

Northeast Residuals and Biosolids Conference 2017

Impact of Greenhouse Gas Emissions on Biosolids Management Decision Making

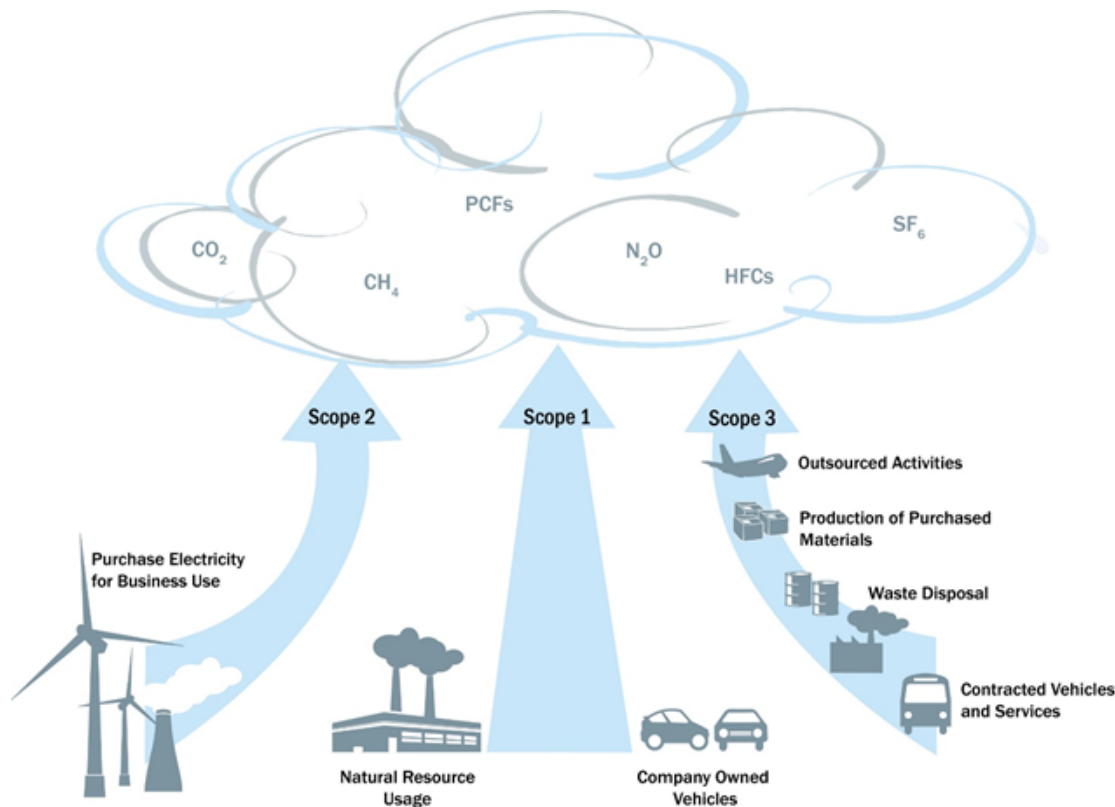
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Tracy Chouinard

T 978.983.2047

tchouinard@browncald.com



Outline

- Overview of Greenhouse Gases (GHG)
- Example of GHG in Biosolids Management Planning
- Summary

