Policy reform alternatives to combat failure of onsite wastewater treatment systems

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Executive Summary: One in six homes in Colorado treat wastewater on-site through septic systems. Properly- functioning septic systems that adequately contain and treat waste save households money, protect property value, help keep families healthy, and protects the environment. Yet, keeping systems functioning properly is a challenge to homeowners due to financial burdens, gaps in maintenance knowledge, and low regulatory oversight. Roughly 10 to 20% of septic systems in the US were not functioning properly in 2002; this number is likely higher now that more older systems have reached their 40-year design lifespan. This brief analyzes four alternatives to reform policies in innovative ways that would address these challenges in Colorado: (1) a tiered, risk-based regulation similar to California; (2) a process for permit renewals; (3) an update to property transfer laws for buyer education; and (4) expanded revolving fund for preventative maintenance. Each policy alternative was evaluated for its competitiveness in feasibility of implementation (including costs), ease of adoption, longevity, and impact on public and environmental health. Considering relative tradeoffs and potential outcomes, **enacting a permit renewal process as a policy directive** emerged as the best alternative for the Colorado Department of Public Health and the Environment (CDPHE) to ensure protection of public health and environment in Colorado.

I. The Problem

Centralized wastewater collection and treatment systems cannot provide services to all homes. When centralization is not feasible, onsite wastewater treatment systems (referred to in this memo as 'onsite systems'), owned by individual homeowners or in small neighborhood clusters, can provide a viable alternative. In 2017, the US Census Bureau estimates that approximately 1.5 million of the 8.9 million households—or one in every six homes— in Colorado, treat wastewater onsite (U.S. Census Bureau 2017). A well-maintained onsite system can save money, protect property value, keep families healthy, and protect the environment (EPA 2017). Onsite systems require less technical upkeep, yet still require minor routine maintenance (e.g., emptying) and occasionally major overhauls (e.g., replacing a soil treatment unit). Often, homeowners lack the knowledge to perform this maintenance, and regulations rarely include adequate oversight to identify maintenance or performance issues. The EPA estimates that 10 to 20% of onsite systems do not treat wastewater to safe standards. (EPA 2002).

What happens when a system fails? Onsite system failure can lead to a public health problem. Accumulation of sludge in the septic tank can overflow and clog the soil treatment unit, leading to surface ponding, runoff, or backup of sewage into homes. Tanks can corrode or crack, leaking 55 to 85% of contents into groundwater and possibly nearby surface water (EPA 2002). The closer the onsite system is to a surface- or groundwater body, the greater the risk. The most dangerous contaminants are pathogens, organic compounds that deplete soil oxygen levels, and nitrogen that accumulates and if ingested, can lower oxygen levels in the blood and can be fatal to infants (EPA 2002).

II. Barriers to proper system upkeep

The gap of knowledge regarding maintenance, the financial burden, and lack of regulatory oversight are barriers that prevent homeowners from properly maintaining their onsite systems.

i. Maintenance knowledge gap

A major issue is that homeowners lack the knowledge to maintain their onsite systems. In the case of transferring property, many home buyers may assume they are connected to a centralized system and are not aware they are responsible for the upkeep of their onsite system. Some counties, such as Boulder County, have tried to combat this by establishing a SepticSmart Property Transfer program that ensures the onsite system is functioning prior to ownership transfer (Boulder County 2018a). However, they have no requirements for informing or educating the new homeowner of the maintenance requirements for their new system. For homeowners that are aware of their onsite system, they still may not know when or how to maintain it.

