Using the Four R's in the Design of De Facto Potable Reuse Water for Enhanced Public Health

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Background

• As industry and human populations expand, the demand for access to a nation's water resources are at an all time high.

•These stakes are only worsened when accompanied with global weather pattern shifts influenced by climate change.

• Although using recycled wastewater in a system, also known as de facto potable reuse, has been used for some time now, there is a new framework being created that broadens the scope of de facto potable water and will provide even more consistent protection of the public health.

• This new paradigm of planned wastewater reuse consists of a general belief in the four R's: reliability, redundancy, robustness, and resilience.

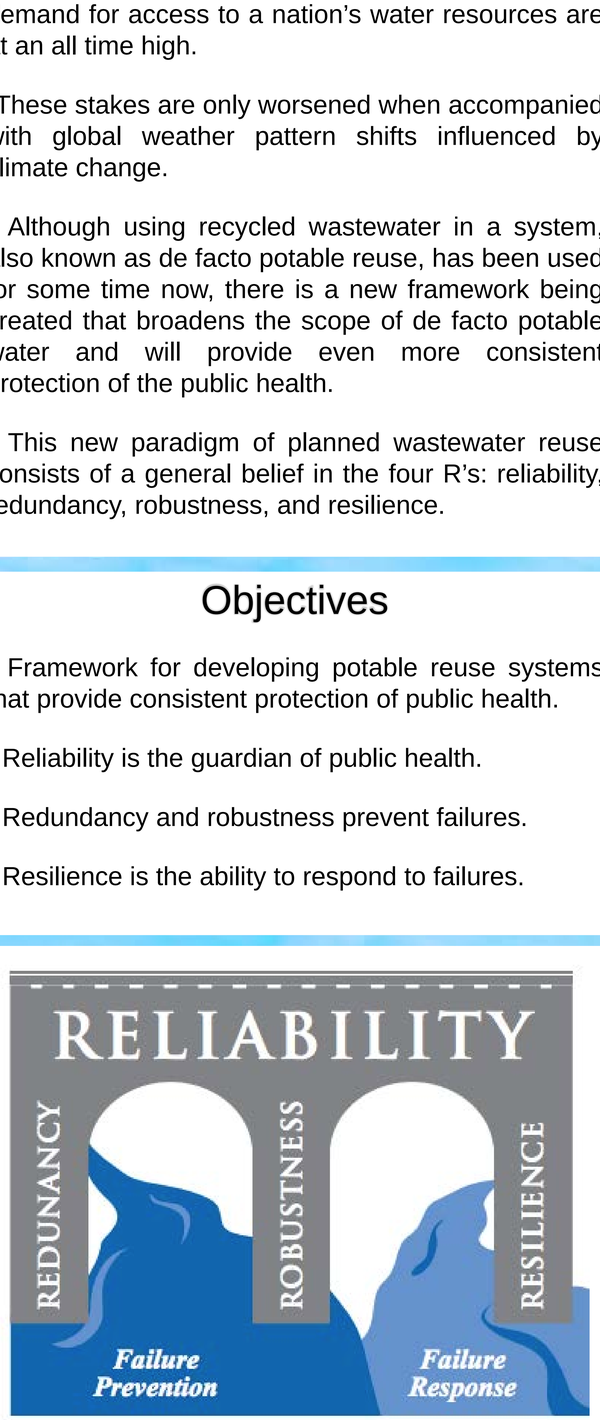
Objectives

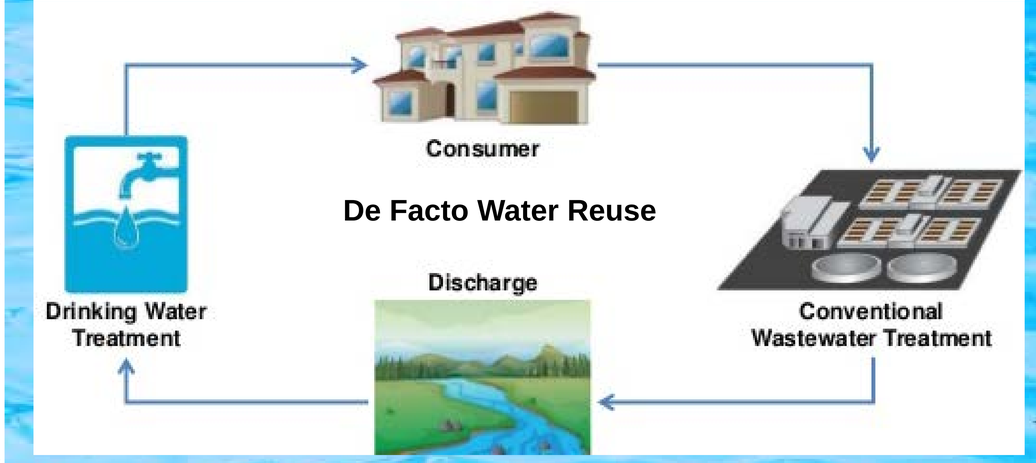
• Framework for developing potable reuse systems that provide consistent protection of public health.

