Stakeholders' Perception towards Regionalization of Responsible Management of Decentralized Wastewater Infrastructure in the Rural Alabama Black Belt

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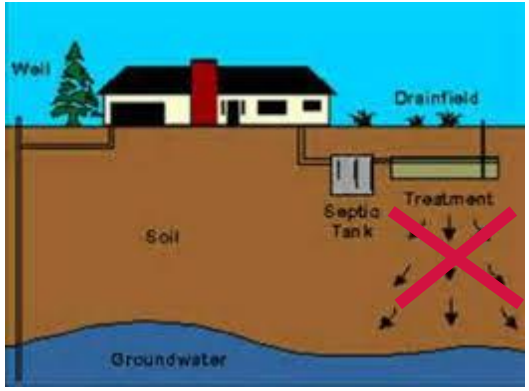
Alabama Black Belt's Wastewater Issues

- What is Black Belt?
  - Named for its fertile black soils
  - Mostly rural region with small spread-out residential clusters and low population density
  - Home to many underserved communities
  - High poverty with average annual income of only $28,873 (i.e., ~54% of national average)
  - Rich clay soils that shrink and swell with moisture, causing low permeability

Wastewater problems in Alabama's Black Belt

- Impermeable soils:
  - Do not accept water
  - Typical onsite wastewater systems (septic tanks and drainfields) do not work



- 49% of residents in the Black Belt do not have access to municipal wastewater services[1]

- In Bibb county[1]
  - 35% of homes with septic tanks showed signs of system failure
  - 15% use straight pipes discharge

1: (White & Jones, 2007)

Site visits: Straight pipes and drainfield failures

Decentralized Wastewater

A potential solution

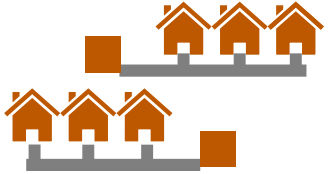
Customized decentralized wastewater models, including individual and clustered systems

Individual Systems

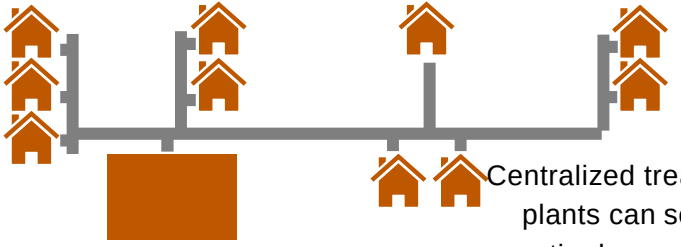
Individual decentralized wastewater treatment systems serve single homes

Clustered Systems

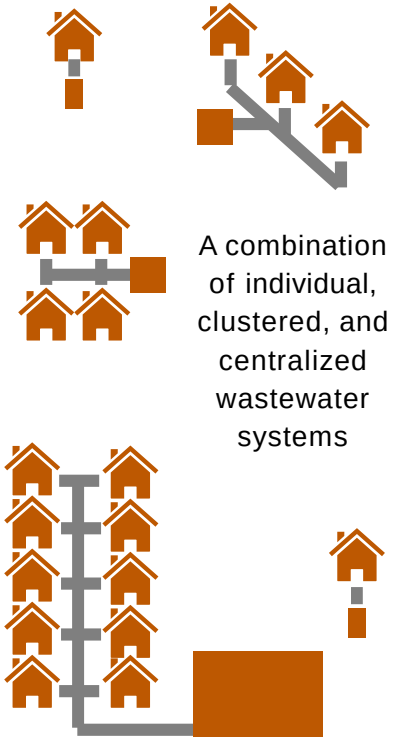
Decentralized wastewater clusters serve multiple households that share a treatment system



Centralized Wastewater Treatment



Centralized treatment plants can serve entire large cities



A combination of individual, clustered, and centralized wastewater systems

Operation and Maintenance (O&M) of decentralized systems

- Improper management of decentralized clustered systems[1]
  - Do not provide treatment level to protect public health and environment
  - Concerns regarding performance and reliability

Source: EPA (2003)

- Need to identify long-term responsible management entity (RME)* to provide O&M[2]
  - Entity characteristics (e.g., entity type, management scale)
  - Operational aspects (e.g., system size)
  - Socio-technical challenges

