

Overcoming Barriers to Promote Sustainable Septage Management

*Kevin Orner, Stetson Rowles, Sara Heger, and Ben
Howard*

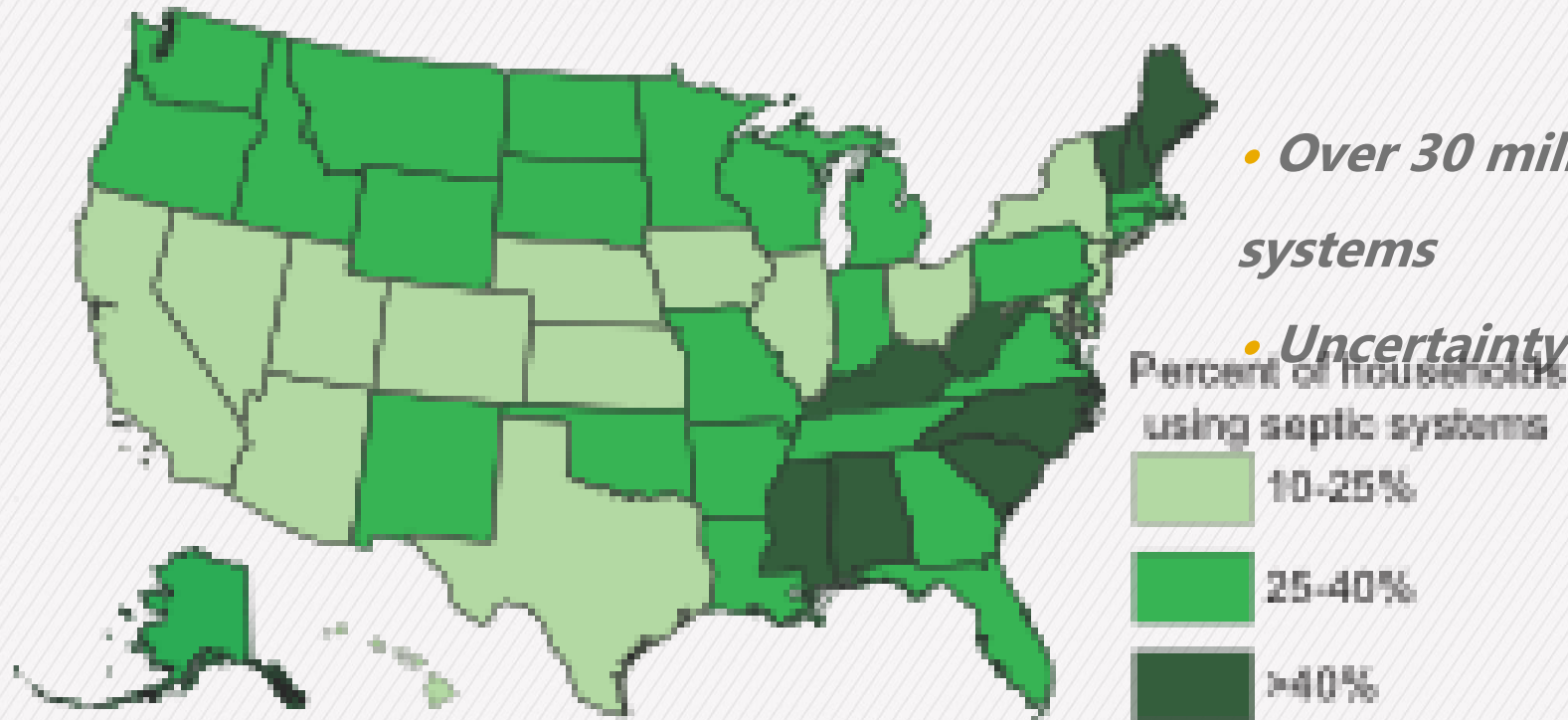


***Statements in this presentation
are the opinions of the presenter,
not NOWRA.***

Outline

- ***Introduction***
- ***Challenges with Current Practices***
- ***Reimagining Septage Management***
- ***Barriers to Change***
- ***Paths Forward***

