

Nutrient Roadmap

A Holistic Overview

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**CDM
Smith**

The Nutrient Roadmap – WEF Special Publication

- Smarter nutrient management
- Guide for decision-makers
- Sustainable approaches to nutrient management
- Presents opportunities for recovery and reuse
- Provides numerous routes to consider



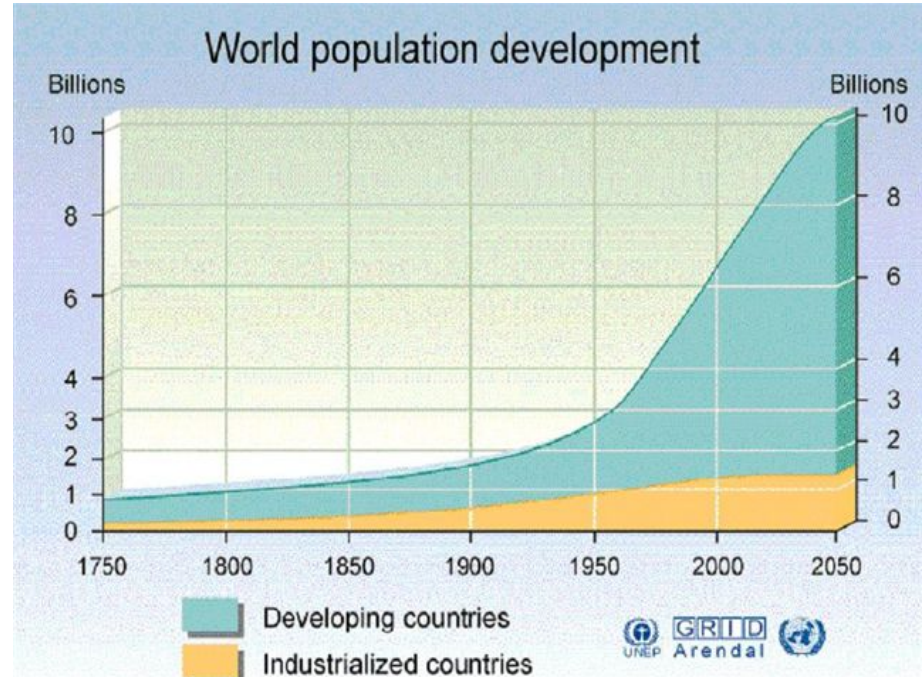
Challenge for our Industry (from WEF's mission)

- Provide bold leadership
- Champion innovation
- Connect water professionals
- Leverage knowledge to support clean and safe water worldwide



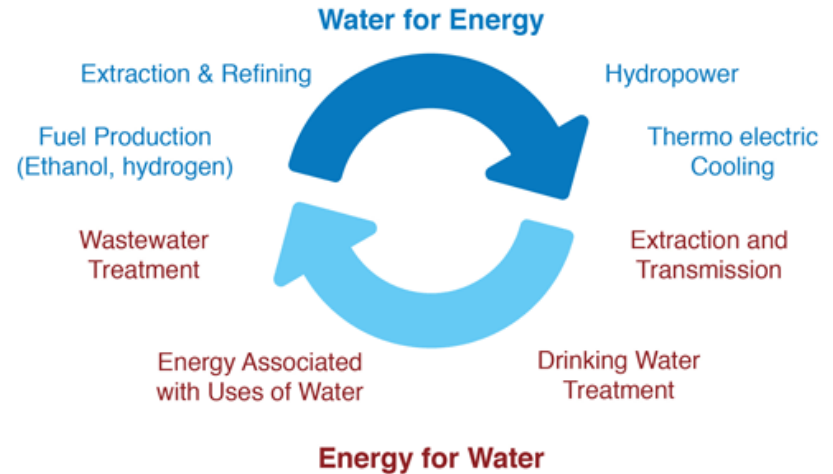
Why Resource Recovery? Why Now?

