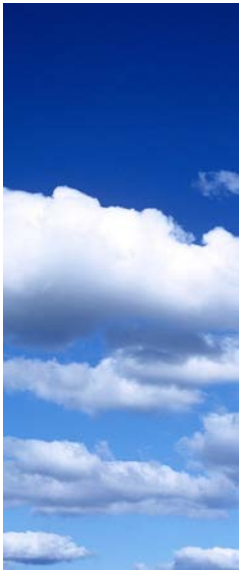
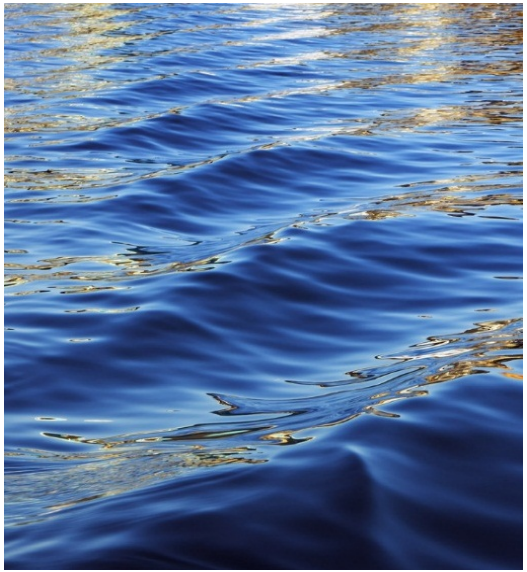


New Standards New Future for Non-sewered Waste Systems

Karleen Kos, Executive Director
PSAI



The Future of Non-sewered Waste Systems

I. The Situation and What's Behind It

II. The World Comes Together

III. Impacts on Portable Sanitation

How Many Have This On Your Arm?