INTRODUCTION



- *Over 30 million households rely on septic systems*

- *Uncertainty in septage mass and management*

*U.S. Census,
1990*

Septage Management

- ***Common strategies: land application, WWTP, landfill***
- ***States subject to federal regulations (40 CFR Part 503)***

Challenges with Current Practices

Land Application

- *Land availability*
- *Economic costs for transport*
- *Environmental emissions, odor*



Challenges with Current Practices

Treatment at Wastewater Treatment

Plants

- ***Economic costs for transport and tipping fees***
- ***High strength, trash***
- ***Lack of plant availability***

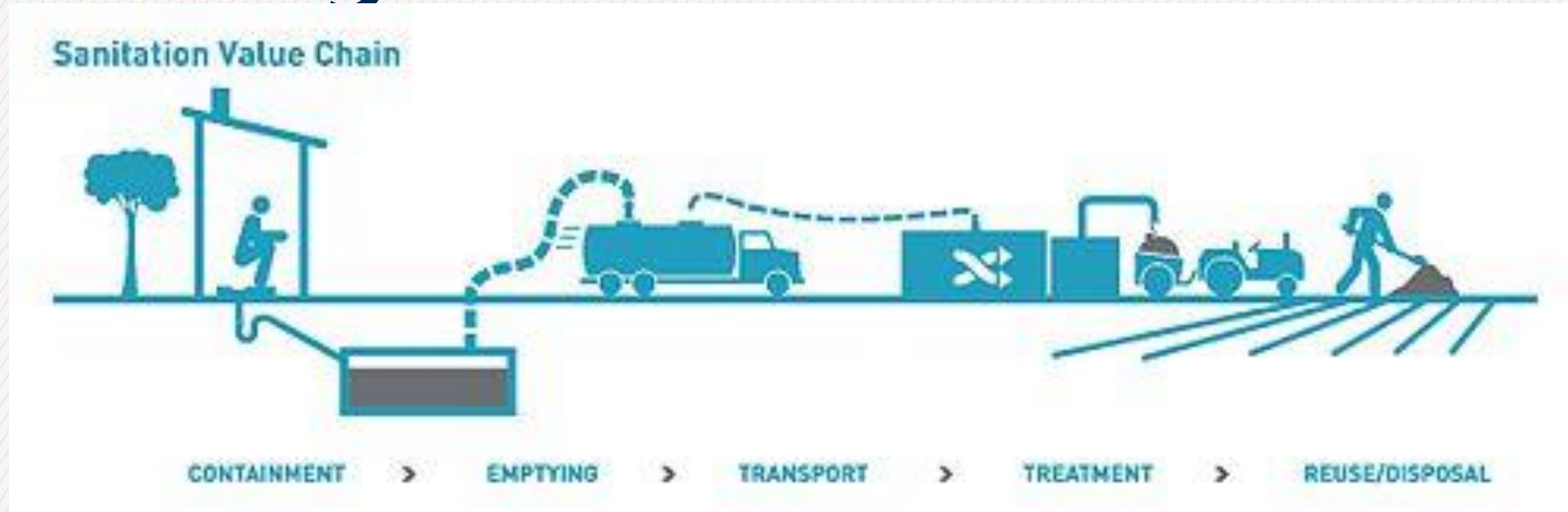


Challenges with Current Practices

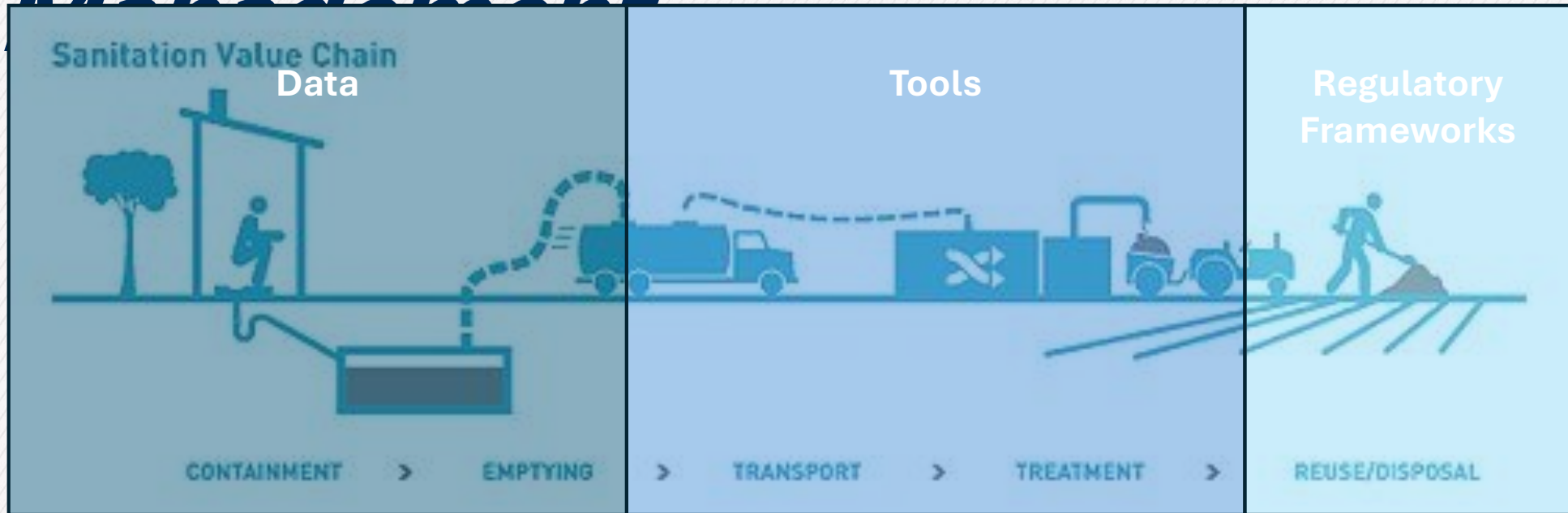
Disposal at Landfill

- ***Economic costs for transport and tipping fees***
- ***Environmental emissions***
- ***Landfill availability***

