

Climate and Waste Characteristics at Disposal Sites in Central America

Landfill Methane Outreach Program (LMOP)
U.S. Environmental Protection Agency

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Overview



- Evaluation of climate and waste disposal data
- Influence of Climate
- Waste Composition Data Sources and Methods
- Waste Composition Results
- Landfill Characteristics

Evaluation of climate and waste disposal data



- Provided information critical for model development
- Climate
 - Precipitation is used to estimate waste moisture, which influences waste decay rates

Evaluation of climate and waste disposal data



- **Waste amounts and composition**
 - Determines volume and rate of methane generation
- **Landfill characteristics**
 - Influences methane generation and recovery
 - Landfill design and management practices
 - Average waste depth

Influence of Climate



- Warm temperatures throughout region
- Precipitation has greatest influence on LFG generation and recovery
 - Most areas in Central America (including all large cities) receive > 900 mm/year rainfall
 - Moist/wet conditions in region maximize waste decay rates and LFG generation
 - Leachate buildup lowers recovery efficiency

Precipitation Data



<u>Country</u>	<u>Average* (mm/yr)</u>
Belize	1,984
Costa Rica	2,500
El Salvador	2,092
Guatemala	1,078
Honduras	1,586
Nicaragua	2,561
Panama	2,370
Average	2,025

- Implications of high rainfall:
 - Waste decay rates at or near maximum levels
 - Limited differences in LFG generation rates at wet vs. very wet landfills

*Average annual rainfall data is weighted based on years of record and station location near large cities

Waste Composition Data Sources and Methods



- **Data sources:**

- Waste composition data sheets sent to each country – most provided data
- Published reports on composition of waste disposed at specific landfills or generated by cities
- Prior project work on landfills in Central America
- Climate – www.worldclimate.com

Waste Composition Data Sources and Methods



- **Data coverage:**
 - Obtained waste composition data for all 7 countries
 - Obtained data from regions representing 34% of the population of Central America (76% of El Salvador)
- **Data compilation method:**
 - Waste data sets given “weighting” factor based on landfill tonnage and population represented

Waste Composition Data – Population Represented



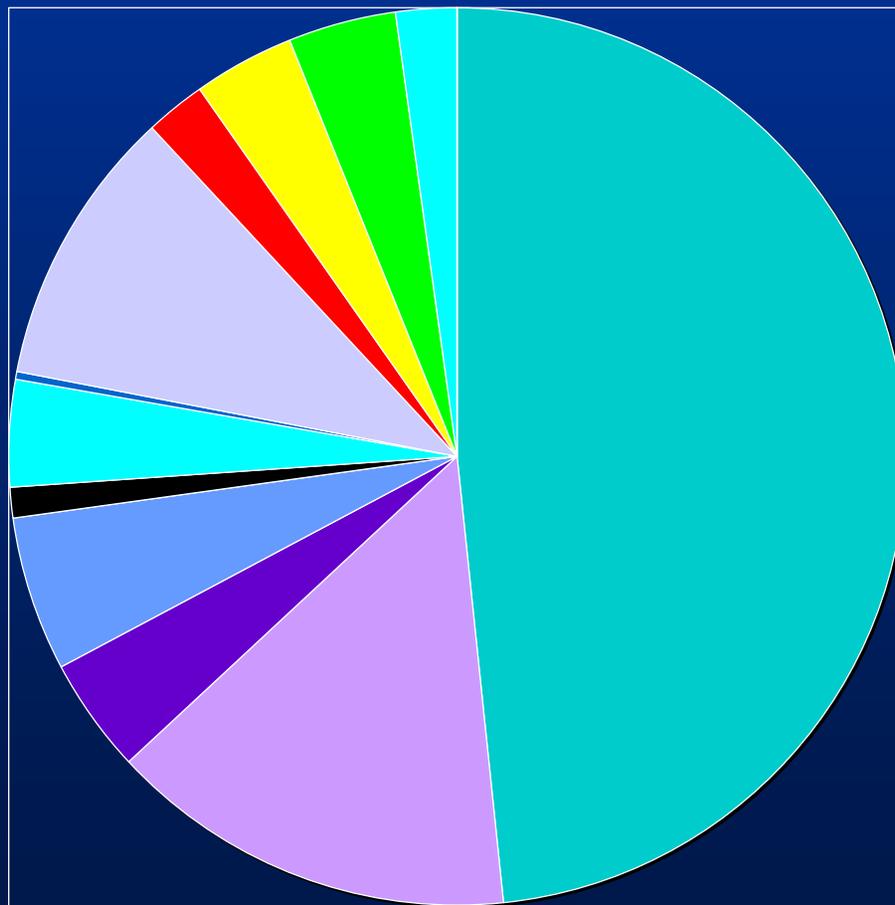
- Belize
- Costa Rica
- El Salvador
- Guatemala
- Honduras
- Nicaragua
- Panama

Waste Composition Study Results



- High % organic waste (78% of total)
 - Includes 3 of 4 largest waste categories (averages for Central America):
 - Food waste: 48%
 - Paper and cardboard: 15%
 - Plastics: 10%
 - Green/landscaping waste: 9.7%
 - Implications for modeling study:
 - Rapid waste decay promotes LFG production over shorter period when compared to US landfills

Central America Waste Composition



- Food
- Paper/Cardboard
- Fast-decaying green waste
- Landscaping
- Wood
- Rubber/Leather
- Other organics
- Plastics
- Metals
- Glass/Ceramics
- Inert
- Special waste

Landfill Characteristics



- Physical characteristics affecting landfill biogas generation and recovery:
 - Landfill status (open vs. closed)
 - Landfill size and depth
 - Bottom liner and cover systems
 - Surface topography and drainage
 - Disposal area/cell sequencing

Landfill Characteristics



- Site management practices affect landfill biogas generation and recovery:
 - Most sites are dump sites with no managed placement of waste or soil cover – high aerobic decay, limited recovery potential
 - Small number of sanitary landfills exist serving the largest cities – higher gas generation and recovery potential
 - Managed placement of waste in lined cells
 - Waste is compacted and daily or weekly soil cover is applied
 - Most have no gas collection systems or have passive venting systems

Conclusions



- **Region has high precipitation rates**
 - Moist conditions yield faster waste decay and LFG generation
- **Detailed waste composition study**
 - Central American waste has high organic content, especially food waste (48%), which rapidly decays
- **Landfill characteristics influence biogas generation and recovery**
 - Large differences between dump sites and sanitary landfills affect project potential

Questions?