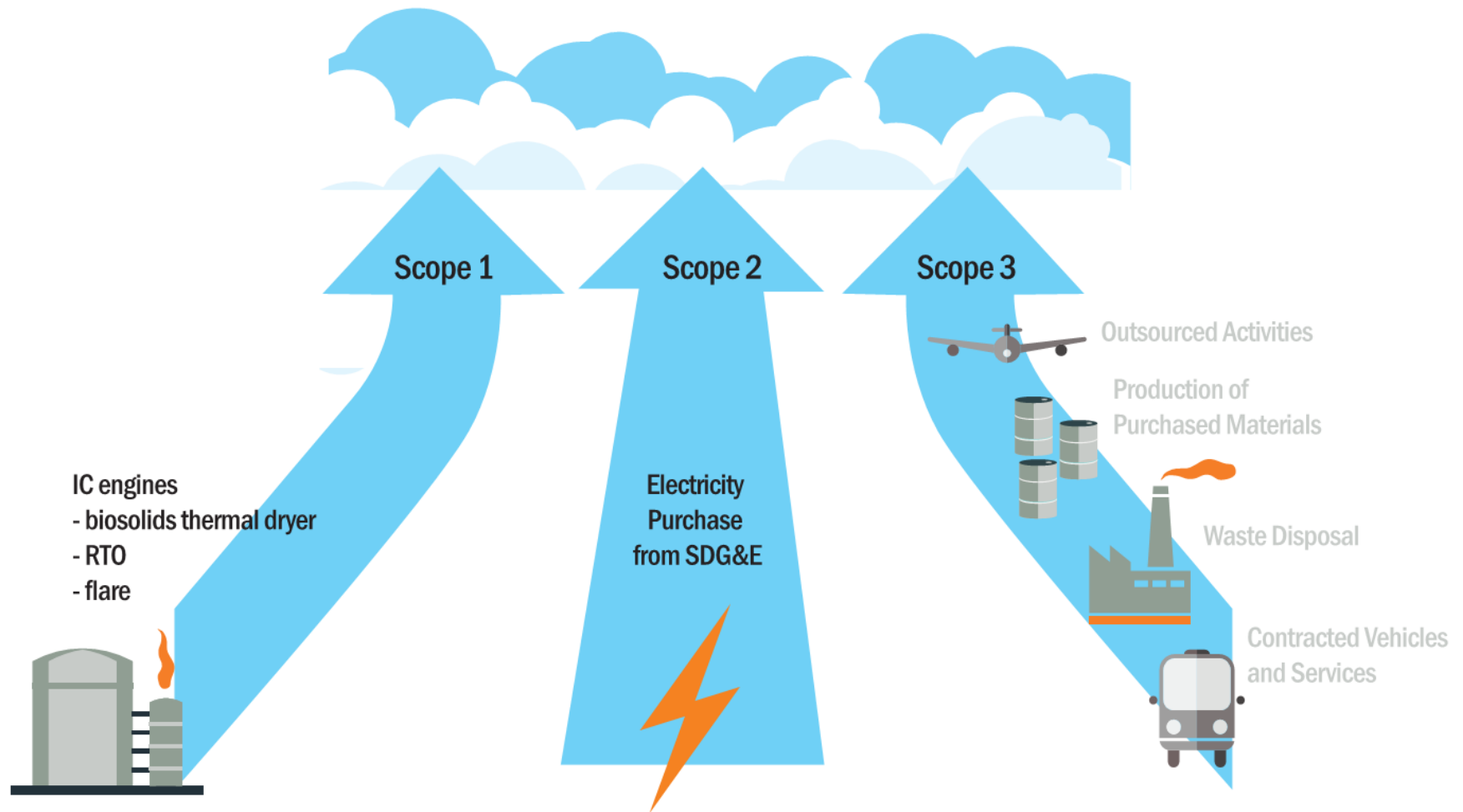


Greenhouse Gas Background

Greenhouse Gases

- Gases that trap heat in the atmosphere
 - Carbon Dioxide (CO₂)
 - Methane (CH₄)
 - Nitrous Oxide (N₂O)
 - Fluorinated Gases (e.g. CFCs and HFCs)
- EPA: The goal is to reduce Scope 1 and 2 emissions 46 percent by FY 2025 and reduce Scope 3 emissions 35 percent by 2025. (Executive Order 13693)