- World population could reach 10 billion by 2050
- We continue to consume resources as if we had 5 planets
- How we manage wastewater can dramatically alter the planet



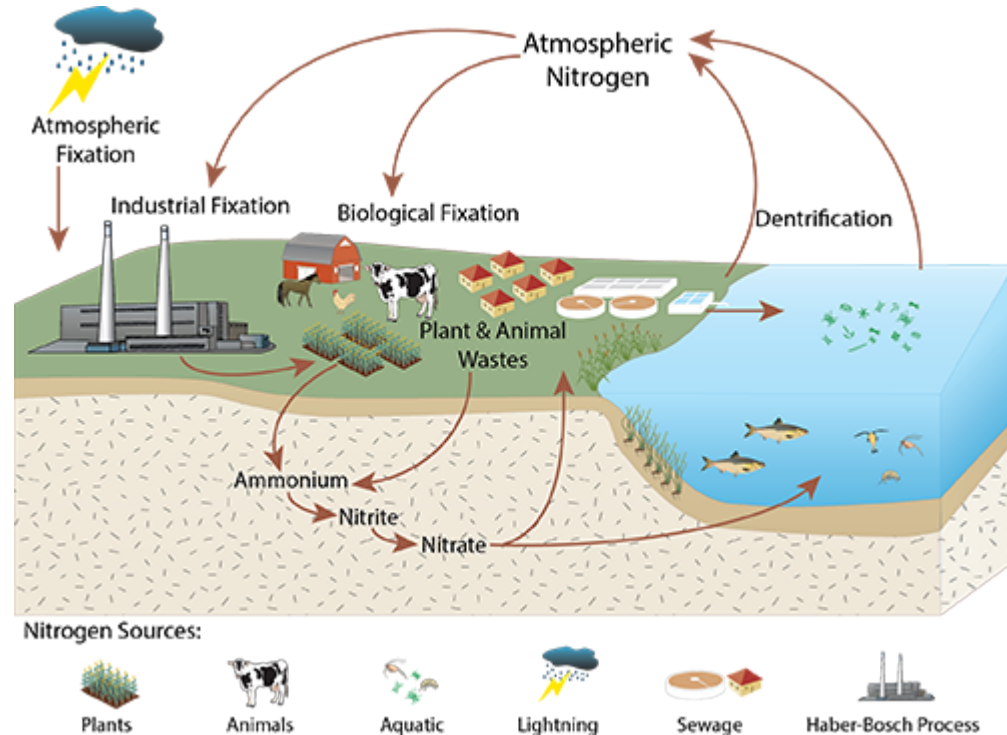
Understanding the Water-Energy-Nutrient Nexus

- It takes energy to clean water
- It takes even more energy to remove nutrients
- The production of electrical energy is the largest consumer of water in the nation



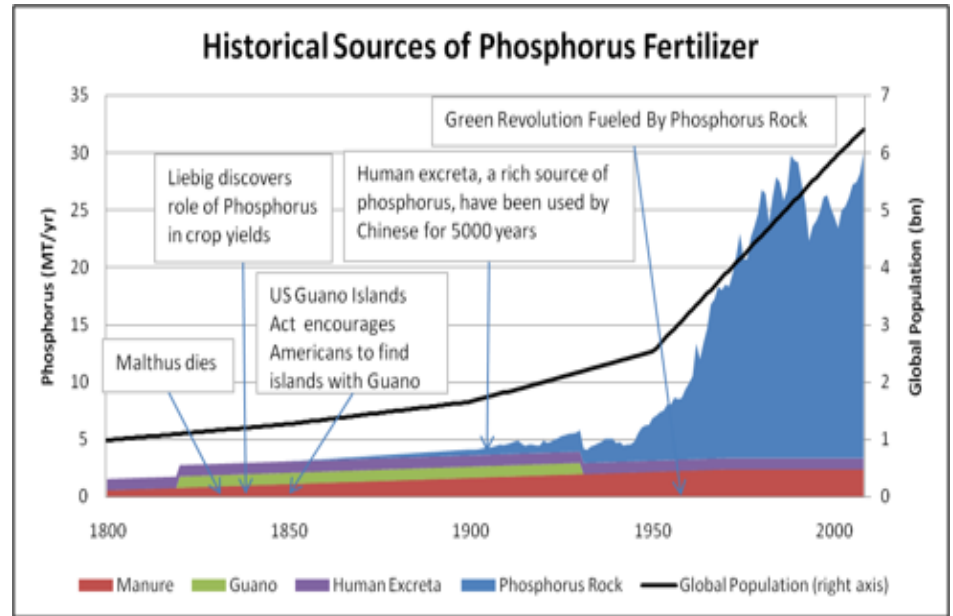
Understanding the Water-Energy-Nutrient Nexus

- The Haber-Bosch process (which converts nitrogen gas to ammonium) consume 3 to 5% of the world's natural gas
- It take resources to mine and transport phosphorus

