Impact of Greenhouse Gas Emissions on Biosolids Management Decision Making

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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

Scope 1
- IC engines
  - biosolids thermal dryer
  - RTO
  - flare

Scope 2
- Electricity Purchase from SDG&E

Scope 3
- Outsourced Activities
- Production of Purchased Materials
- Waste Disposal
- Contracted Vehicles and Services
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, WA: 47% from Water/Wastewater

Source: City of Bellingham 2007
Bellingham Breakdown of Water & Wastewater

Source: City of Bellingham 2007
Tacoma Municipal Operations GHG Emissions

- **Buildings**: 2%
- **Fleet**: 42%
- **Employee Commute**: 7%
- **Water/Wastewater**: 48%
- **Solid Waste**: 0.07%
- **Streetlights**: 1%

Source: City of Tacoma 2012
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

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| Feed Power (kW) | 2720 | 2720 | 2720 | 2720 | 2720 |
SWEET Economic Results

20 YEAR COMPARISON OF COST

- Total Capital Costs
- Present Worth of Annual Costs
- Total Present Worth (Capital + Annual Costs)

Bar chart showing cost comparisons for different processes and scenarios.
GHG Emissions

Carbon Dioxide Equivalent Emissions

- Direct Emissions
- Purchased heat, electricity, or steam
- Production of purchased materials and uses of end products

Mesophilic + 50% Land Application
Mesophilic + 100% Compost
Mesophilic + 100% Land Application
Mesophilic + Thermal Drying
Mesophilic + Thermal Drying with Natural Gas
TPAD of NCWRP&FOG + PLWPT Thermal Drying
TPAD of NCWRP&FOG + PLWPT Thermal Drying with Natural Gas
TPAD of NCWRP&FOG + PLWPT Compost
THP of NCWRP&FOG + PLWPT Thermal Drying
Mesophilic + Landfill
GHG Emissions

- Direct Emission
- Purchased heat, electricity, or steam
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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?
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References


• CalRecycle. http://www.calrecycle.ca.gov/climate/grantsloans/


QUESTIONS?

it’s about connecting