Reimagining Septage Management



Reimagining Septage Management



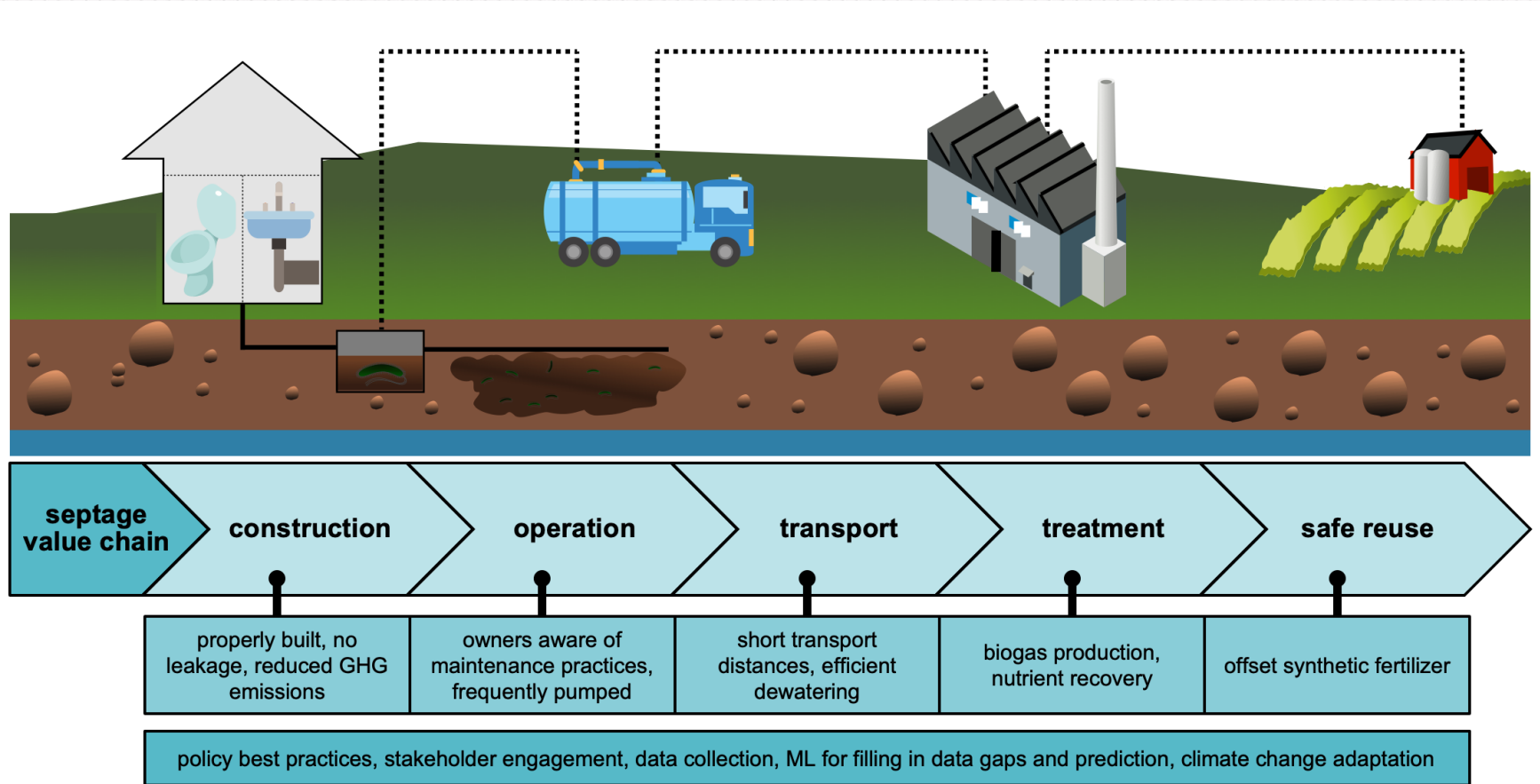
Which data are necessary & encourage resource recovery?

What tools are available?

What are effective frameworks?

Reimagining Septage

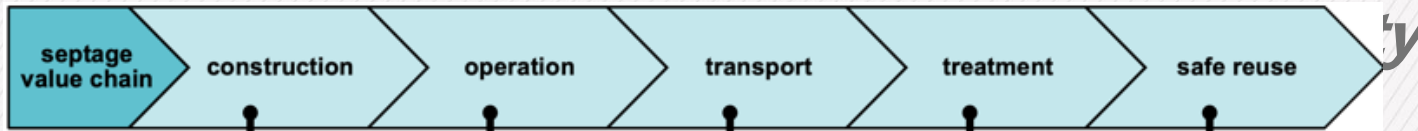
M.



Reimagining Septage Management

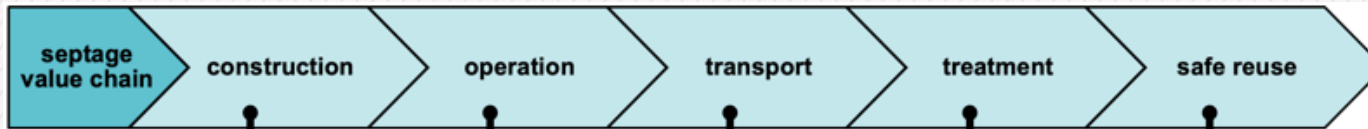
Construction and Operation

- *Proper construction and sealing of new tanks*
- *Alternative: separation of urine and feces*
- *Data: Location of existing septic tanks,*