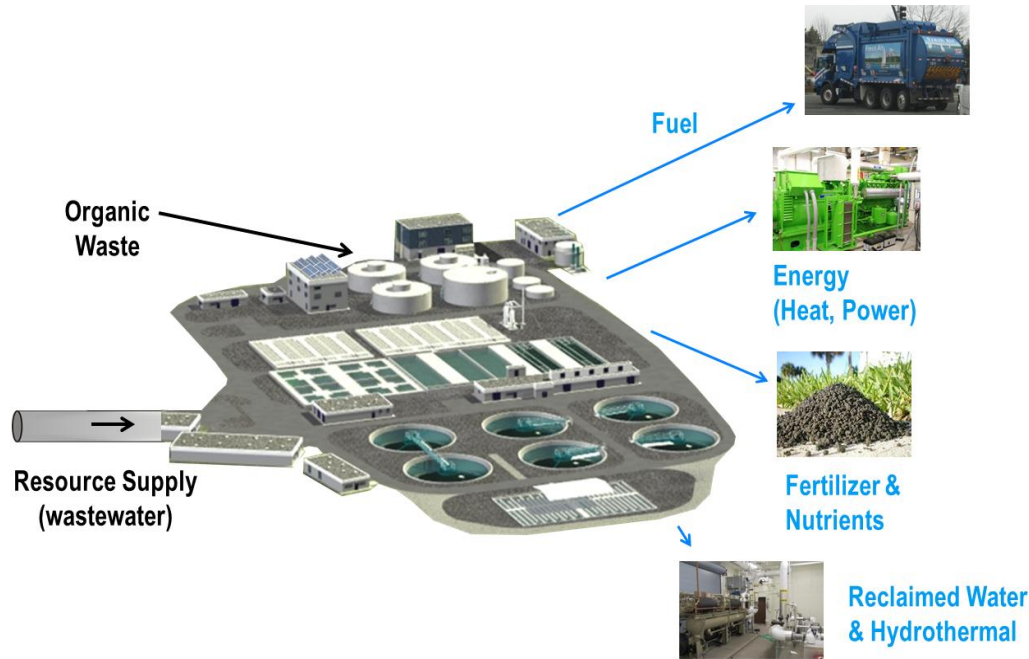


Connecting the Dots: A Case for Nutrient Recovery

- 90% of phosphorus rock reserves controlled by 5 countries
- Phosphorus rock reserves may be depleted in 50 to 100 years



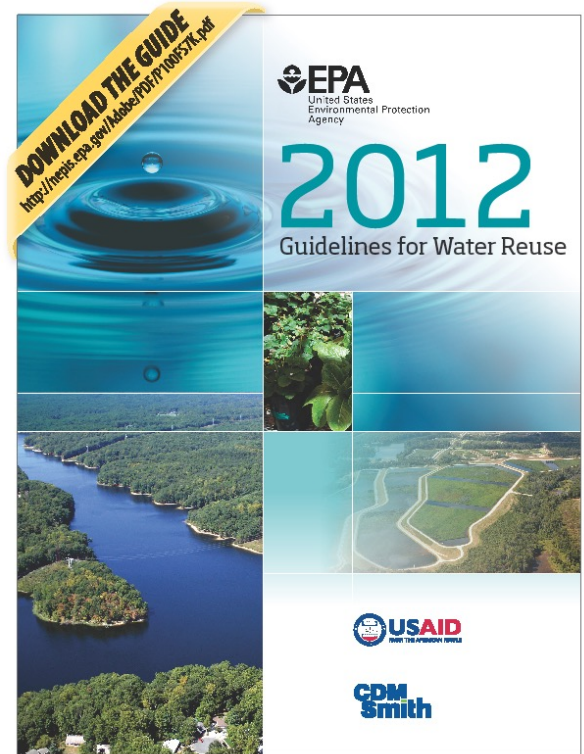
We are the Next Generation: Water Resource Recovery Facilities (WRRFs)



- Water reclamation
- Beneficial use of biosolids and nutrients (fertilizer and fuel)
- Energy recovery (heat and power)