• Reliability is the guardian of public health.

• Redundancy and robustness prevent failures.

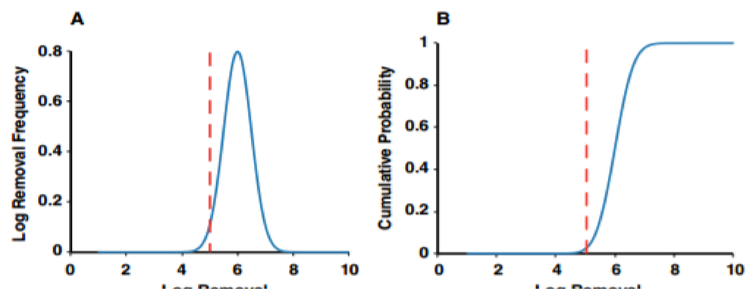
• Resilience is the ability to respond to failures.





Reliability

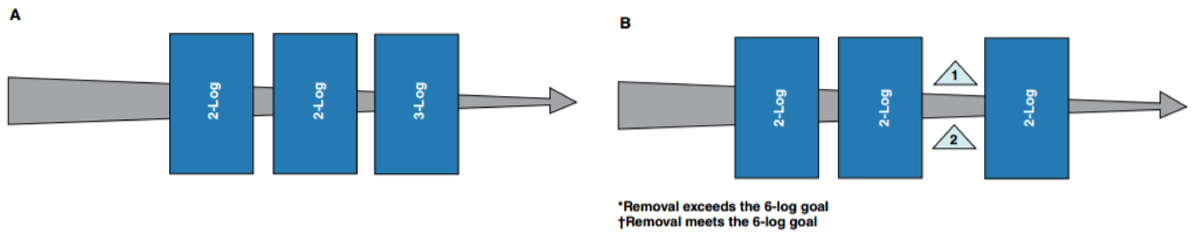
• The ability of a potable reuse system to provide water that consistently meets or exceeds the public health protection provided by existing drinking water supply.



Sample probability distribution function of an ozone system designed to achieve 5-log removal of *Giardia* cysts: (A) continuous and (B) cumulative distributions

Redundancy

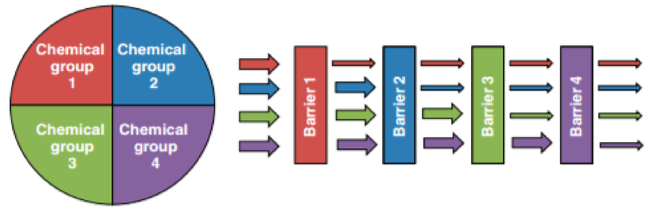
• The use of measures beyond minimum requirements to ensure that treatment goals are more reliably met or that performance can be more reliably demonstrated.



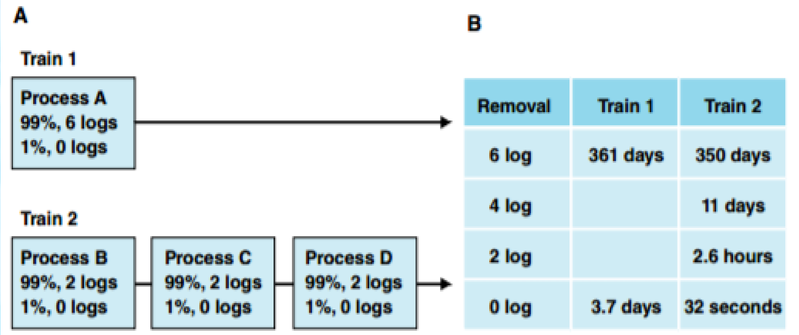
Types of redundancy, including (A) treatment* and (B) monitoring† redundancies

Robustness

• The ability of a potable reuse system to address a broad variety of contaminants and resist catastrophic failures



Robustness and the use of diverse barriers to protect against diverse contaminants.



(A) Treatment performance and (B) the benefit of the multiple-barrier approach

Resilience

• The ability of a treatment train to successfully adapt to failure.

• Natural disasters, failure response

[1] Pecson, Brian M., R. Shane Trussell, Aleks N. Pisarenko, and R. Rhodes Trussel. "Achieving Reliability in Potable Reuse: The Four Rs." Journal - American Water Works Association 107 (2015): 48-58. Web

[2] https://www.slideshare.net/tolivito/meeker-the-new-frontier