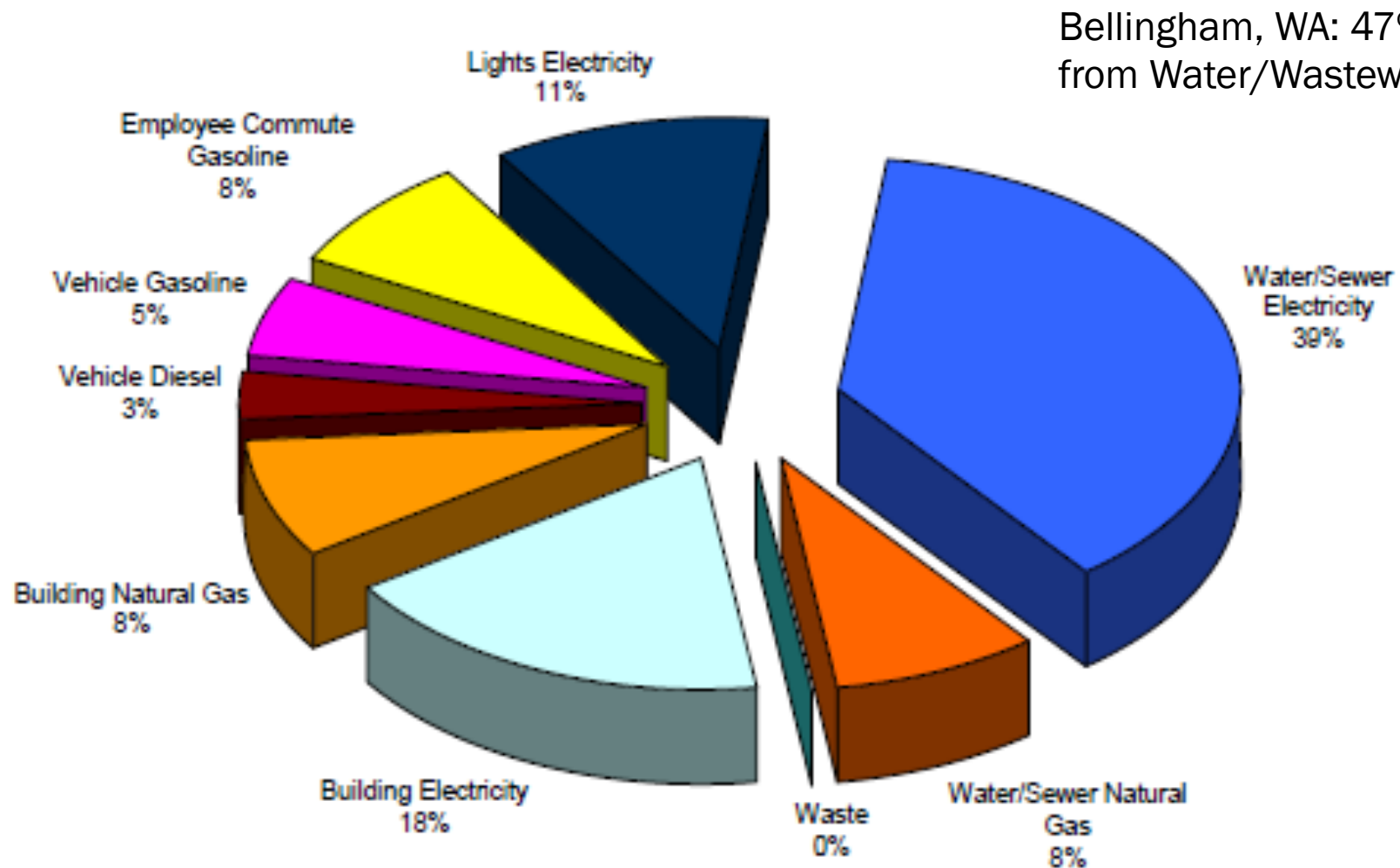
GHG Emission Types



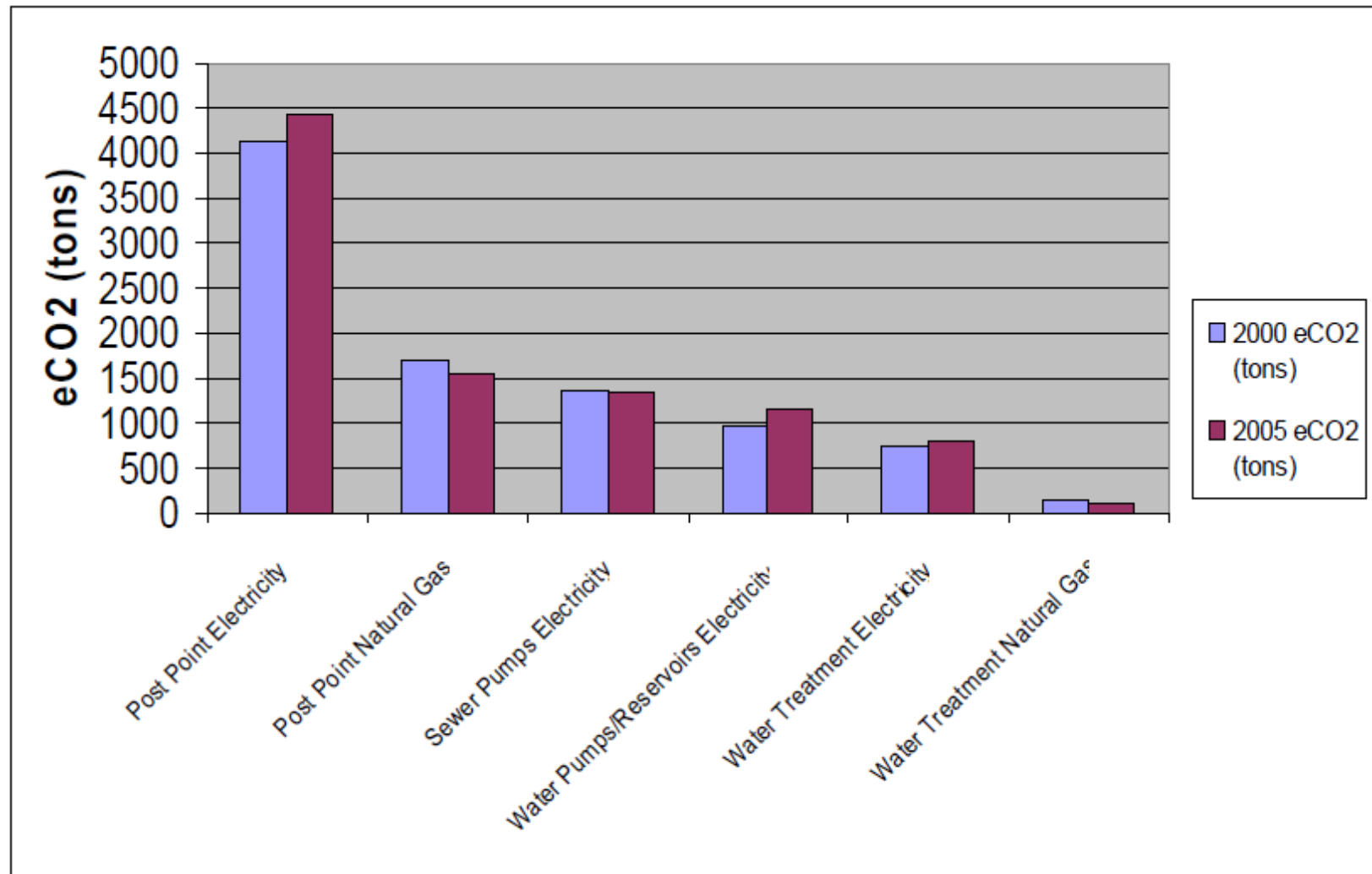
Why Track GHG?