Reimagining Septage Emptying Management

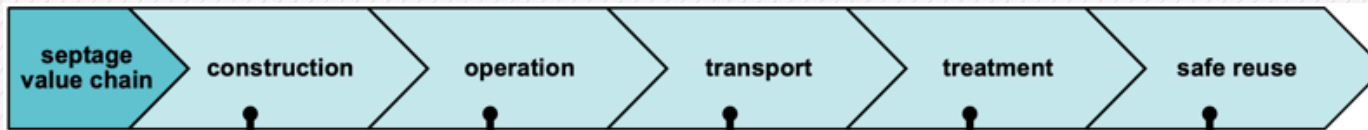
- *Timely pumping of tanks*
- *Dewatering*
- *Data: % filled, emptying company, emptying frequency*



Reimagining Septage Management

Transport

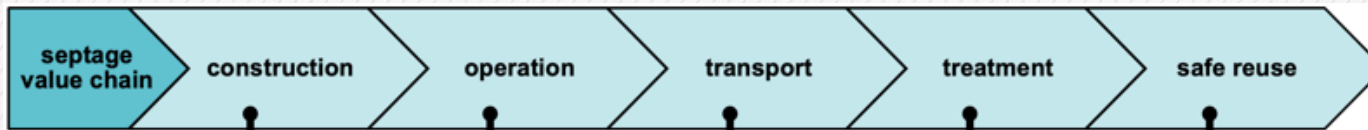
- *AI to optimize transport logistics, reduce impacts*
- *Data: transport distance, transport emissions*



Reimagining Septage Management

Treatment and Safe Reuse

- *Increase quantity of septage going to WWTPs practicing resource recovery*
- *Anaerobic digestion, Composting, Hydrochar*
- *Data: septage volume, septage characteristics, treatment technology, treatment efficiency*



Septage Management Strategies

Management Strategies	Current Status	Opportunity for Resource Recovery	Important Operational Variables
<i>surface land application</i>	established	N and P content	volume, nutrient content, trash contamination
<i>landfill</i>	established	CH ₄ capture	volume, C content, liquid content
<i>composting</i>	established	N and P content	storage space and distribution
<i>anaerobic digestion</i>	established	CH ₄ yield	temperature, time, pH, feedstock quantity
<i>aerobic digestion</i>	established	none	temperature, residence time
<i>chlorine oxidation</i>	established	none	contact time
<i>stabilization lagoon</i>	established	none	Time
<i>pyrolysis</i>	emerging	biochar, bio-oil yield	temperature, time
<i>struvite precipitation</i>	emerging	N and P recovery	pH, molar ratio of Ca Mg, or NH ₄ to PO ₄
<i>ammonia stripping</i>	emerging	N recovery	temperature, pH, NH ₄ N load ratio

Barriers to Change

Lack of comprehensive national data

- ***U.S. Census discontinued national data collection in 1990***
- ***Lack of data hampers assessing impacts, identifying hot spots, and developing targeted interventions***

Barriers to Change

State-specific Regulation and Management

- Permitting: 41% health department, 27% county, 19% state, 13% other***
- Varying regulations and best practices (e.g., some states ban land application) can limit scale***

Barriers to Change

Public Perception & Awareness

- ***Residents unaware of water quality impacts of failing systems***
- ***“Out of sight, out of mind”***

Barriers to Change

Financial Constraints

- ***Upgrades or replacements can be prohibitively expensive***
- ***Limited staff for permitting and enforcement***

