The State of Source Separation

Applications to Enhance Treatment in the US and Europe

BRIGHTWATER *TOOLS*

NOWRA 10-20-2024

Why Should We Consider *Source Separation?*

"Across all sizes of WWTPs, systems are operating at an average of 81% of their design capacity, while 15% of systems are at or have exceeded that threshold."

-American Society of Civil Engineers

Why Should We Consider *Source Separation?*

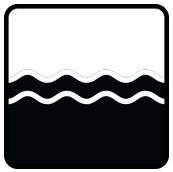
Society is at an inflection point…

As we rebuild our water/wastewater infrastructure we can use the most current scientific understanding and technological advances to **implement future proofed systems that optimize resource efficiencies.**

Source Separation Fosters Innovation

Capturing waste streams at their point of origin they can be separately treated according to their unique properties.

BLACKWATER



Includes solid human waste

URINE

Only includes urine

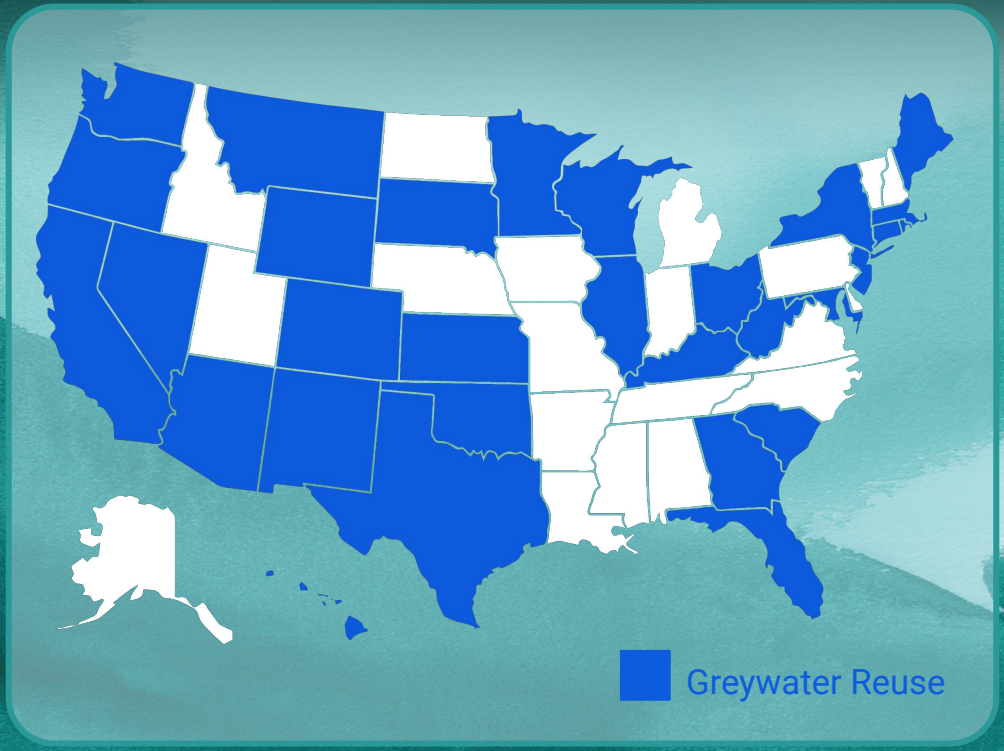
GREYWATER

From sinks, showers, and laundries

Greywater Recycling Opens the Door for Source Separation

Water Reuse is *HERE*

- Greywater reuse is **common** in the United States.
- **30 states** regulate and allow greywater reuse to varying degrees.
- Most common allowed greywater reuse is **irrigation**, specifically subsurface irrigation.
- Other uses for treated greywater include **toilet flushing**.