ii. Financial burden

Costs for an onsite system are greater than being connected to a centralized sewer, and can occur suddenly without notice. Upfront costs for an onsite system include permitting, soil analysis, design and installation, and vary largely due to variation in soil, ground slopes, groundwater level, and flow capacity requirements (Boulder County 2018b). Following construction, maintenance and repair costs an average of $370/year. However, these costs are not distributed uniformly over time (Kohler et al. 2017). In Boulder County, for example, any permit inspection and approval, whether for a new system, major repairs or replacement, costs the homeowner $1,023 (Boulder County 2018c). Further, a major repair or replacement of an onsite system might cost a homeowner $15,000 to $20,000 (Kohler et a. 2017). Paying lower costs distributed over the service life provides a better option for homeowners than large, sudden costs associated with failure. Without knowledge of the economic benefits associated with regular upkeep, homeowners inadvertently cause system failure.

iii. Low regulatory oversight

With low regulatory oversight, protection of environmental and public health is left to the owners of onsite system, or county health departments with limited resources. Federal regulations do not cover onsite systems, as onsite systems were originally a characteristic of low-density rural communities where failure of an individual system had a small impact on overall groundwater quality. Now, onsite systems are used increasingly in concentrated suburban areas where impact compounds. But regulation is hardly feasible when enforcement of effluent standards must cover thousands of unmonitored individual systems. Unlike homes connected to centralized sewers and water distribution systems, onsite wastewater system owners also often rely on wells for drinking water, exacerbating their risk if their system fails close to their drinking water source and shifting responsibilities to homeowners.

III. Policy context

When a homeowner plans to construct an onsite system, they must go through a permitting process overseen by "local boards of health," meaning a local, county, or district board of health in Colorado. State Regulation 43 provides guidelines for onsite system design in Colorado, such as product acceptance lists and rules for certified septic engineers but does not monitor the maintenance of the system or require re-permitting at any point in the system lifespan. This opens a door for failure, as even properly-designed technologies can fail if not properly operated, and all properly-operated systems still have a design lifespan of 40 years. 55% of homes in the Mountain Division were built before 1980 and are approaching or have surpassed this lifespan (US Census Bureau 2017). Yet, any protection against failure is better than none. When Regulation 43 was first adopted at the state level in 2013, it had to be adopted at the county level but only 12 of the 64 CO counties enacted the regulation (Meseck, J., Mendez, D. n.d.). The remaining 52 counties do not have regulations for onsite systems.

Thus, policy reform is needed to ensure proper onsite system maintenance by addressing homeowner knowledge of maintenance requirements, financial burden, and/or regulatory oversight. Functioning onsite systems that adequately contain and treat waste leads to improved health, reduced financial risk, and protected property value for 1 in 6 homes in Colorado.

IV. Alternatives

This brief presents four alternative solutions, that could enable homeowners to maintain their onsite systems, minimize failure, and mitigate public health risks and groundwater contamination in Colorado:

1. Tiered System for regulation on risk-basis (State policy directive)
2. Re-permitting law (State legislative action to local level)
3. Educational programs for property transfer (CDPHE regulation or state grant)
4. Revolving state fund for repairing failed systems (State budget allocation)

Implementing a **Tiered Risk-Based System** at the state level targets the challenge of regulatory oversight. A tiered system, such as California Onsite Wastewater Treatment Systems Policy Tiers, categorizes new, existing, and replacement systems through risk-based criteria of site characteristics, such as proximity to surface water, and initiates regulatory action for each tier (California State Water Resources Control Board 2018). This oversight system requires homeowners and local boards of health to raise design standards, monitor effluent quality, and repair damage in areas near impaired surface water bodies.

Enacting a **Permit Renewal Law** through the state legislature targets the challenges of regulatory oversight and financial burden. Recent research in Boulder County found that a key factor leading to failure was lack of inspection and recommended that "mandatory inspections through a mechanism such as **renewable permits** would significantly reduce life cycle repair/failure frequency and severity, lowering onsite costs to owners and reducing public exposure to wastewater contaminants" (Kohler et al. 2017).

Initiating a mandatory **Property Transfer Educational Program** through either a regulation by the Colorado Department of Public Health or a state grant would target the knowledge gap. Closing the knowledge gap about responsibilities can raise homeowner's desire to maintain their onsite systems consistently and prevent failure. Some counties in Colorado have a SepticSmart Property Transfer program (Boulder County 2018a) that ensures the onsite system is functioning prior to ownership transfer, however, it has no requirements for the buyer to receive information about their treatment system or when it needs to receive its next inspection or emptying.