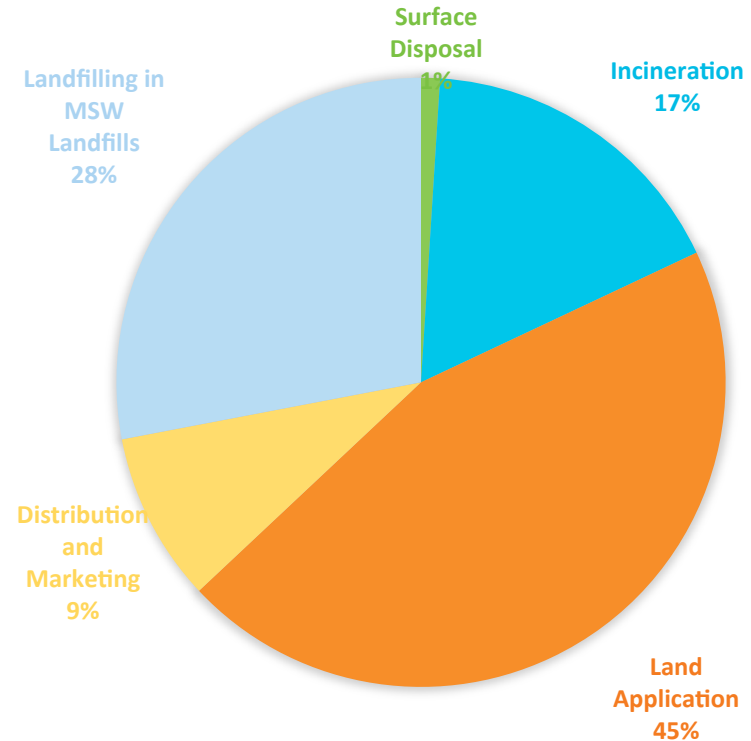
Water Reclamation as it Relates to Nutrients

- What is the current source of water and how resilient is it to climate change?
- What is the quality of the source and what does it cost to treat it?
- What is the largest user in the system and do they require a potable source?
- Consider use specific reuse standards



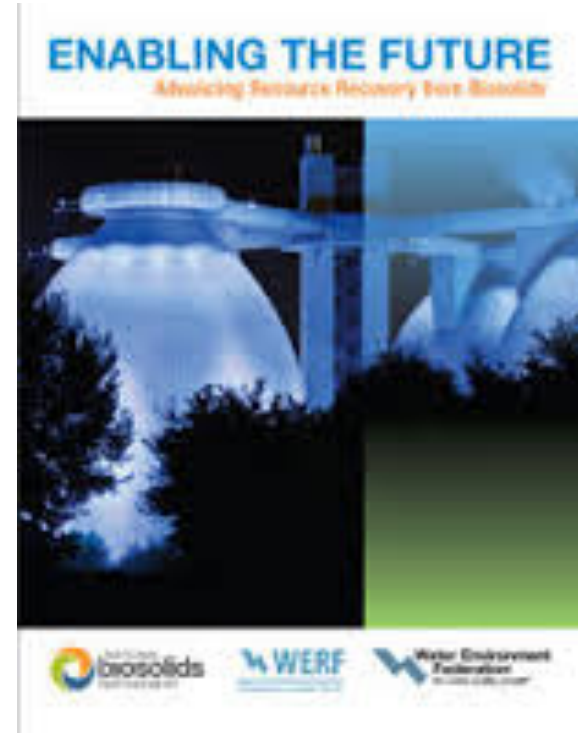
Beneficial Use of Biosolids

- 1993 40 CFR Part 503 Rule promulgated
- Land application
- Fertilizer production
Milorganite being produced since 1925
- Incineration
- Opportunity: Redirecting landfilled biosolids



Biosolids are a Resource – Not a Waste Product

- Land Application
 - Rich in nutrients
 - Replenishes organic content
 - Increases soil's ability to absorb and store moisture
 - Slow release
- Anaerobic Digestion
 - Converts biosolids to biogas
 - Renewable energy source
 - Produces power through CHP
 - Can introduce FOG and organics
 - Pretreatment can improve performance
- Fertilizer manufacturing



Considerations for Resource Recovery with Biosolids

- Facility size
- Facility location
- Existing infrastructure
- Regional economics
- Revenue opportunities
- Regulations



Nutrient Recovery through Sidestream Treatment

- Nutrient recovery most effective with high strength low flow stream
- Most attractive with anaerobic digestion and biological phosphorus removal
- Struvite precipitation
- Waste activated sludge treatment
- Ammonia removal
- Fertilizer manufacturing



Challenge

- Provide bold leadership
- Champion innovation
- Think globally, act locally
- Leverage knowledge to support clean and safe water worldwide





Questions

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