Barriers to Change

Emerging Contaminants

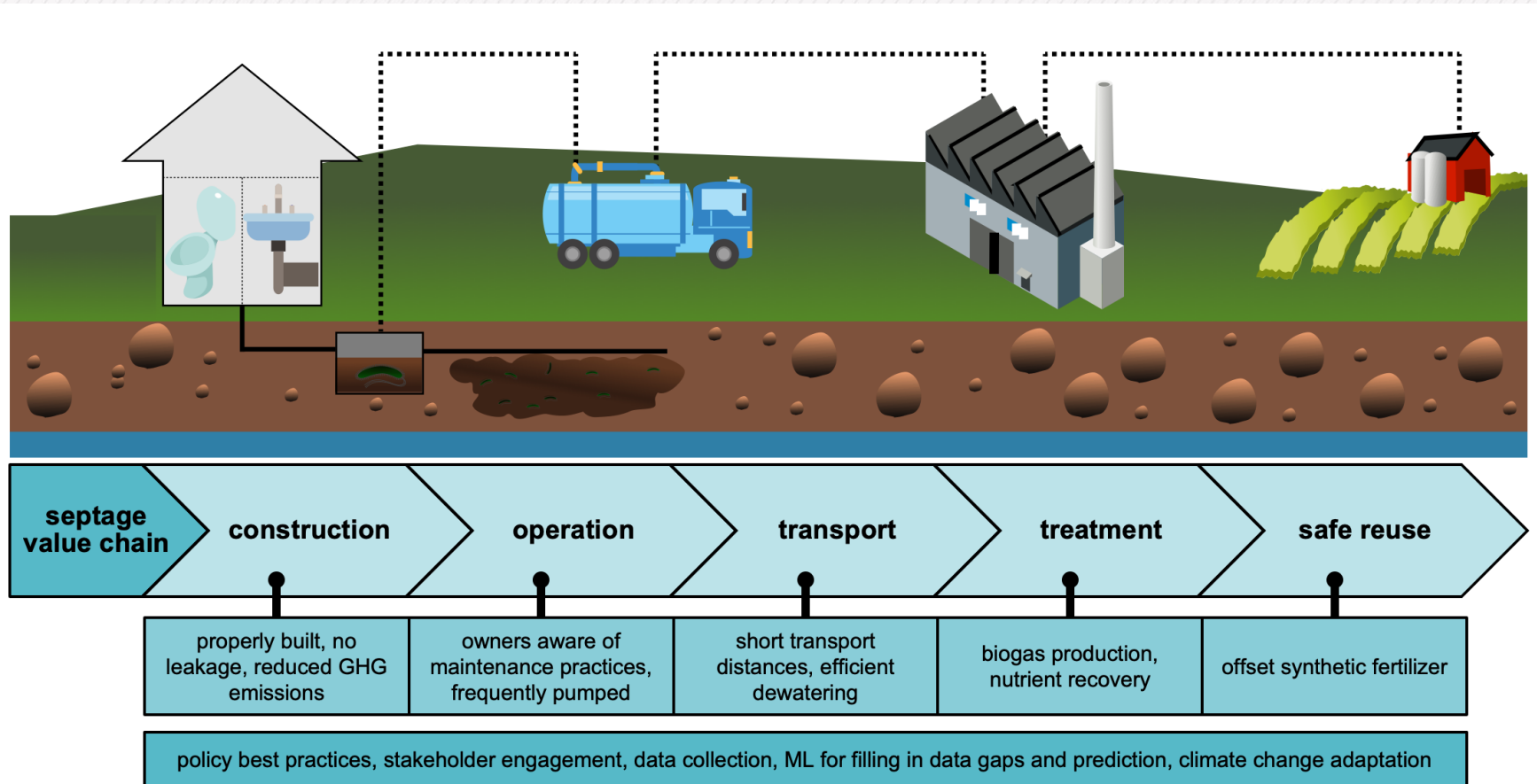
- ***PFAS***

Barriers to Change

Lack of data, tools, and regulatory frameworks

- Lack of data on septic tank locations, technology employed, and septage generated***
- Homeowner often in charge of maintenance tasks and costs***

Paths Forward





*Kevin Orner, Assistant Professor, Environmental
Engineering
Kevin.Orner@mail.wvu.edu*