Allocating a **Revolving Fund for Preventative Maintenance** targets financial burden at the state level. Allocating funds at the state level would incentivize homeowners to maintain their systems on schedule, leading to consistent functioning and reduced failure. In Colorado, some counties provide low-interest loans available to lower-income brackets up to $25,000 in case of system failure or major repairs (Kohler et al. 2017), however, there is no fund available to homeowners to encourage preemptive maintenance to avoid failure in the first place.

V. Evaluation criteria

A successful policy should realistically create the conditions to enable all homeowners to maintain their onsite wastewater treatment systems over the long-term, minimizing system failure and maximizing public and environmental health. With this goal, each policy alternative was evaluated against four, equally-weighted criteria on a scale of 1 to 5:

- <u>Feasibility</u> of an alternative is defined by the **likelihood that the alternative can be implemented** by either the CDPHE or Colorado local boards of health, including costs, political acceptance, or existence of a similar program. For example, if an alternative requires the update or expansion of an existing initiative, it may be more feasible to implement than an alternative that requires a completely new program.
- <u>Ease of adoption</u> of each alternative first assumes the alternative was successfully implemented and then considers **how likely it is to achieve complete adoption**. For example, if an alternative requires voluntary time, action, or resources from individual homeowners, it is less likely to be adopted compared to a required regulation.
- <u>Longevity</u> of the alternative is scored based on its ability to **last for many years**, including the ability to adapt to changing conditions. This analysis compares alternatives based on their ability to remain effective beyond 40 years, as that is a typical lifespan for onsite systems.
- <u>Health</u> ensured by an alternative is defined by the ability of the alternative to comply with EPA regulations, reduce health risks to families and neighbors, and to protect the

health of the subsurface and surface environment.

VI. Outcomes

A summary of each alternative's strengths and trade-offs regarding the evaluation criteria is provided briefly below. A matrix evaluating each alternative against the evaluation criteria provides a more thorough description and is provided in the Appendix.

Implementing a **Tiered Risk-Based System** at the state level scored high for longevity and health, with moderate ease of adoption and low feasibility. Although no current tier-system exists, there is some precedent for design criteria to be based on risk. For example, if the groundwater table is high then soil treatment units must be on a mound. Establishing this system and adapting it over time would take time and resources, yet once implemented it is likely to be adopted as it would be mandatory. It also could guide future regulations and thus could be highly robust. As it would target onsite systems based on their risk, it could provide consistent minimization of risks to public and environmental health.

Enacting a **Permit Renewal Law** through a state-level policy directive has a high longevity and high ease of adoption for a moderate health output yet has a low feasibility. No current permit renewal law exists but it would build on an existing permit system. It would require heavy upfront time for implementation to adapt that existing system to allow for renewals, but as it would be mandatory, adoption is likely to be high and long-lasting. As enforcement can only occur on an interval, such as when permits are renewed, health impacts can be mitigated in intervals rather than consistently, thus it only provides moderate health benefits.

Initiating a mandatory **Property Transfer Educational Program** through a state-level legislative action has moderate feasibility and ease of adoption, yet restrained longevity and health. It would build on an existing law and could keep costs low through an online program, making it feasible to implement. However, if an online program is not possible, its implementation would be more costly and thus less feasible. It would require time by the homeowners but would be mandatory and thus may show better adoption. Yet, even though it would not need to be adapted once implemented, educational programs are not very robust on their own and may not last for the long-term (Mohamed 2009). Further, they could not guarantee consistent repair but may reduce some system failure and thus lead to some reduced health risk.