- GHG Emission Tracking and Reduction
 - King County, Washington
 - Columbus, Ohio
 - Flagstaff, Arizona
 - Bellingham, Washington
- Clean Energy Initiatives
 - King County – clean energy transit
 - Minneapolis - utilities partnerships for new clean energy options
 - Westchester County, NY - utilities partnerships for cleaner, cheaper energy options
- Grant opportunities
 - California - Greenhouse Gas Reduction Grant and Loan Programs to help fund new infrastructure projects, which resulting GHG reduction

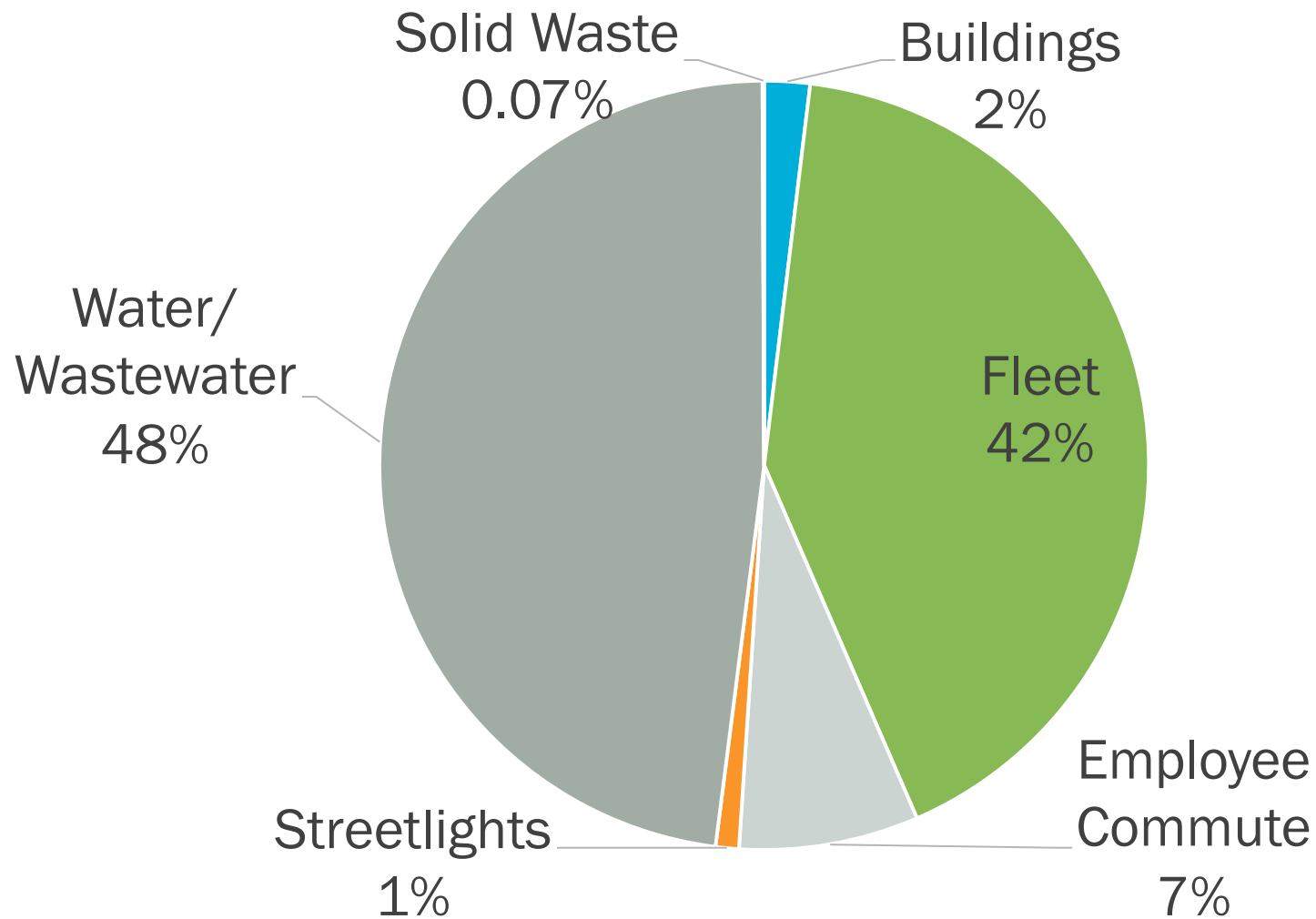
Why should municipalities track GHG?