Greywater Recycling Opens the Door for Source Separation

TECHNOLOGIES IN EXISTENCE

SMALL SCALE

LeapFrog Design

MEDIUM SCALE

Use Water Twice
HYDRALOOP

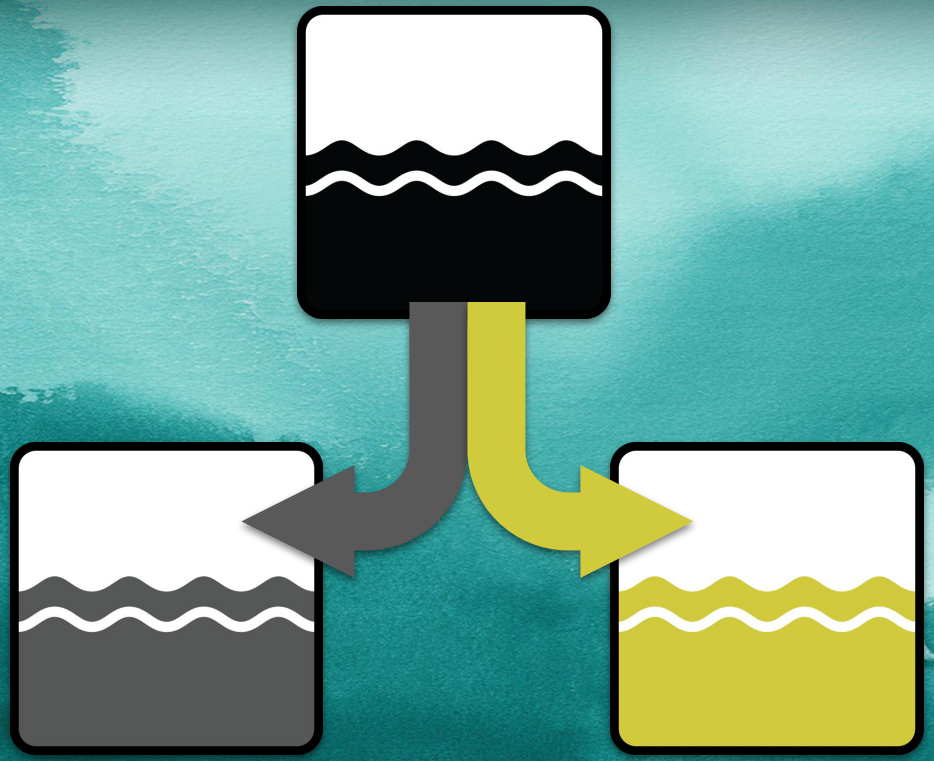
LARGE SCALE

RecoLab

Biological treatment, followed by ozonation, followed by nanofiltration

Urine Diversion Increases Nutrient Reduction for Source Separation

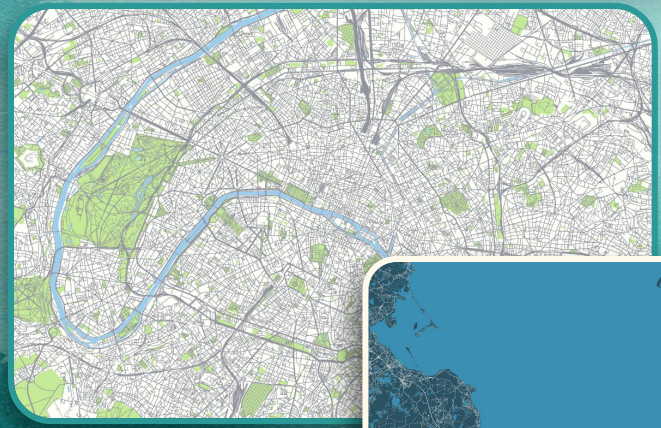
As most of the pathogens in human waste are contained in the black water, urine diversion is expanding communities' ability to recover nutrients for reuse safely.



Urine Diversion Increases Nutrient Reduction for Source Separation

This is relevant in places like **Saint-Vincent-de-Paul** and **Cape Cod** that are experiencing acute, wastewater-derived nitrogen pollution.

Urine diversion can be the most **prudent solution** (minimal technology required while removing up to 80% of nitrogen).



Saint-Vincent-de-Paul, Paris, France

Cape Cod, Massachusetts, USA

Urine Diversion In Falmouth, MA (Cape Cod)

Problem: Excess wastewater-derived nitrogen pollution to local waterways.

Proposed Solution: Urine diversion to significantly the loading of nutrients to existing onsite treatment systems.

Potential Benefits: Decreasing wastewater-derived nutrient pollution while preventing the need for upgrading onsite systems or sewering these communities at great financial expense.