Allocating a **Revolving Fund for Preventative Maintenance** through the state budget would have restrained feasibility and ease of adoption, very poor longevity, and a moderate impact on health. It would require time to implement because any reallocation of budget will be debated as it takes state funds away from public schools and programs. Voluntary programs are hard to adopt and rely on homeowners taking initiative. Shifting budgets may have poor longevity due to constant budget fluctuations and shifts throughout the state. However, reducing the financial burden would incentivize upkeep and preventive maintenance that would keep systems functioning properly rather than just fixing them once they fail.

VII. Chosen Policy Alternative

Two of the four alternatives emerged as equally able to satisfy the intended outputs of the policy revamp. Enacting a **Permit Renewal Law** through a state-level policy directive may be more readily adopted but not provide guarantee of consistent onsite system upkeep, as it only regulates on an interval (when permits are re-evaluated and renewed). A **Tiered Risk-Based System** at the state level would be more challenging to implement but provide greater benefits to public and environmental health as it would minimize impacts more consistently rather than on an interval. This poses a trade-off between ease of adoption and health risks.

The key stakeholders affected by the selected policy alternative are owners of onsite systems, the local boards of public health, and the Colorado Department of Public Health. Each of these stakeholders may weight each of the four criteria differently and thus determine priorities. Yet, this analysis acknowledges that a policy that is more readily adopted has more potential to have a widespread impact, and thus **recommends that the Colorado Department of Public Health and Environment enacts a permit renewal law through a policy directive.**

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Appendix. Evaluation Criteria Matrix

Scores 1-5 where 1 = very poor, 2 = low, 3 = restrained, 4 = moderate, 5 = high.

Alternative	Feasibility	Ease of adoption	Longevity	Health
Alt 1. **Tiered Risk-Based System** Final Score: 17	No current law exists, though some precedent exists for design (i.e. high groundwater tables require mounds). It would increase regulatory oversight costs for the state and local boards. It has worked in CA and may be accepted in CO. **Score: 3**	Once implemented, would take constant adaptation at the state level. But, as it requires some mandatory action, it is likely to be adopted. **Score: 4**	If institutionalized, this tier-based system can guide many future regulations and programs and could thus remain quite robust. **Score: 5**	Regulates systems based on their risks to the environment and public health. **Score: 5**
Alt 2. **Permit Renewal Law** Final Score: 17	No current law exists, and permit renewals can be expensive. But renewal permits could be less than installation or repair permits to increase political acceptance. The cost to Colorado would be low. **Score: 3**	Once implemented, permit renewal would be mandatory and, if enforced, adoption is likely to be high. **Score: 5**	Likely to remain robust once it becomes a required practice, and likely to lead to higher functionality overall and thus continue to be practiced. **Score: 5**	No guarantee of consistent upkeep and repair, but would increase the frequency of maintenance based on renewal timeline. **Score: 4**
Alt 3. **Property Transfer Educational Program** Final Score: 13	Builds on an existing law. Educational programs can range in expenses, but if implemented online at a low cost, costs to the homeowner and the state can be kept low. **Score: 4**	Once implemented, an educational program would be mandatory. It will require time from the homeowners, and often educational programs are not very effective on their own (Mohamed 2009). **Score: 3**	Educational programs, if kept simple, would not need constant updating and would be able to integrate into other property transfer practices, which are robust. **Score: 3**	No guarantee of consistent upkeep and repair, but likely would reduce the amount of system failure due to no knowledge of the system and responsibilities. **Score: 3**
Alt 4. **Revolving Fund for Preventative Maintenance** Final Score: 11	Adapts an existing budget for system failure repair, but any re-allocation of budget will be debated as it takes state funds away from public schools and programs. **Score: 3**	Once implemented, still relies on homeowner initiative. Homeowners would still have to be aware of and voluntarily apply for the fund, so it will be harder to adopt. **Score: 3**	Budget allocations are constantly fluctuating and shifting based on other state needs. **Score: 1**	Allows homeowners to conduct preventative maintenance and keep systems functioning properly instead of fixing them once they break, reducing overall leakage. **Score: 4**