Bellingham Breakdown of Water & Wastewater



Tacoma Municipal Operations GHG Emissions



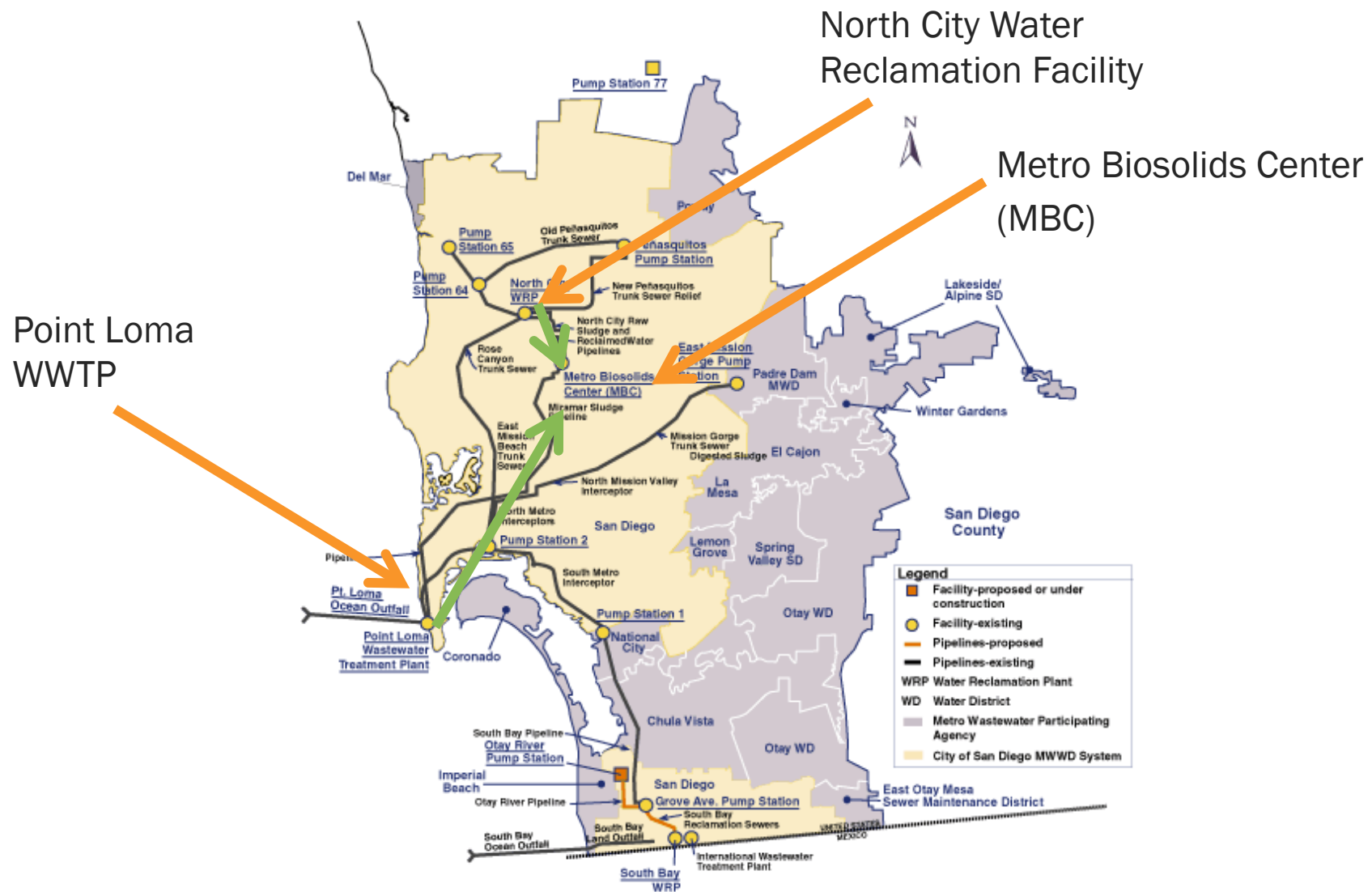
Types of Models and Calculators

- EPA: GHG Equivalency calculator
 - Calculates CO₂ emissions from areas such as electricity use and fuel consumed (scope 1 and 2)
 - Does not provide carbon sequestration benefits
- The Community Protocol (Local Governments for Sustainability USA)
 - International Council for Local Environmental Initiatives
- BEAM: Biosolids Emissions Assessment Model
 - Excel based model that accounts for Scope 1, 2, and 3 emissions.
 - Carbon sequestration benefits
 - Focuses on processes associated with solids handling and transportation



GHG in Biosolids Management Plan

City of San Diego Service Area



Source: <https://www.sandiego.gov/mwwd/general/servicearea>

Alternatives Evaluated

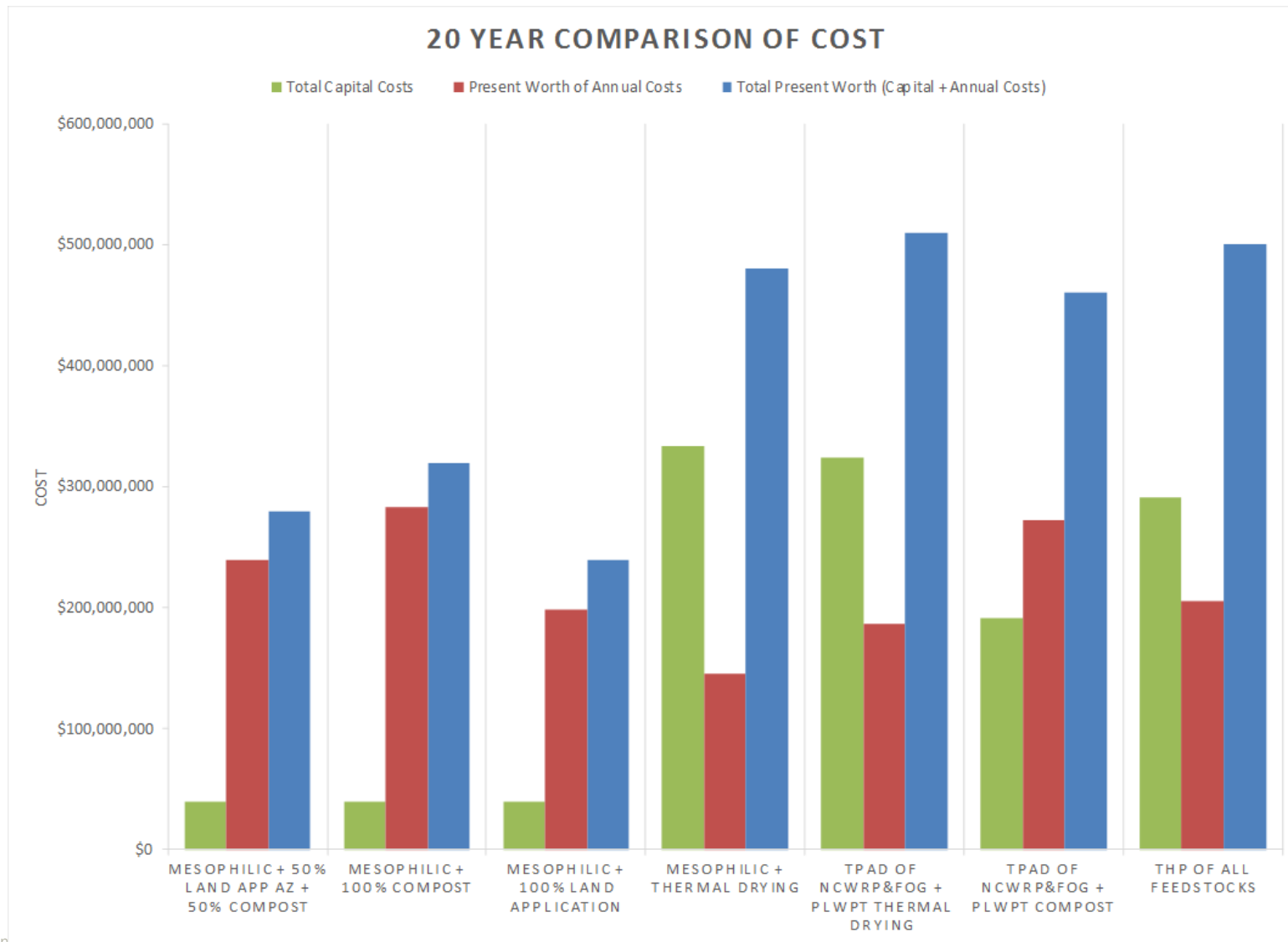
- Mesophilic – Land Application
- Mesophilic – Land Application and Compost
- Mesophilic – Thermal Dryers
- Temperature Phased Anaerobic Digestion - Land Application
- Temperature Phased Anaerobic Digestion - Thermal Dryer
- Thermal Hydrolysis - Land Application