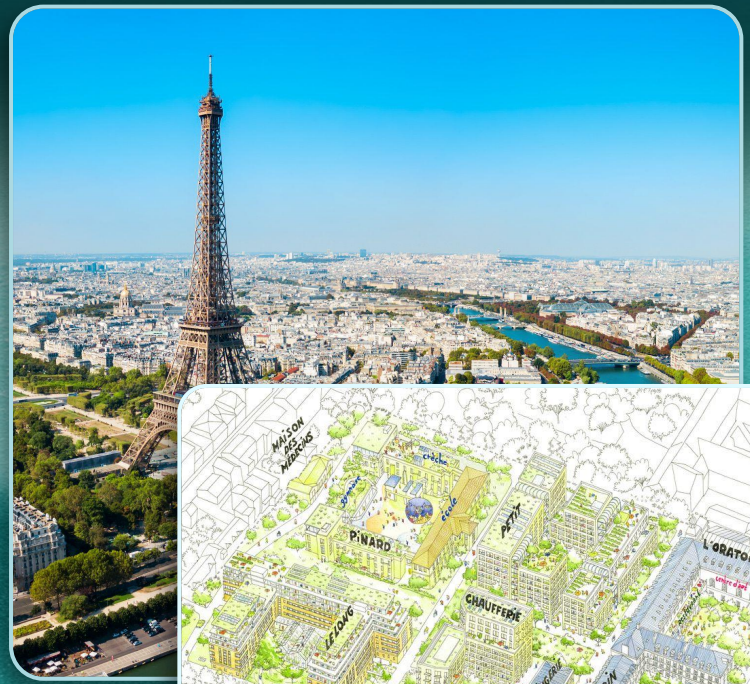
Urine Diversion In Paris, France

Problem: The **Siene**, the outlet for the Paris' wastewater, is too small to dilute nutrients.

Solution: Source-separation (subsidized by the Seine-Normandie Water Agency) is being implemented in a new housing building Saint-Vincent-de-Paul (~1000 urine diverting toilets)

Benefits:

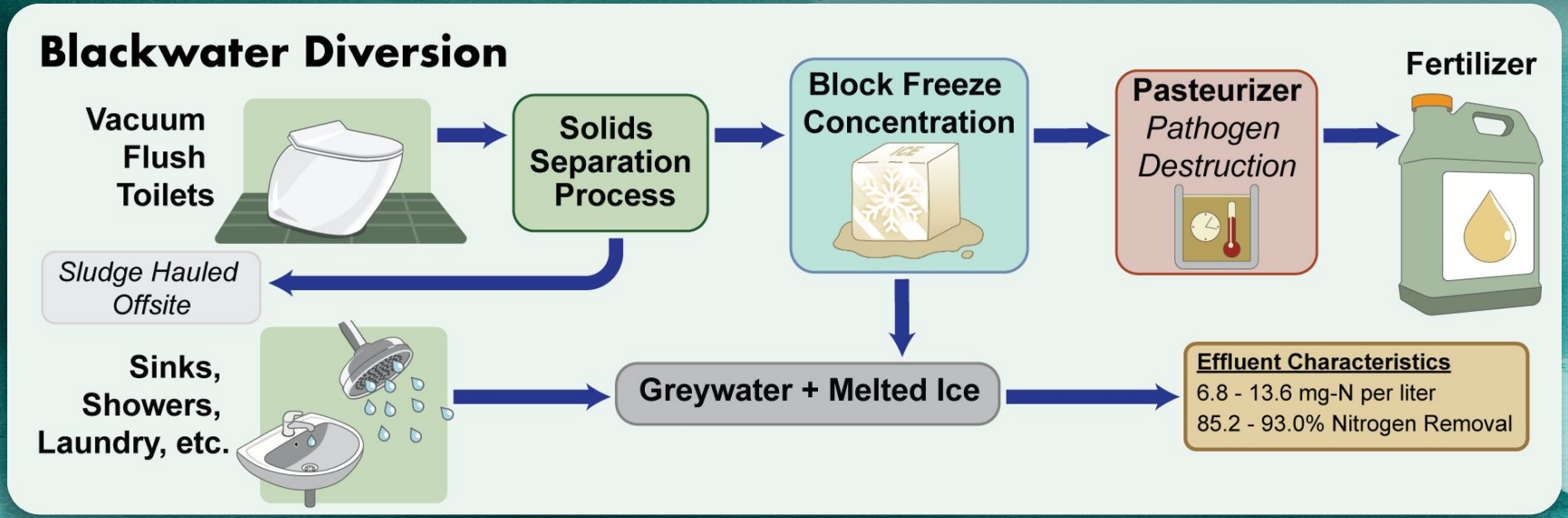
1. Allows for more focused, efficient treatment
2. Mitigates nutrient pollution
3. Generates sustainable fertilizer



