

Ontario Realities and Opportunities for Biosolids Management

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- OCWA
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 - Numerous municipalities
 - SOWC

Motivation

- Sludge handling and biosolids disposition are significant elements of wastewater treatment
- Traditionally municipalities have faced pressures to ***effectively*** and ***efficiently*** operate facilities
- Recently, additional drivers are influencing decision-making
 - i.e. energy/greenhouse gas emissions
- Little system-wide information in Ontario describing
 - current implementation of technologies
 - current practices

Goals

Characterize current sludge handling/biosolids management practices in the province of Ontario to inform decision-making leading to enhanced sustainability

1. Establish profile of technologies currently employed
2. Characterize the quantities of biosolids generated
3. Characterize properties of biosolids generated
4. Summarize current disposition practices
5. Identify opportunities to respond to anticipated drivers

Approach

- Sources of information:
 - MOECC database on sludge processing technologies and disposition practices (486 WWTPs)
 - Somewhat dated
 - Results of survey with self-reporting of practices
 - Updated with information provided by municipalities
 - OCWA
 - Operating data from 93 WWTPs (2014-2016)
 - Direct approaches to municipalities
 - Operational data, annual reports, raw data reports from certified labs and regional master plans (2014-2016)
 - 136 additional WWTPs

Data processing

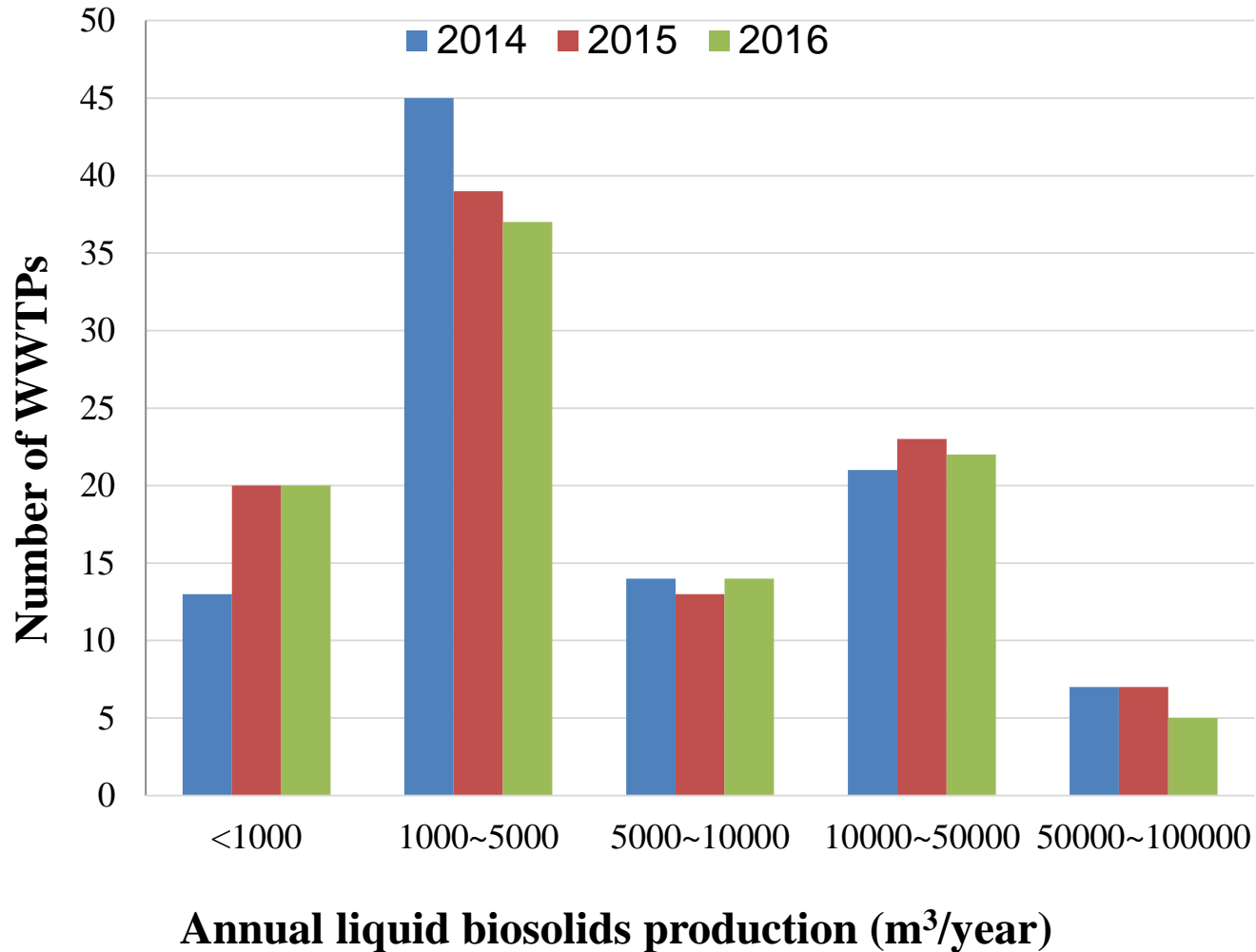
- Sludge handling technologies
 - Initially sorted by functionality (thickening, stabilization, dewatering)
 - Subsequently categorized by scale
 - Design hydraulic capacity (DHC) of WWTP
- Biosolids quantities
 - Sorted as either liquid or dewatered
 - WWTPs sorted by quantities produced