Solids Water Energy Evaluation Tool

Baseline-TD Output Summary		
Final TS, Wet (WT/D)	199	
NG Req. (cfh)	0	
LFG (scfm)	8975	
NG equivalents (cfh)	324	
Total Aux Fuel Req. as NG (cfh)	0	
Electricity Req. (kWh)	6195	
Power Generation (kWh)	3466.328	
Net Power (kWh)	-2728	

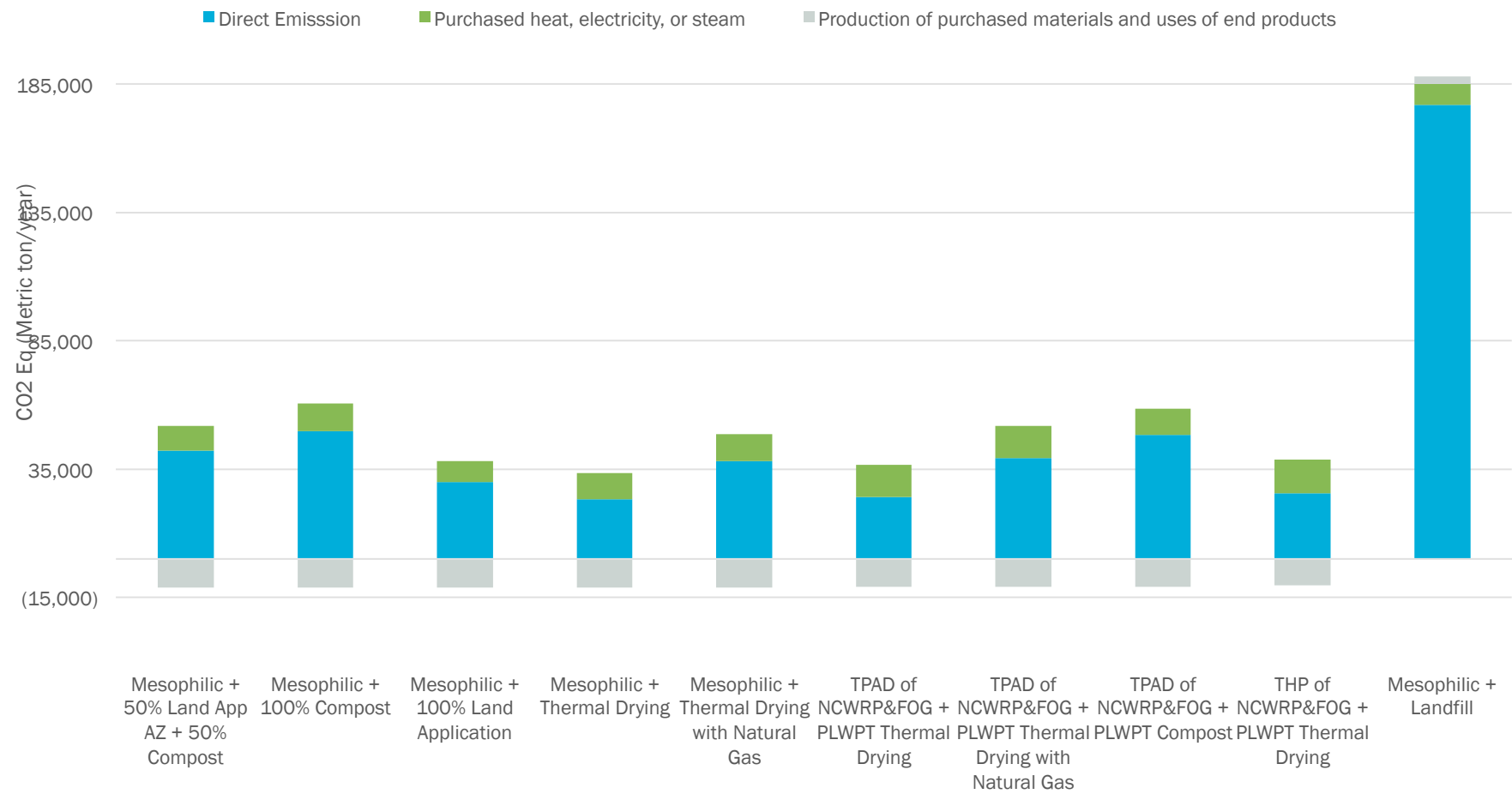
Dry Mass Flow		13330	PPD	Centrifuge		30024	PPD	Digester (Meso)		262423	PPD	Centrifuge		Dryer	CHP Engine	30% LA to AZ	40% Fertilizer Blend	30% Bulk Hort	
TS	0.5%			90%		6.0%		VSR	52.0%	2.7%		95%		90.0%		107718	143624	107718	
VS	76%			5.1%	Capture TS	93%		Duty No.	3	49%		28%	Capture TS			90.0%	90.0%	90.0%	
Calorific Value	10,000	Btu/lb VS				10,000	Btu/lb VS	Duty No.	3							54%	54%	54%	
Feedstock Type		NCWRP Sludge		NCWRP Sludge		FOG		PLWTP Sludge											
Energy Consumption		0	hp	708	hp	0	hp	386	hp	0	hp	163	hp	500	hp	185	hp	0	hp
Efficiency		90%		83%		90%		83%		90%		83%		83%		90%		90%	
Shell Heat Loss		19%						10%						5%					
Sludge Inlet Temp		60	F			60	F					60	F						
Operation Temp		100	F			100	F					220	F						
Btu/lb		560				560						1,600							
cfh/lb VS		15				15						58.89							
MMBtu/hr		6.25				6.25													
Wet Mass Flow		1,473,798	lb/hr	135,508	lb/hr	156,358	lb/hr	153,024	lb/hr	552,086	lb/hr	53,432	lb/hr	16,623	lb/hr	16,623	lb/hr	4,987	lb/hr
Dry Mass Flow		7,664	lb/hr	6,897	lb/hr	8,148	lb/hr	4,814	lb/hr	15,748	lb/hr	14,961	lb/hr	14,961	lb/hr	14,961	lb/hr	4,488	lb/hr
VS		92.0	DTPD	82.8	DTPD	97.8	DTPD	57.8	DTPD	189.0	DTPD	179.5	DTPD	179.5	DTPD	179.5	DTPD	71.8	DTPD
Water		5,832	lb/hr	5,249	lb/hr	6,412	lb/hr	3,076	lb/hr	8,469	lb/hr	8,045	lb/hr	8,045	lb/hr	8,045	lb/hr	3,218	lb/hr
