

# Determination of Biomethane Generation Potential in the Domestic Municipal Waste Flow of Hanoi, Vietnam

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## Introduction

- Hanoi: Burden on waste management
  - Severe shortage of landfills
  - Large daily domestic municipal solid waste (MSW) discharge volume
  - Increasing MSW treatment cost
- Mainly landfilling (2 landfills: Xuan Son and Nam Son) and combustion
  - Lack of waste recycling and treatment factories
  - Environmental and health concerns
- Waste-to-energy by anaerobic digestion of MSW
  - Produce methane, which is the main component of biogas
  - Application: fuel and energy source => Replace fossil fuel
  - Decrease greenhouse gases
  - Eliminate pathogens, prevent odors
  - Byproduct: plant fertilizer

## Methodology (continued)



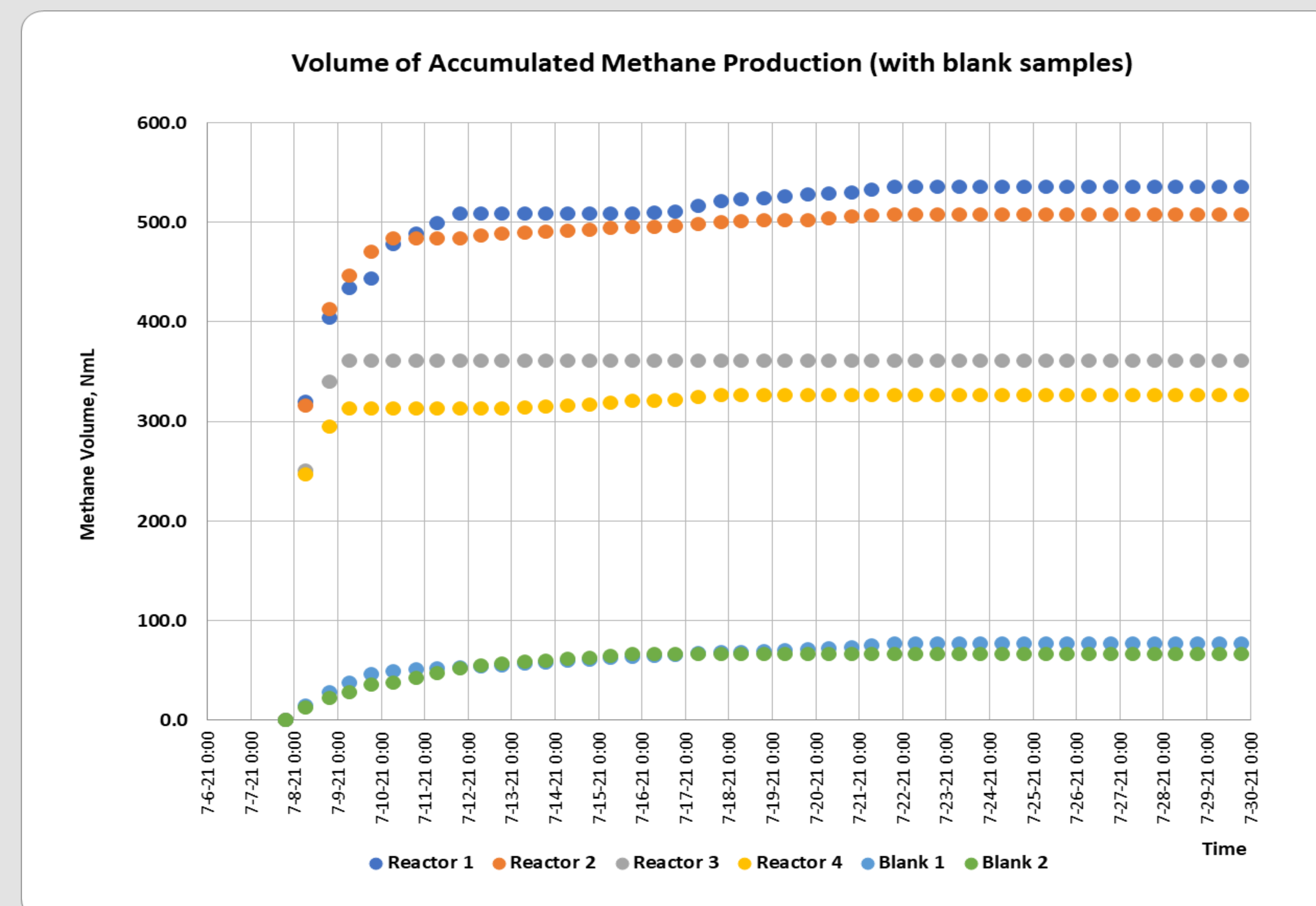
The generated gas flow from the beakers were exposed to sodium hydroxide (NaOH) to eliminate CO<sub>2</sub>. The resulting flow would only have methane (CH<sub>4</sub>).



The volume of generated CH<sub>4</sub> was measured using volume displacement method.



## Results and Discussion



- Volatile solid (VS) composition:
  - Seeding sludge: 19.28 g/L
  - Organic MSW: 152.71 g/L
- For a 300 mL beaker: 10 mL MSW + 290 mL seeding sludge
- **Cumulative volume of methane generated:**
  - **Mixed reactors: 294.3 mL/g VS**
  - **Unmixed reactors: 177.8 mL/g VS**
- Mixing of the substances in the beakers is important
  - Reactors 1 and 2: much higher volume of CH<sub>4</sub> generated than reactors 3 and 4
- The maximum volume of generated methane was reached after day 3, which is a lot faster than the suggested experiment time for biomethane potential tests (21 days)

## Conclusion

- Anaerobic digestion is a promising approach of a sustainable waste treatment process for Hanoi
  - Aim for energy recovery, waste recycle and to solve the city's current crisis of waste management.
- If the waste's composition is not optimum, it can be mixed with waste from other sources with different chemical compositions (like wastewater treatment sludge) in order to generate the combined waste flow with the best ratio of chemical elements for biogas production.

## Acknowledgements

The authors acknowledge the Undergraduate Research Opportunities Program of the University of Minnesota – Twin Cities for funding this research. Special thanks to Professor Viet-Anh Nguyen and the team of the Institute of Environmental Sciences and Engineering, Hanoi University of Civil Engineering, Vietnam, for sampling, composition examination, and experimental facilities supply. Many thanks to Professor Hidenari Yasui at the University of Kitakyushu for discussion partnership.

## Methodology



4 samples of Hanoi organic solid waste were combined with a culture of anaerobic microorganisms at 35°C for 21 days.  
 Reactors 1 and 2 were mixed.  
 Reactors 3 and 4 were not mixed.  
 2 blank samples with only the microorganisms were also examined.