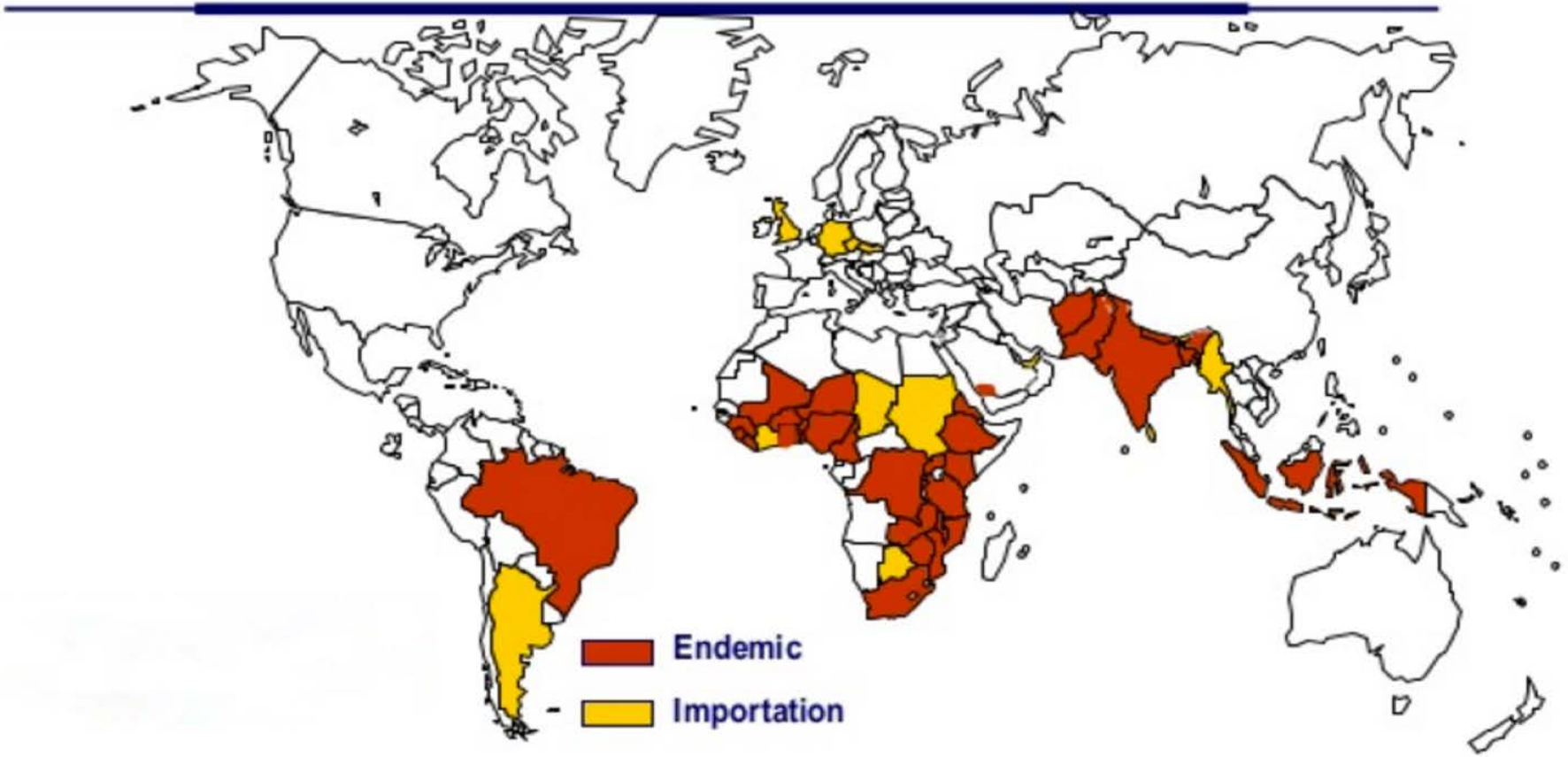
A Look at Smallpox

- A scourge dating back 12,000 years
  - 30% mortality
  - First vaccine in the late 1700s
- 1966
  - 10-15 million cases globally
  - 2 million deaths
  - 180 years post vaccine

1977: Last Known Case

- 1965-67 World Health Organization created its Smallpox Eradication Unit
- Solution required
  - Know-how: they didn't vaccinate the whole world
  - Commitment of resources
  - The will to make it happen

Smallpox, 1967: endemic in 31 countries or territories



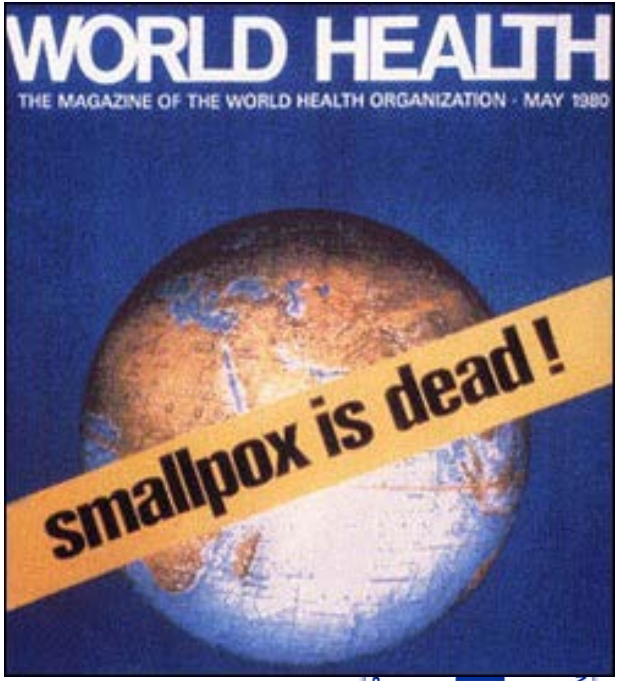
Analysis

Costs in 1967

- 1.5 million lives
- $1.4 billion for treatment globally ($10.1 billion today)
- $92.8 million in the US for vaccines

Cost of eradication

- $300 million over 12 years
- US contribution $23 million
- USA saves the equivalent of its entire WHO contribution every 26 days because it doesn't have to vaccinate or treat the disease




SO
WHAT?