Data processing

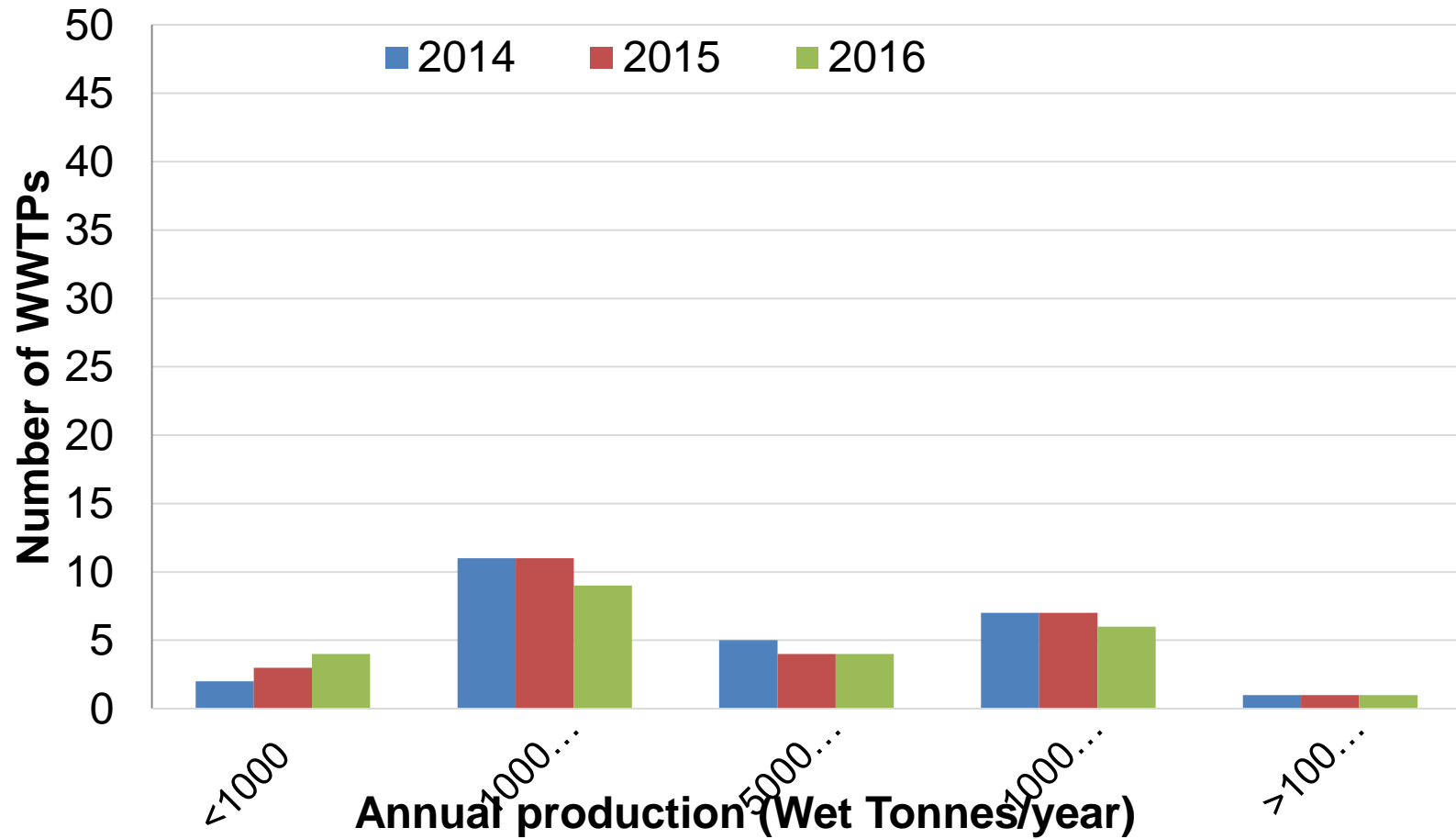
- Biosolids properties
 - Solids, pathogen indicators, heavy metals, nutrients
 - Liquid and dewatered biosolids
 - Categorized by scale (DHC)
- Disposition practices
 - Categorized by end use

Results

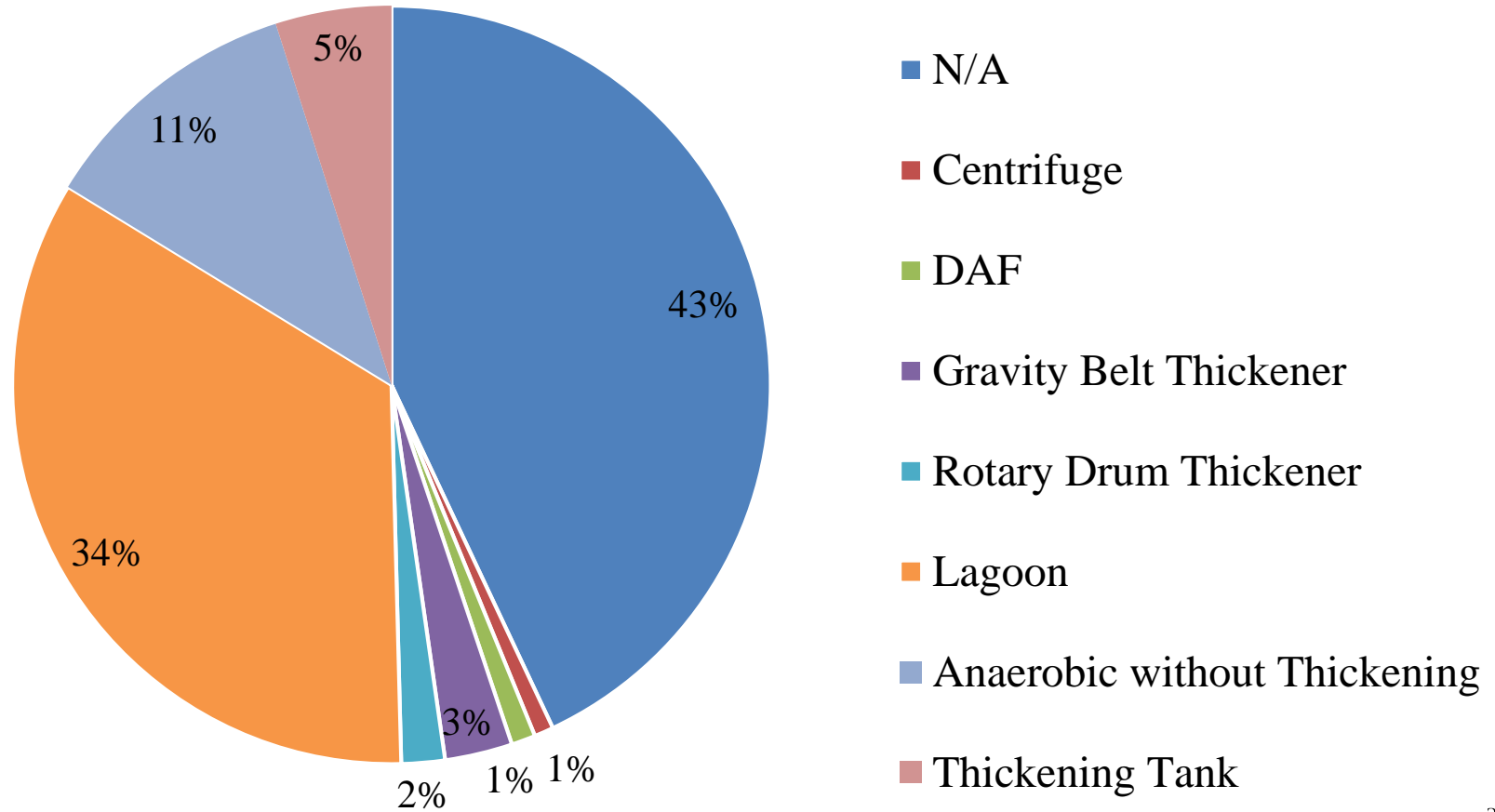
Distribution of liquid biosolids production



