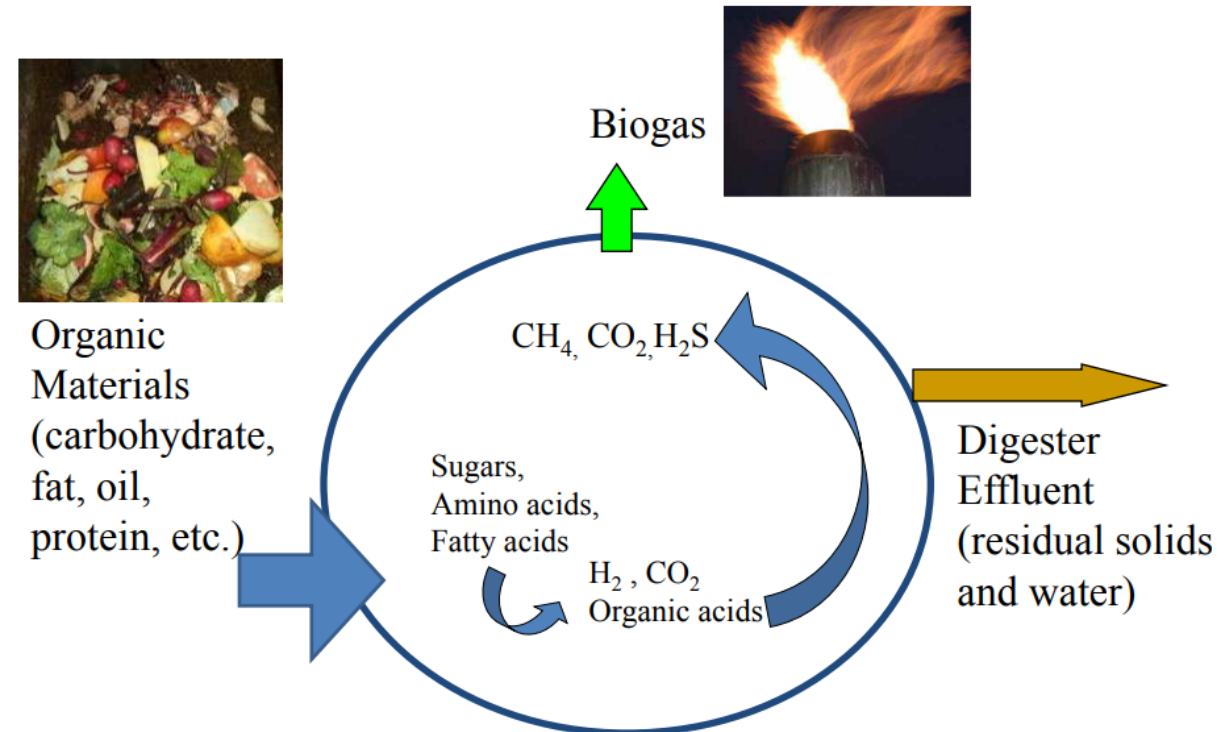
Credits: Detroit Zoo



<https://www.biofermenergy.com/>

Zoo Anaerobic Digester Study

- What is an anaerobic digester?
 - Process of treating organic waste at high temperatures
 - Uses microorganisms to breakdown waste in absence of O_2
 - Biogas can replace natural gas or electricity use
 - Digestate can be used for fertilizer or compost



Zoo Anerobic Digester Study

General pros and cons of digesters:

- + 'Free' renewable energy
- + Reduced landfill waste + emissions
- + Potential for compost bi-product
- Staffing and time commitment
- Expensive, can have long payback



Zoo Anerobic Digester Study

- MKE Zoo site visit to visualize waste patterns

Herbivore waste
to be composted



Commercial
composting site

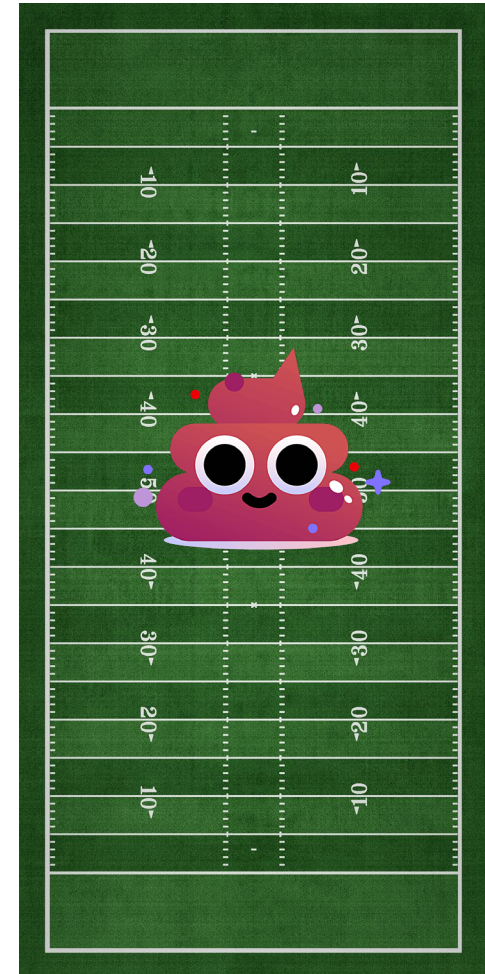
Biosecurity/Zoonotic
animal waste
(gorillas, bonobos,
parasitic waste, etc.)
that goes to landfill



Zoo Anerobic Digester Study

- Estimated annual waste based on:
 - 7 days at Apes of Africa and Primates exhibits
 - 4 days at Big Cat Country exhibit

Exhibit/Animal	Total Waste (kg/yr)
Apes of Africa – Bonobo	148,336
Apes of Africa – Gorilla	68,109
Primates – Orangutan	15,768
Big Cat Country	30,477
Primate & Carnivores total	262,690



Zoo Anerobic Digester Study

**Payback
~17 years**

Estimated costs and savings – Zoo animal waste*:

Waste volume	85,506 lbs/year
Digester size	~3,000 gallons
Biogas generation	10,130 kBtu/year

Est. Savings	
Natural gas replacement	\$460/year
Electrical replacement	\$563/year
Landfill diversion	\$5,930/year
Total:	\$6,953

Est. Costs	
Biodigester tank	~\$20,000
Controls, Pumps, Instruments	~\$60,000
Installation	~\$40,000
Total:	~\$120,000

*Methodology from 1995 Zoo consultant study

Conclusions

- Digester may not be cost effective; however:
 - Consider rising cost of energy
 - Test energy and water content of waste
 - Factor operation + maintenance costs
- Consider 'deeper dive', include food waste?
- Making progress toward reducing emissions
- Climate Action 2050 Plan will drive future actions



Acknowledgements

Thanks to everyone who supported this project!

- Katie Bainer
- John Blonien
- Victor Campagna
- Stu Carron
- Tom Dragotta
- Maura Ducharme
- Greg Failey
- Thomas Lenihan
- Matt Lapshan
- Chelsea Malacara
- Amy Martin
- Jim Moon
- Gerry Otto
- Blake Prusak
- Rory Peters
- Mark Rapant
- Alan Sackmann
- Josh Solorio
- Steven Sturdevant
- Charlie Wade
- Derrick Watson
- Kari Williams & Zookeepers
- Knowledge Services
- We Energies
- MRMC Thermal
- All who provided data!





**MILWAUKEE
COUNTY**