Part I

THE SITUATION

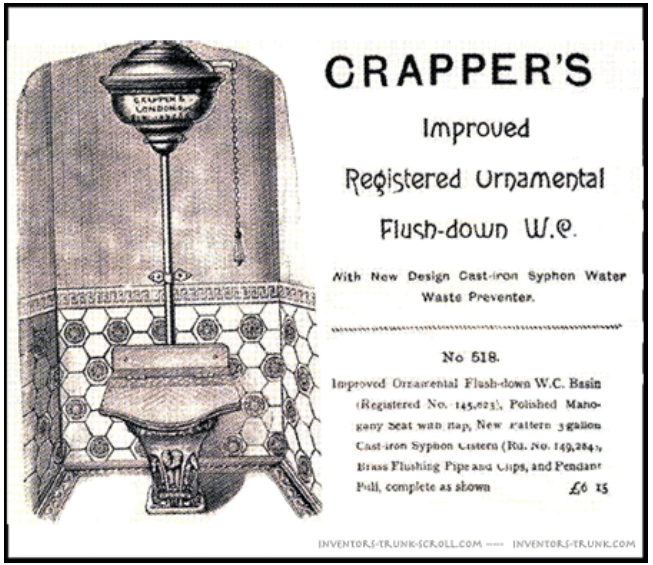
Poop and Pee are Problems

Situation

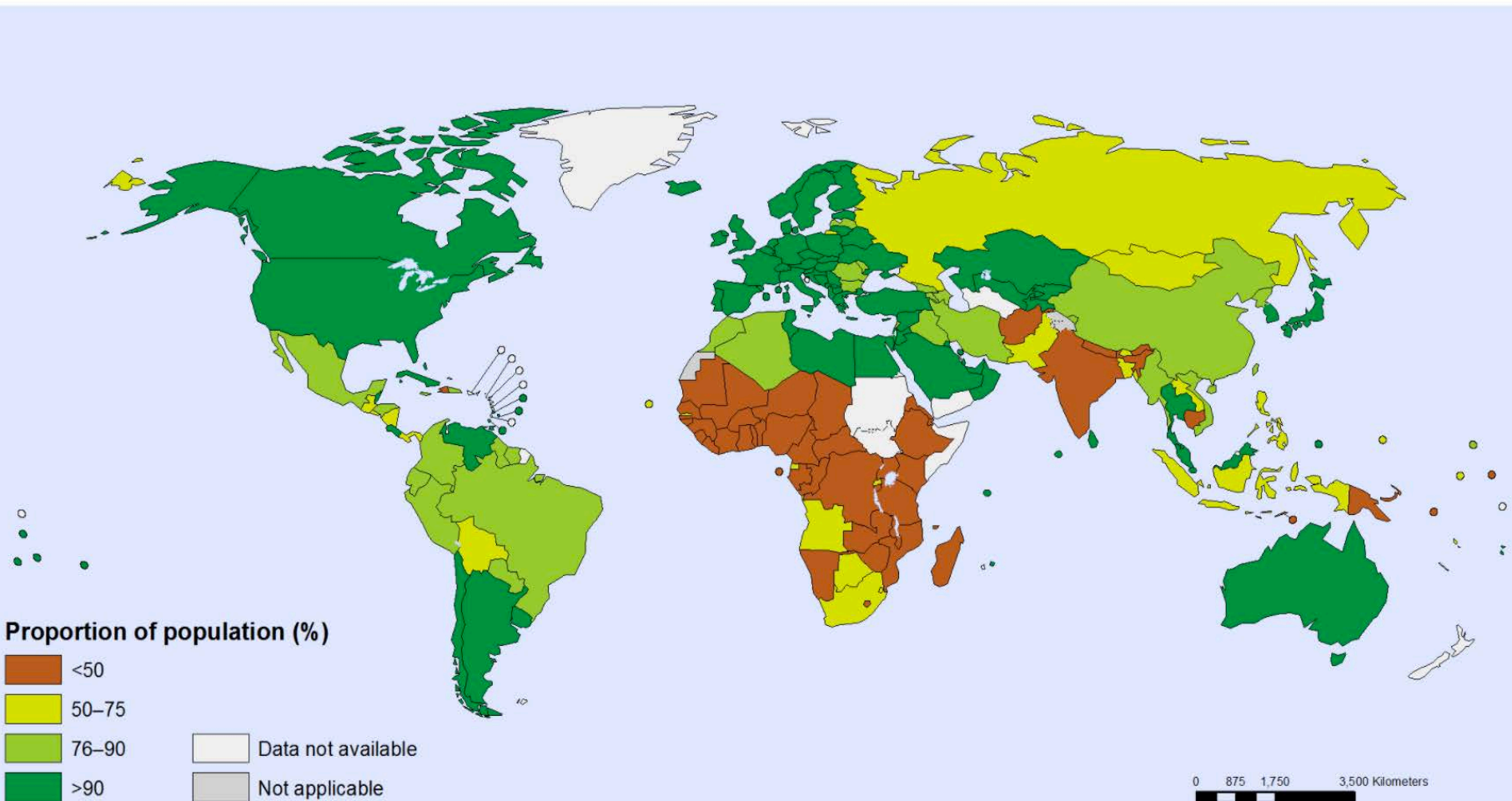
- ~2.4 billion people around the world do not have access to “improved” sanitation.
- ~1 billion people still defecate in the open
- Diarrheal disease is the second largest killer of children under the age of 5, where >500,000 die every year
- Issue of dignity and safety particularly for women and girls

Why?