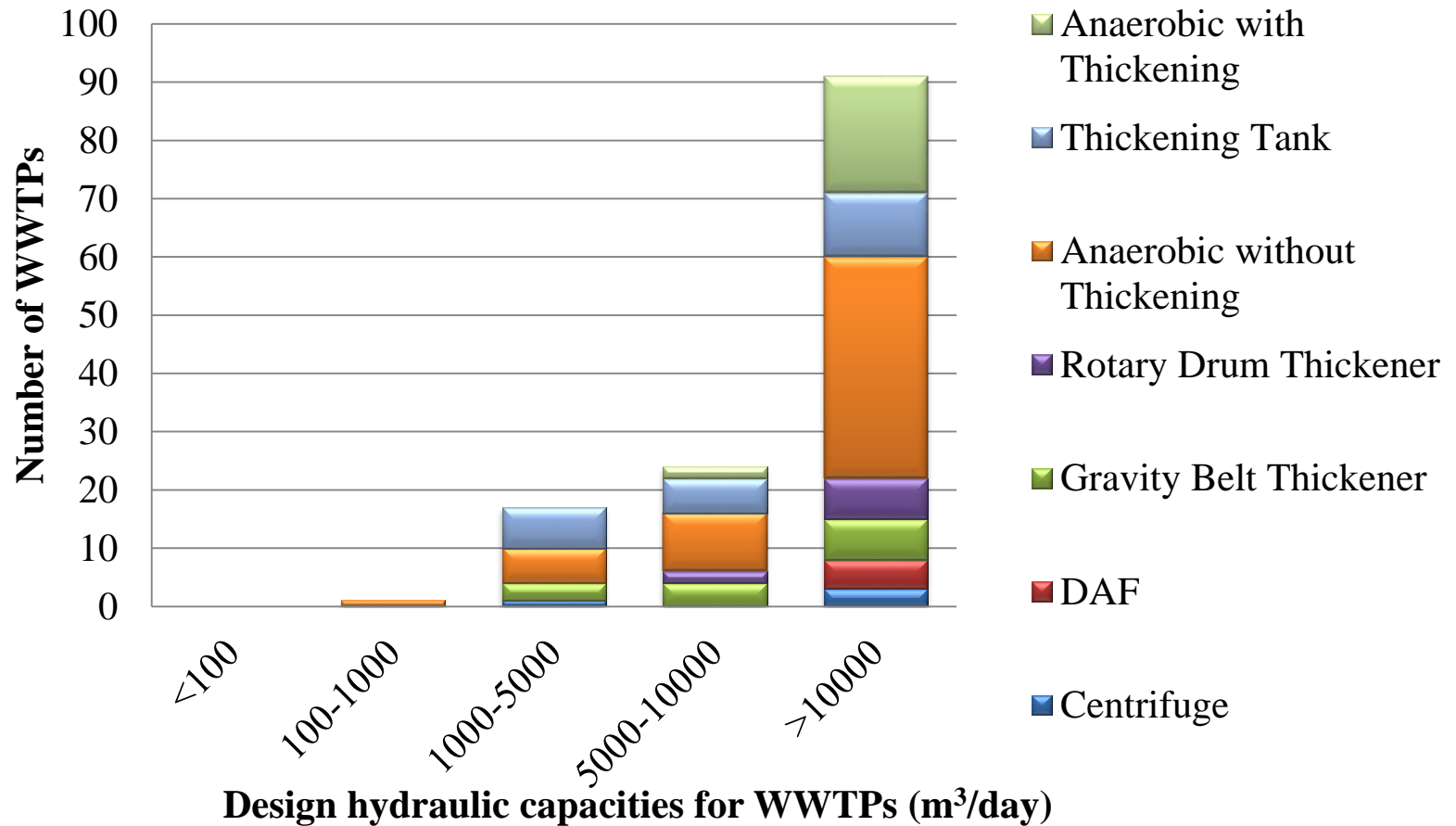
Distribution of dewatered biosolids production