* RME: Legal organization with the technical, managerial, and financial capacity to provide O&M

1: (EPA, 2018)
2. (EPA, 2003)

Type and scale of RME

- Type[1,2]
  - Public service providers, such municipal utilities (e.g., water, wastewater, electric power, natural gas, solid waste management)
  - Private agencies (e.g., electric cooperatives, community development corporations)
  - Non-profit corporations

- Scale/jurisdiction[1]
  - Community-level management (e.g., a small group of homes)
  - County-level management (e.g., several clusters within a county)
  - Regional-level management (e.g., several clusters across multiple counties)
  - State-level management (e.g., several clusters within a state)

1: (EPA, 2005)
2: (RMI, 2004)

Regionalization of responsible management

- Community stakeholder preferences towards multi-county management scale
  - Economies of scale
  - Addressing limited customer base

- Bridging knowledge gaps to identify whether any changes in policy is proactively needed
  - **Objective 1:** Understand challenges to regionalizing RMEs
  - **Objective 2:** Identify strategies for addressing these challenges

Data and Methods

Semi-structured interviews

- Eight interviews with 11 stakeholders
- Sep 14, 2022 – Feb 8, 2023
- State gov. agencies, non-profit, for-profit, academic institutions
- Each more than 21 years of experience
- Ranging between 40 to 96 minutes
- Teleconferencing, transcription, QA/QC

Inductive thematic analysis

- Inductive: Open-minded to what the data suggested
- Emerging challenges and strategies
- Coding using *Nvivo* software
- Unit of analysis: Complete response
- Reliability analysis
  - *Mezzich's Kappa* statistic (0.65)

Major challenge within each dimension

- Five socio-technical dimensions emerged

Emerged Dimension	Emergent Major Challenge Within Dimensions
Technical	Difficulty to ensure timely responses to issues in times of extreme events when operating at a larger scale
Social	Trouble getting community buy-in
Financial	Possible inequitable billing mechanism across communities involved in regionalization
Institutional/Regulatory	Lack of enabling legal structure and legislation
Political	Political resistance and power dynamics

Trouble getting community buy-in

- Social and cultural differences may complicate the implementation of regional approach

"[If you spread it out, you get personal issues, with the different beliefs…, norms, and cultures. …You may just have a lot of trouble getting buy-in if you try to make everybody fit into one little box. Because the whole point of having clustered systems, is that they all have different needs. If we think of it financially and technically it's great. But if we need to think of it from a social aspect, it has some drawbacks. So, we need to be very careful with that."

"The [challenge] about a regional [entity] is you lose contact with the people. I mean, who your customers are; …you getting to know them; … them getting to know you."

Trouble getting community buy-in (cont'd)

"Keeping [the regionalization scale/geological coverage] to where everybody feels associated with each other."

"It's important for [regional RMEs] to be well-branded. [For instance], they [need to] have a uniform [that] has the logo. The truck that they're in has the logo of the utility, so they're well-recognized."

- Re-emphasizing the need to keep local community residents engaged in the regionalization process
- Soliciting their continuous buy-in → Meeting their actual needs and preferences

Lack of enabling legal structure and legislation

- Lacking the legal structure and legislation needed to facilitate regionalization

> *"[Implementing regionalization] is going to be a really heavy lift. We need to create a governmental entity and just call it the 'Black Belt Utility Authority'. It'll have multi-county footprint, and somehow, it has to have some sort of funding source. And it'll require special legislation because there's no such thing right now being at that kind of level."*

- Need for a special state and county legislation to incentivize and/or mandate more regional RMEs (e.g., New Mexico)

Implications

- Empirical understanding to challenges impeding effective regionalization
- Capturing key stakeholders' insights into strategies for addressing identified challenges
- Highlighting policy changes to support the operationalization of regional RMEs
- RMEs are better enabled to provide sustainable O&M services to decentralized systems

Paths forward

- Incorporate additional stakeholders' insights
  - Conducted 32 semi-structured interviews (diverse stakeholders)
  - Comprehensive understanding to challenges and strategies related to regionalization

- Recently awarded grants
  - EPA Community Change: ~$15 million, between nine institutions, led by Texas A&M University
  - USDA Rural Development: ~$5.2 million, between five institutions, led by University of Alabama

For more information

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