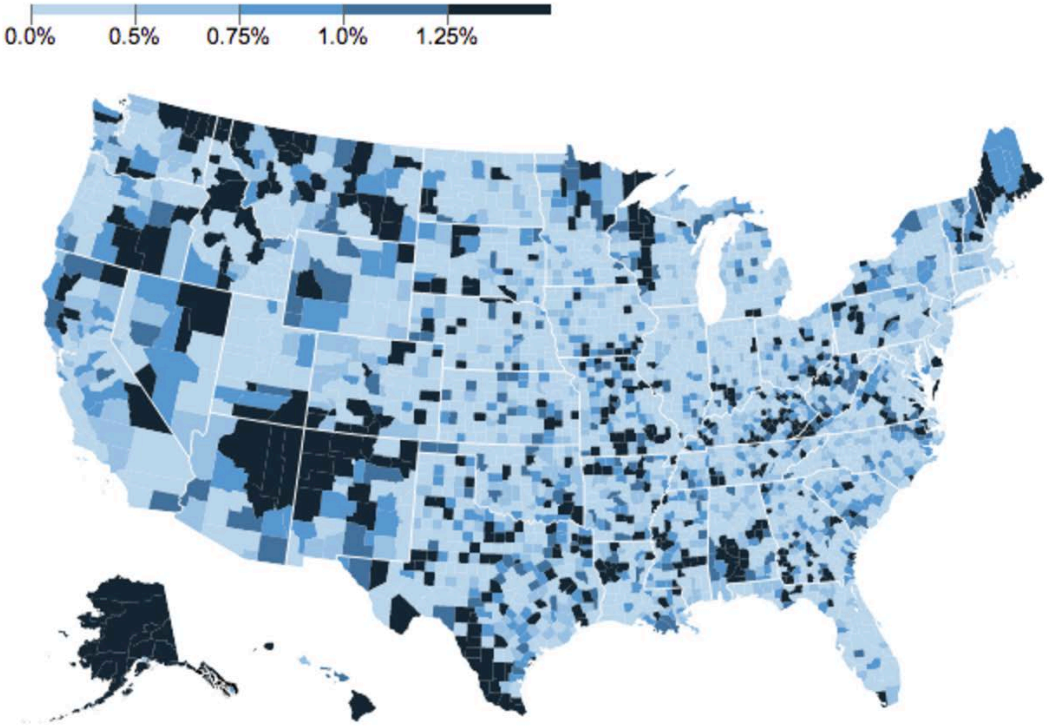
- Flush toilets have been around a while
  - Invented 1596
  - Widely adopted late 1800s