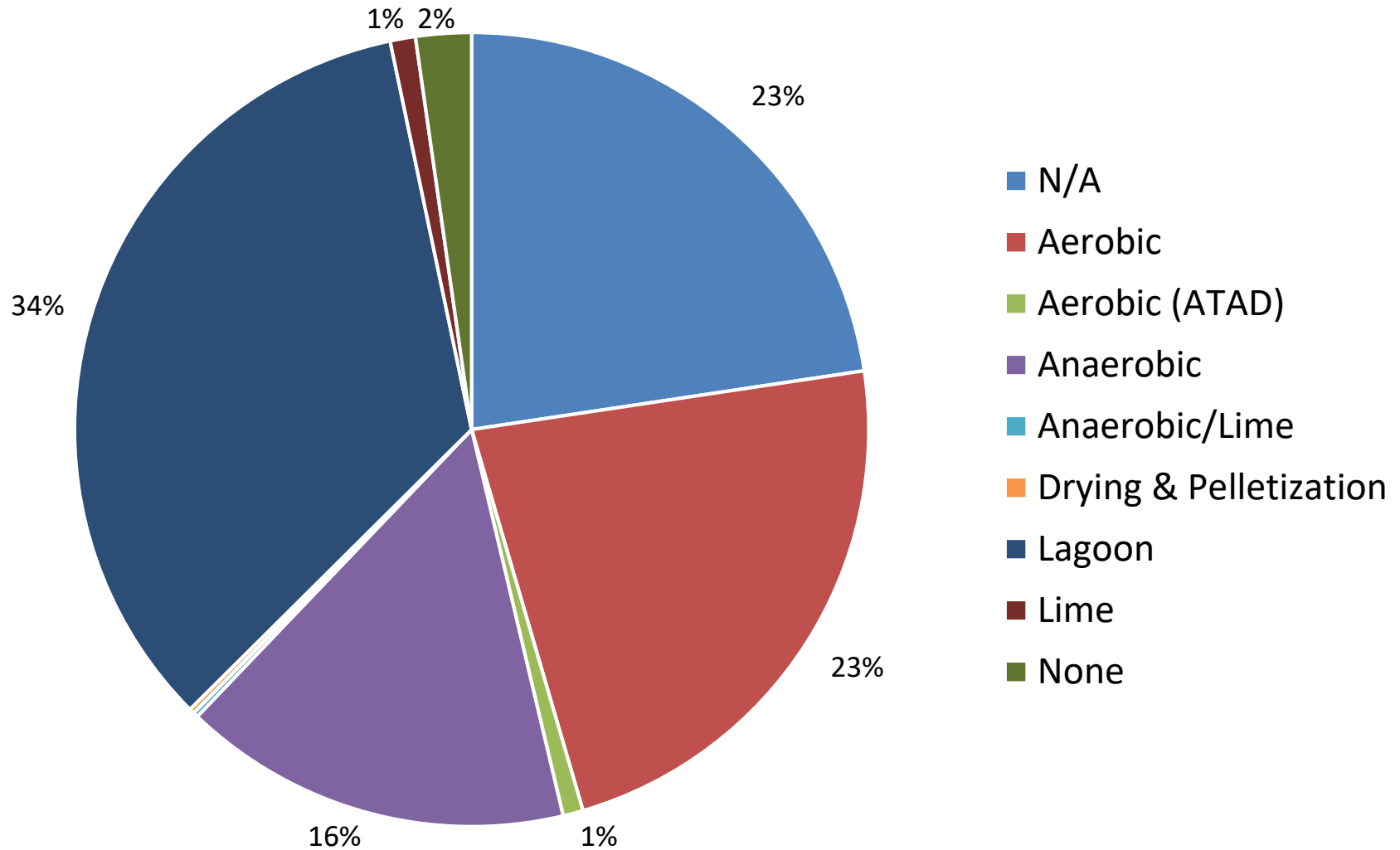
Sludge thickening technologies



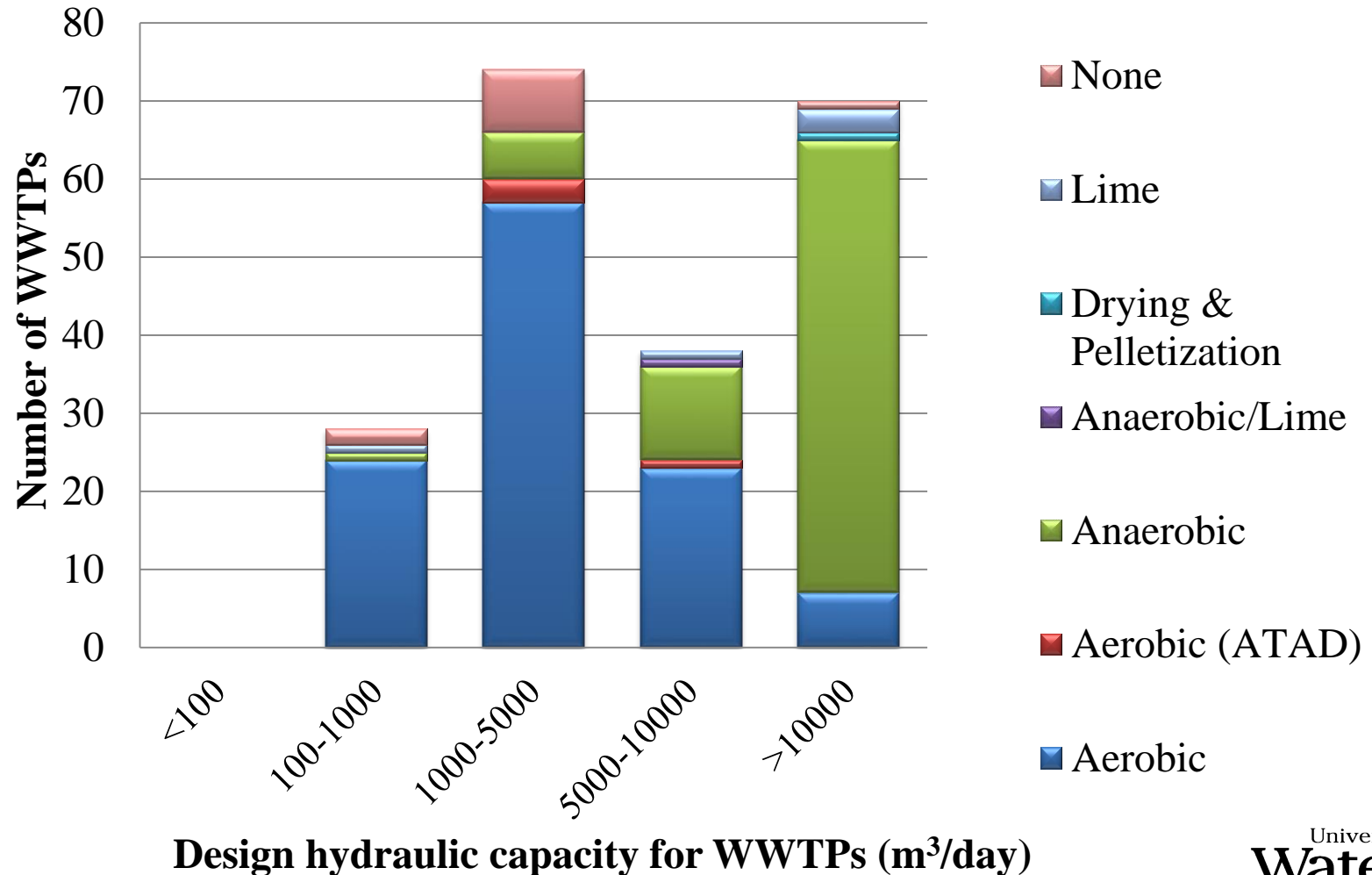
Sludge thickening technologies vs DHC



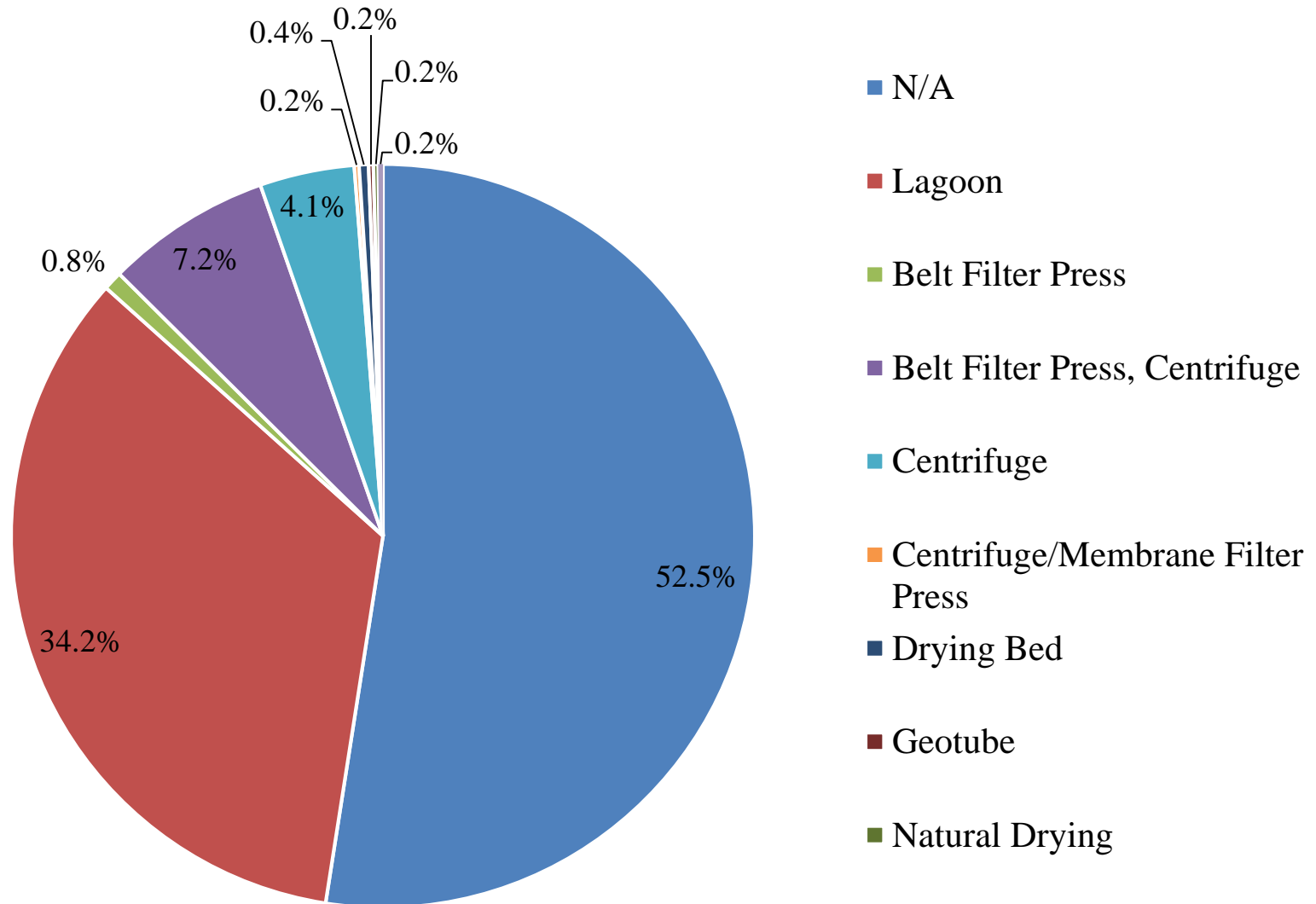
Summary of sludge stabilization



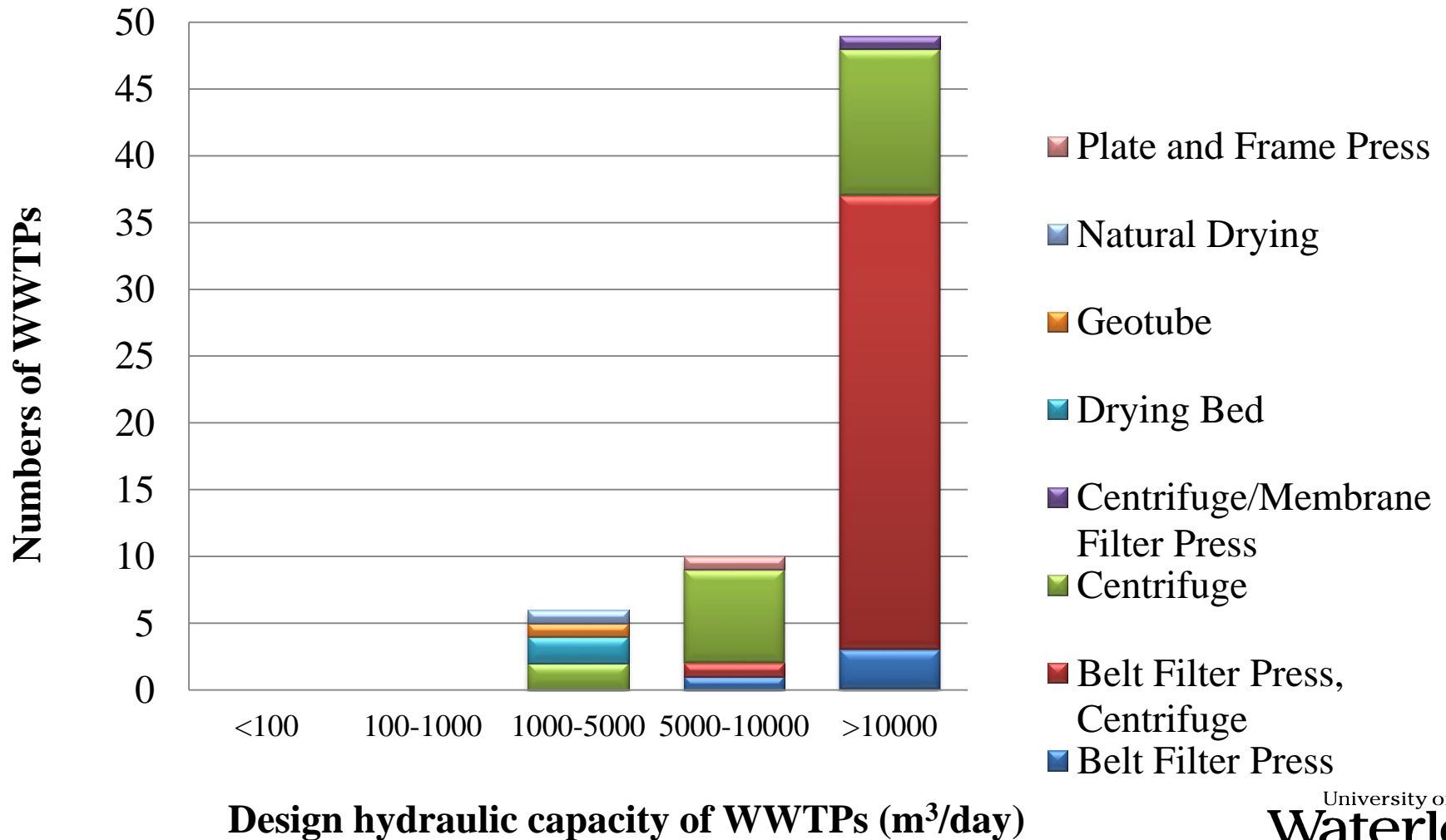
Stabilization technologies vs DHC



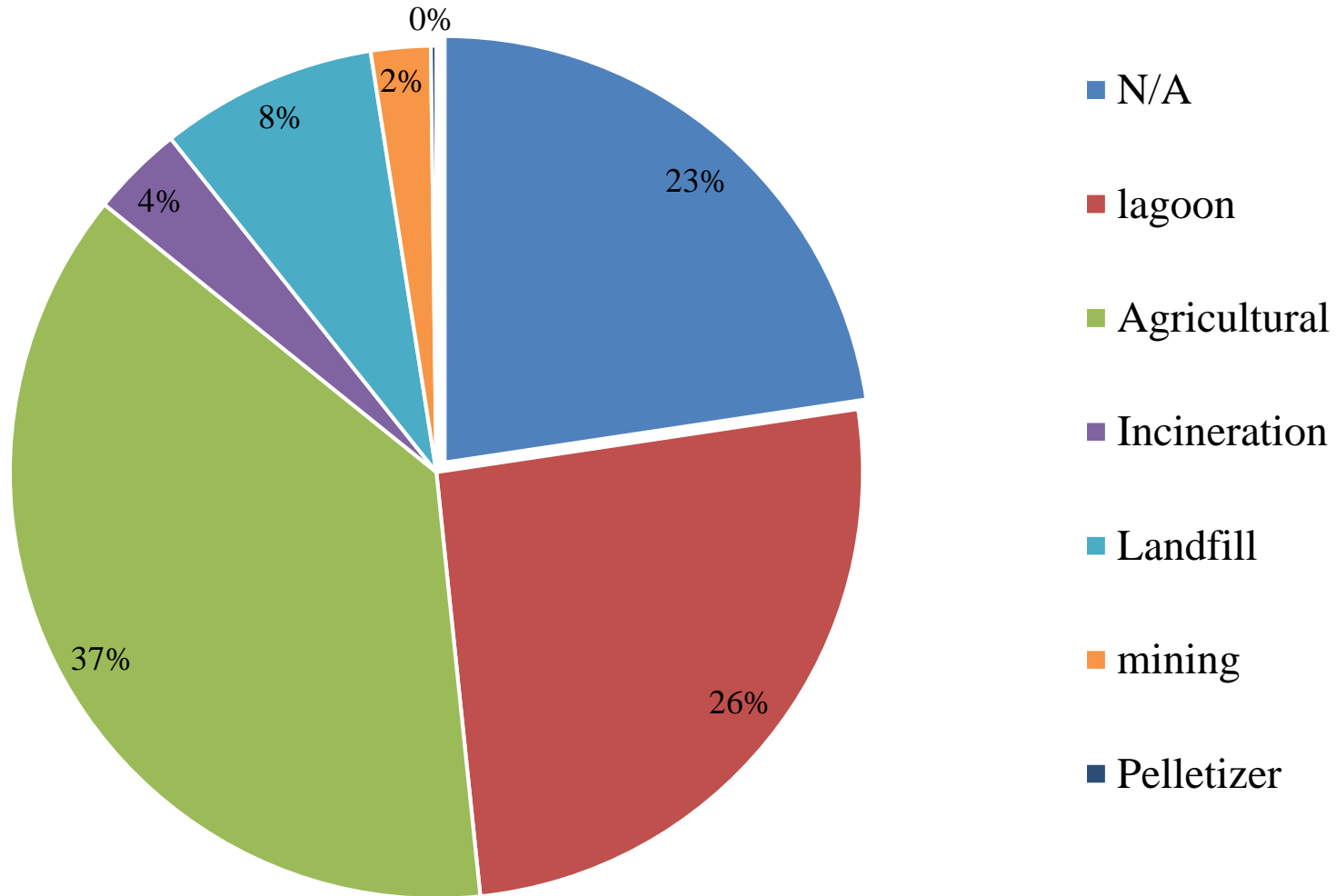
Summary of sludge dewatering practices



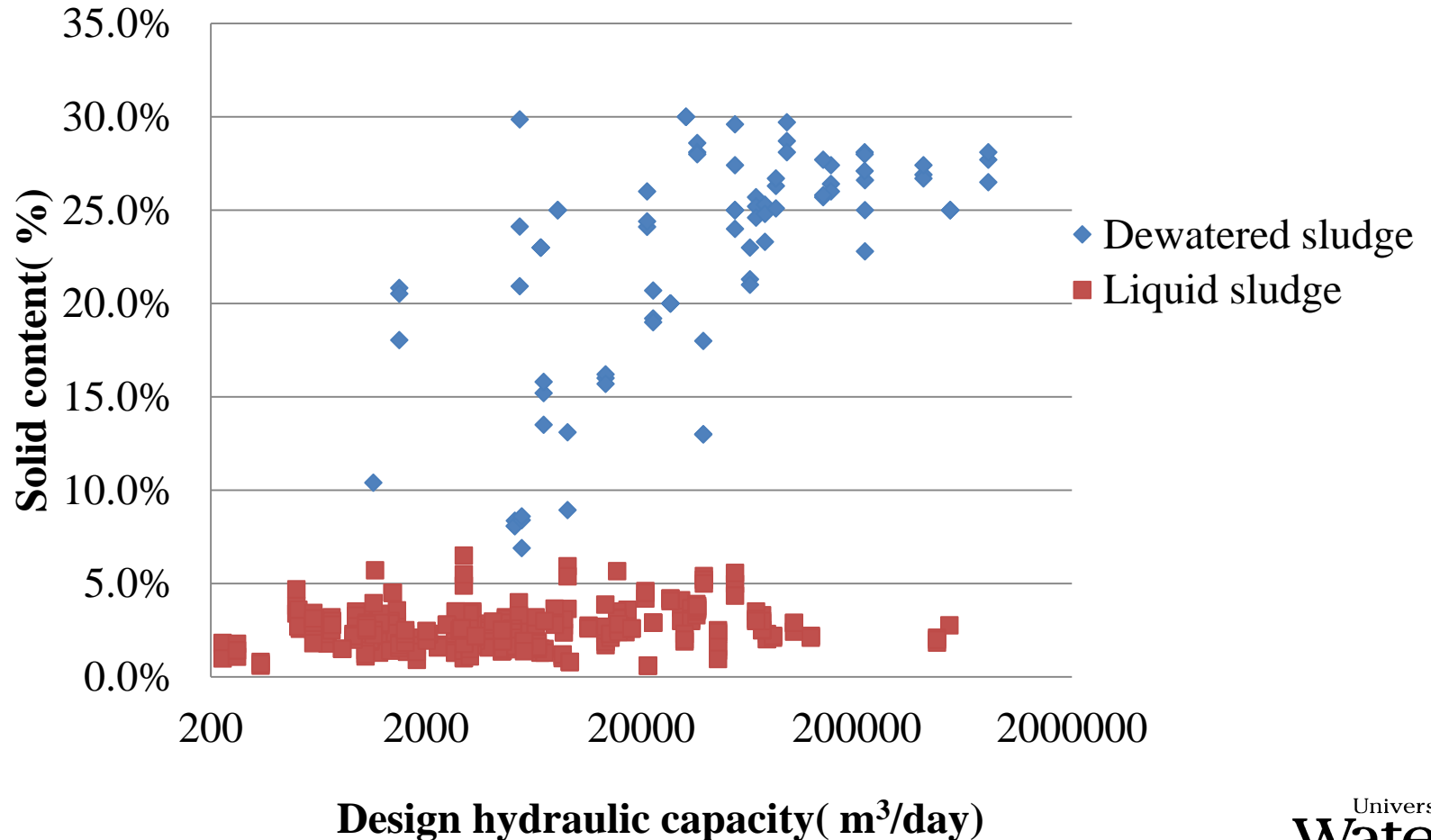
Sludge dewatering technologies vs DHC



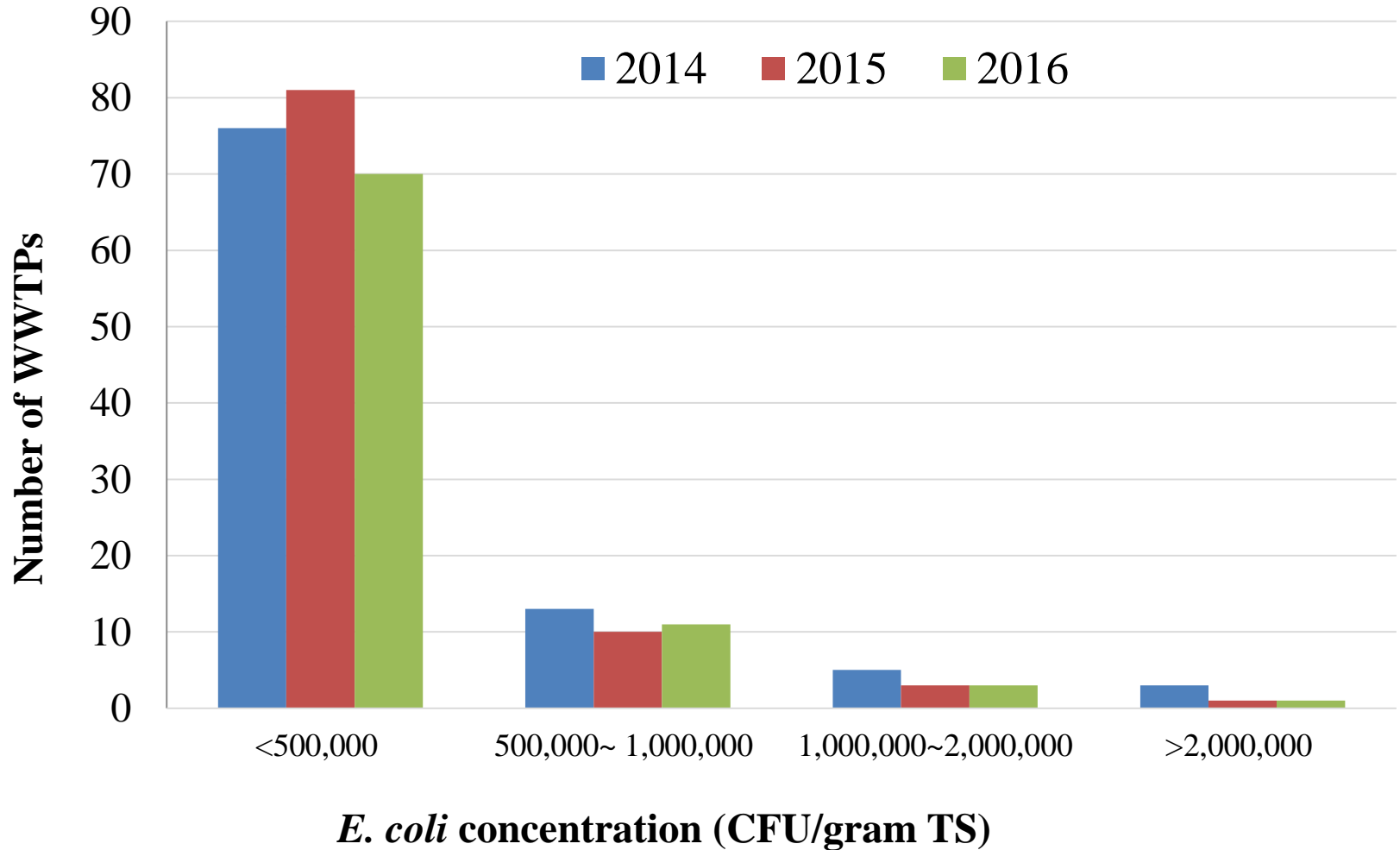
Summary of disposition practices



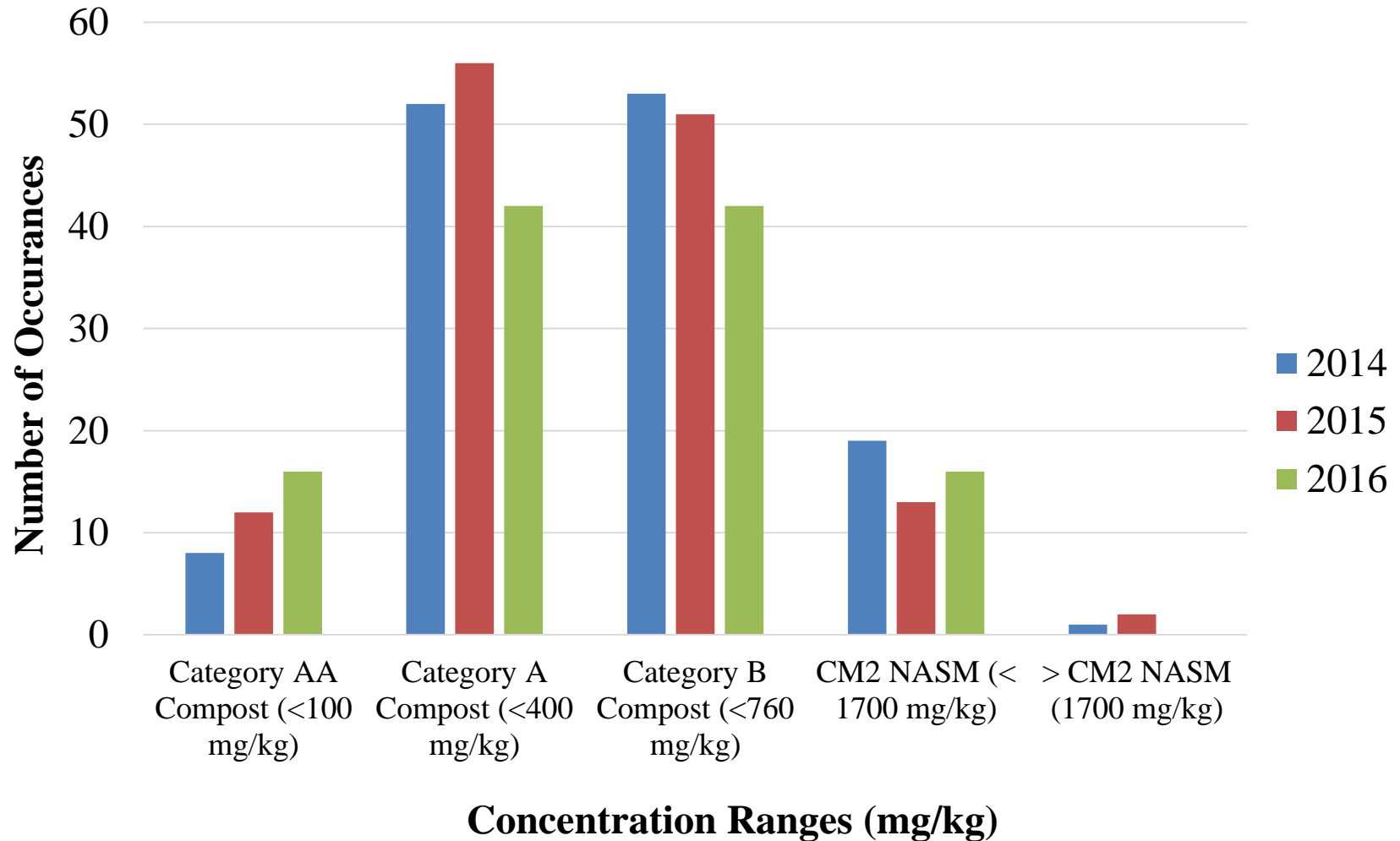
Solids concentrations versus DHC



Distribution of WWTPs by *E.coli* conc.



Distribution of WWTPs by copper conc.