TS		1,466,134	lb/hr	128,611	lb/hr	148,210	lb/hr	148,210	lb/hr	536,337	lb/hr	38,471	lb/hr	1,662	lb/hr	1,662	lb/hr	665	lb/hr
VS		0.52%		5.09%		3.15%		2.85%		28.00%		90.00%		90.00%		90.00%		90%	
Water		76.10%		76.10%		79%		64%		53.77%		54%		54%		54%		54%	
Calorific Value		2,929.9	gpm	257.0	gpm	296.2	gpm	296.2	gpm	1,071.8	gpm	76.9	gpm	3.3	gpm	3.3	gpm	1.0	gpm
Electrical Demand		10,000	Btu/lb VS	10,000	Btu/lb VS	10,000	Btu/lb VS	10,000	Btu/lb VS	10,000	Btu/lb VS	10,000	Btu/lb VS	10,000	Btu/lb VS	10,000	Btu/lb VS	0	Btu/lb VS
Unit Heat Bal.		0	kW	2543.6	kW	0.0	kW	1041.5	kW	0.0	kW	880.6	kW	880.6	kW	880.6	kW	0.0	kW
Total Heat Bal.		0	MMBtu/hr	0.00	MMBtu/hr	0.00	MMBtu/hr	-6.88	MMBtu/hr	0.00	MMBtu/hr	0.00	MMBtu/hr	-61.84	MMBtu/hr	10.60	MMBtu/hr	0.00	MMBtu/hr
Unit Aux. Fuel Bal.		0	MMBtu/hr	0.00	MMBtu/hr	0.00	MMBtu/hr	-6.88	MMBtu/hr	0.00	MMBtu/hr	-6.88	MMBtu/hr	-48.72	MMBtu/hr	-58.12	MMBtu/hr	-58.12	MMBtu/hr
Cum. Aux. Fuel Bal.		0	MMBtu/hr	0.00	MMBtu/hr	0.00	MMBtu/hr	0.00	MMBtu/hr	0.00	MMBtu/hr	0.00	MMBtu/hr	0.00	MMBtu/hr	0.00	MMBtu/hr	0.00	MMBtu/hr
Unit Process Fuel Bal.		0	MMBtu/hr	0.00	MMBtu/hr	0.00	MMBtu/hr	0.00	MMBtu/hr	0.00	MMBtu/hr	0.00	MMBtu/hr	0.00	MMBtu/hr	0.00	MMBtu/hr	0.00	MMBtu/hr
Cum Unit Process Fuel Bal.		0	MMBtu/hr	0.00	MMBtu/hr	0.00	MMBtu/hr	0.00	MMBtu/hr	0.00	MMBtu/hr	0.00	MMBtu/hr	0.00	MMBtu/hr	0.00	MMBtu/hr	0.00	MMBtu/hr
Generated Steam		0	lb/hr	0	lb/hr	0	lb/hr	0	lb/hr	0	lb/hr	0	lb/hr	0	lb/hr	-27.45	MMBtu/hr	0.00	MMBtu/hr
Power Generation		0	MW	0.00	MW	0.00	MW	0.00	MW	28.01	MMBtu/hr	28.01	MMBtu/hr	28.01	MMBtu/hr	0.56	MMBtu/hr	0.56	MMBtu/hr