The Siene, Paris, France

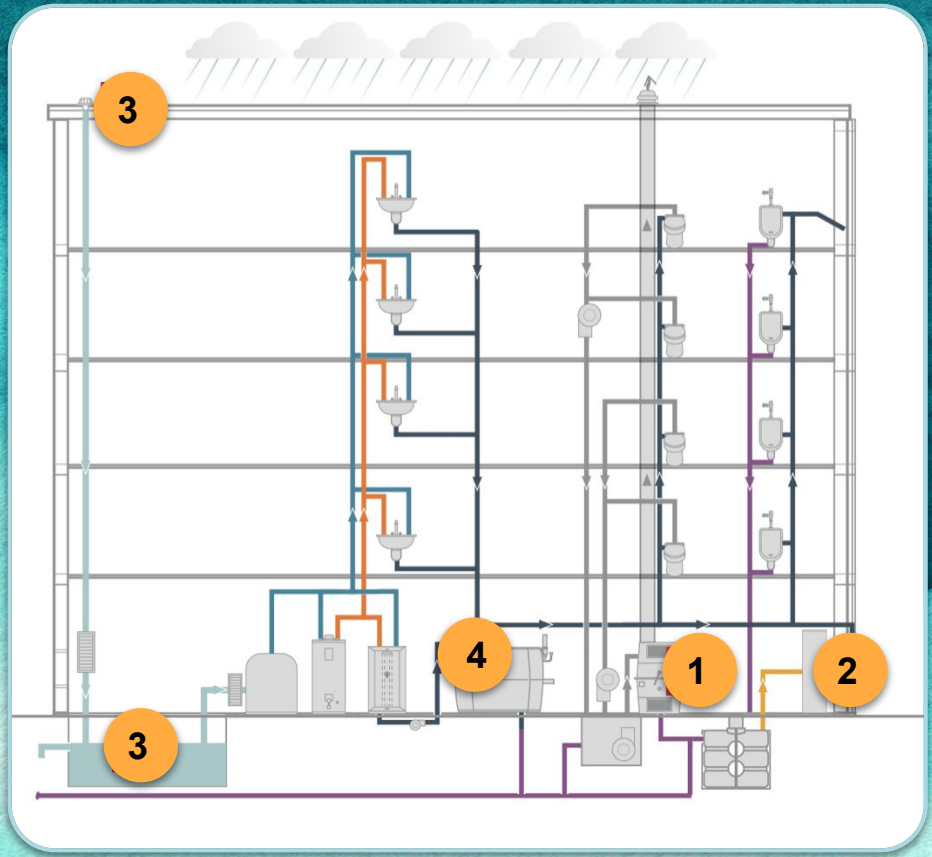
Drawing by Diane Berg

The Next Phase of Source Separation Includes Blackwater Diversion



Blackwater Separation in Portland, Oregon (PAE Building)

1. Toilet waste composting
2. Urine separation and fertilizer production
3. Rainwater capture and reuse
4. Greywater treatment and reuse



Composting Toilet Waste

PAE – Portland, Oregon

Photo: ZGF

Blackwater Separation in Europe (The Anchor Project)

- Network of five blackwater separation projects - *utility driven*
- Collectively serve more than 5000 PE
- Using a combination of:
  - Vacuum flush toilets
  - Blackwater digestion
  - Food waste digestion
  - Greywater treatment and reuse
  - Wastewater-derived fertilizer production
- Online since: 2005 (1), 2020 (2), 2021 (2)

Community-Scale Source Separation at RecoLab

- Contains a testbed for validating emerging technologies with real, source-separated streams
- Municipally-funded project done in collaboration with local wastewater authorities (NSVA)

The RecoLab, Sweden

Community-Scale Source Separation at RecoLab

- **Anaerobic digestion** of vacuum flush toilet water and food grinder waste
- **Struvite precipitation** and ammonia stripping of effluent to make chemical fertilizer feedstocks
- **Greywater treatment** (biological, ozonation, and nanofiltration) yields potable quality effluent

Opportunity In Your Watershed

To build a robust, resilient and efficient water supply include innovative approaches in the assessment process and technology selection process