Drivers for change - Energy/Greenhouse gases

Increased emphasis on energy and GHG mitigation should stimulate innovation:

- high-efficiency aerobic digestion technologies with reduced energy consumption,
- anaerobic digestion technologies feasible for small- and medium-size WWTPs,
- advanced thermal reduction technologies capable of recovering energy and/or producing fuels,
- dewatering technologies to reduce the total volume of hauled biosolids for land application

Drivers for change - Changing populations

- Community growth
 - larger production at facilities
 - potentially longer distances for disposition
 - Enhanced dewatering,
 - Thermal reduction/hydrolysis
 - Incineration
- Community shrinkage
 - reduced biosolids production
 - reduced resources for processing
 - Passive technologies (i.e. long term storage)

Drivers for change - Regulations

- Wastewater discharges
 - Canadian Wastewater Systems Effluent Regulations (2012)
 - Increased sludge production in small WWTPs
 - passive sludge processing technologies
 - low cost thickening and dewatering technologies,
 - high efficiency aerobic digestion technologies
- Landfill operation (ban on biosolids?)
 - additional winter storage capacity
 - emergency dewatering
 - Enhanced thickening and dewatering technologies in small and medium size WWTPs

Drivers for change – Regulations (ctd)

- Septage disposition?
 - In small and medium WWTPs
 - Increased mass of sludges generated,
 - Changed sludge properties (i.e. partially stabilized)
 - Sludge processing technologies
 - less emphasis on stabilization
 - More focus on thickening/dewatering

Drivers – Resource recovery

- Traditional recovery through:
 - Biogas generation for fuel
 - Agricultural land application for nutrient recycling
- Alternative products
 - diversify end uses
 - higher value products
- Integration of technologies for high quality fuel and fertilizer production
 - Thermal technologies
 - Enhanced anaerobic digestion

Summary

- System-wide data on sludge handling is not readily available in Ontario
 - A challenge for ongoing monitoring of progress
- Clear trends in technology implementation as a function of WWTP scale
- Data used to identify areas where technology development/implementation might assist municipalities to respond to drivers that will influence sludge generation and biosolids disposition in the future

Ongoing Work: Sustainability of Sludge Handling in Small WWTPs

- Detailed benchmarking of current operations
 - Selection of plants (10)
 - Data Collection
 - Process Simulation
 - Evaluate Key Performance Indicators (KPIs)
- Characterization of Innovative Technologies
 - Compilation of technology capabilities
 - Critical Assessment of Technology Implementation

Questions?