SWEET Economic Results

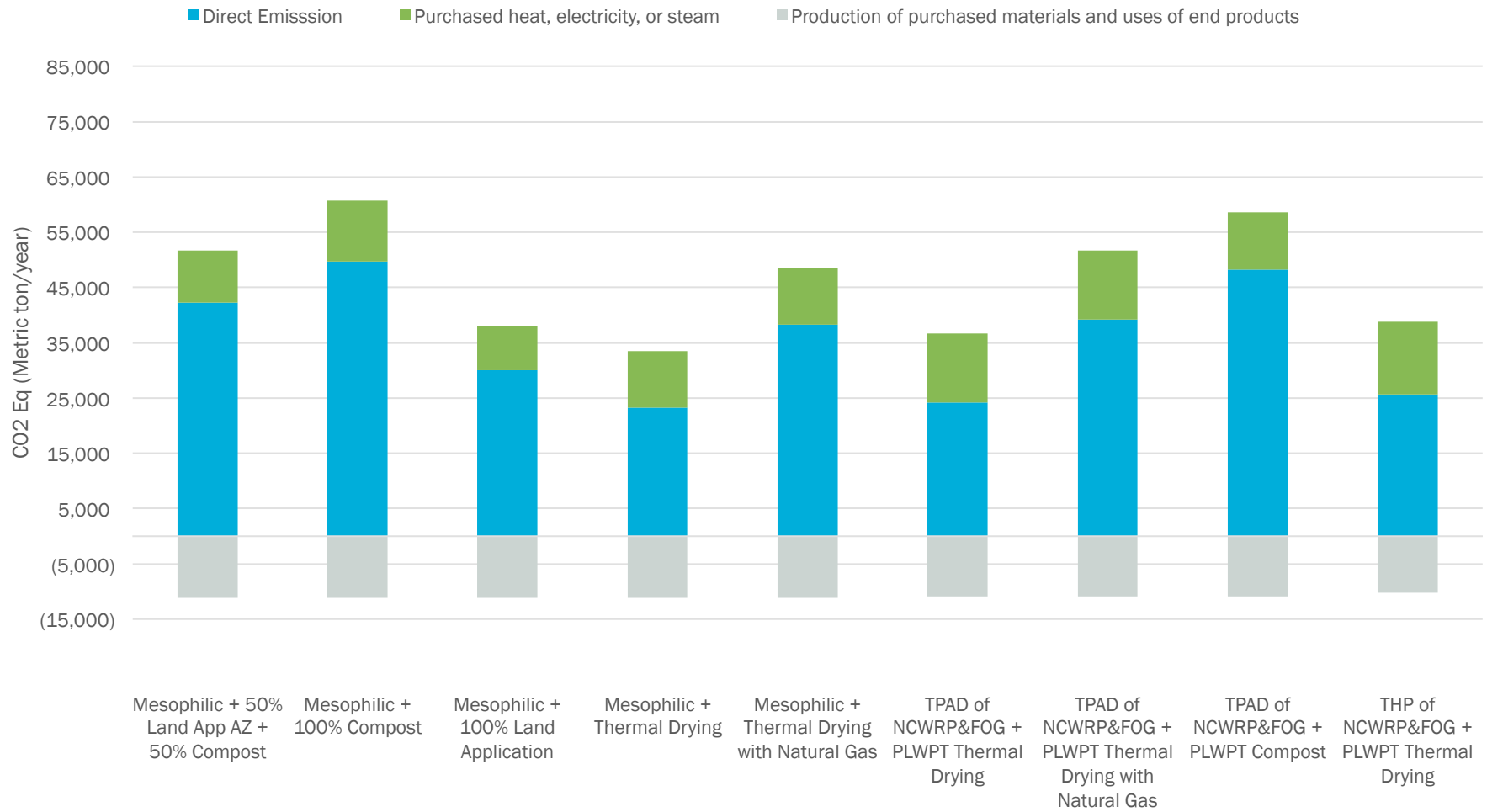


GHG Emissions

Carbon Dioxide Equivalent Emissions



GHG Emissions



Summary

- GHG trap heat in the atmosphere
- 3 categories of GHG
- Municipalities are creating GHG reduction plans
- GHG reductions can impact planning decisions



Thank you. Questions?

Tracy Chouinard, PhD
tchouinard@brwncald.com

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QUESTIONS?



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