Proportion of population using improved sanitation facilities (%), 2015



Percent of housing units lacking complete plumbing facilities

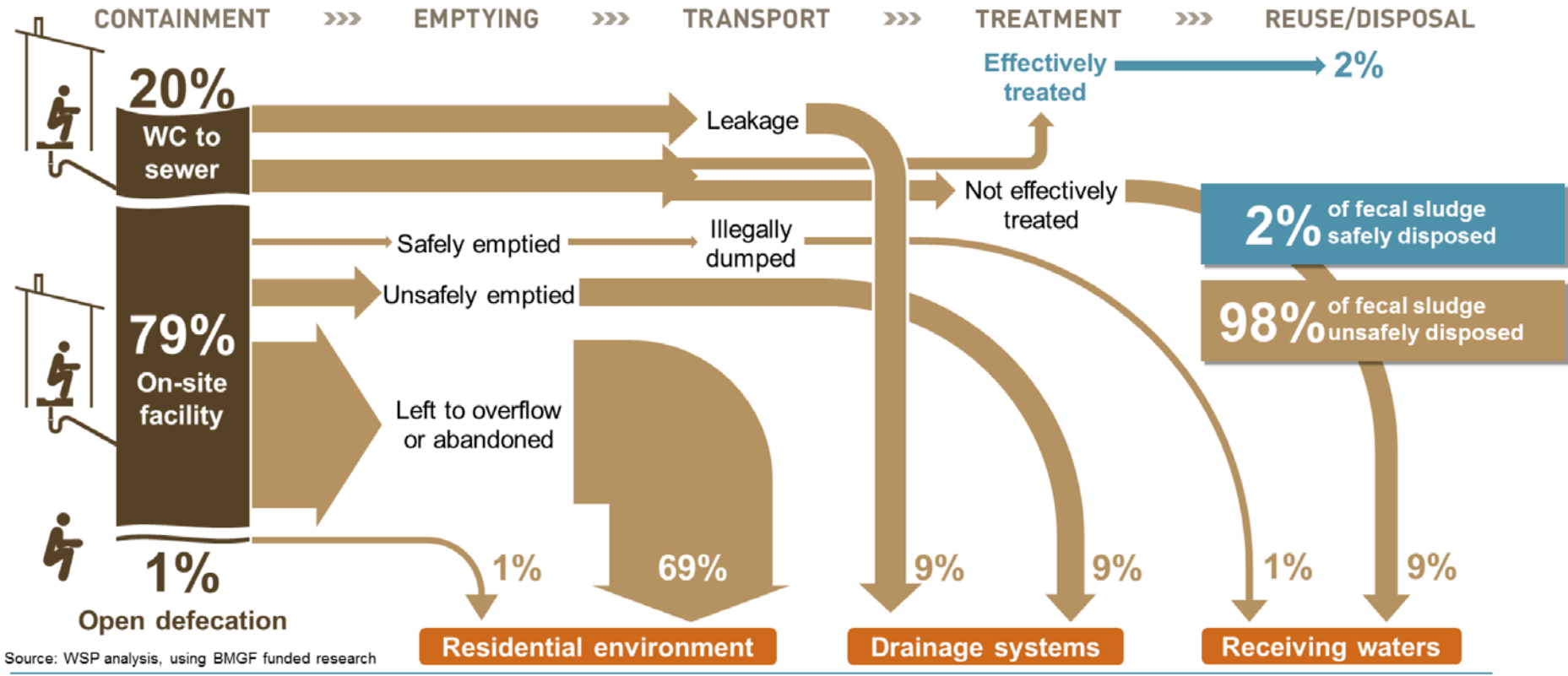


Consider

- Census bureau: 630,000 households in the United States lack hot and cold running water, a bathtub or shower, or a working flush toilet
- That's 1.6 million people
- Cost to address: between $3B and ??? depending on how you figure it – and the deck is stacked in our favor

EXAMPLE OF POOR FECAL SLUDGE MANAGEMENT (FSM):

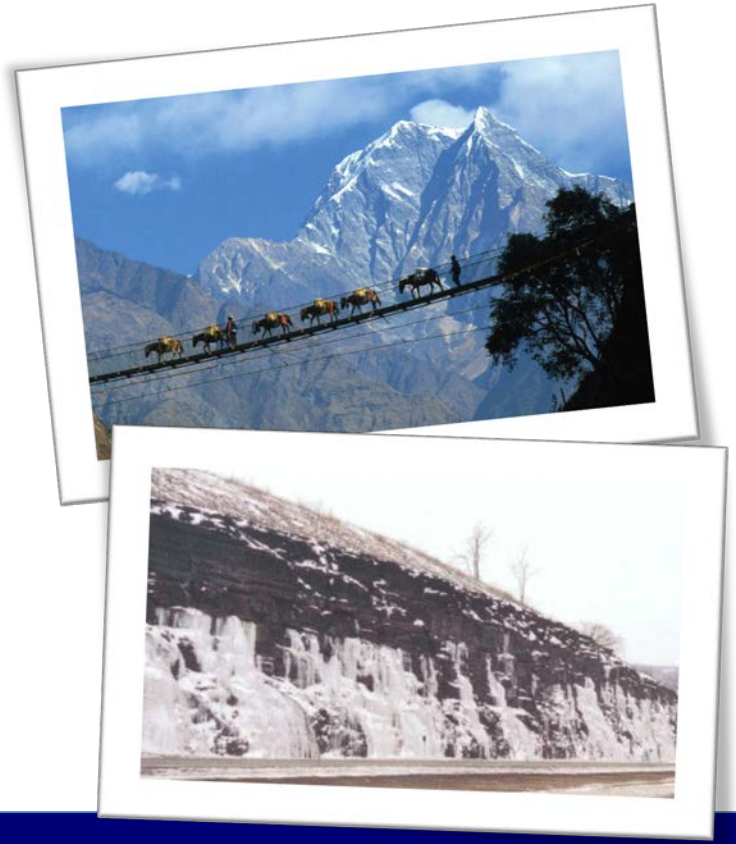
Institutional open defecation - Sludge direct to the environment: no service chain



Source: WSP analysis, using BMGF funded research

Challenges

- Lack of financial resources
- Lack of water
  - Toilets that require water in any amount are not practical
- Lack of infrastructure
  - Few if any treatment facilities
  - Limited water for traditional treatment even if facilities were there
  - Ground is not amenable to septic systems
  - Power is not always available/practical



Is it a technology problem?

FINDING TODAY'S TOILET SOLUTIONS

In the DEVELOPING world

THE PROBLEM

How can we destroy human born fecal pathogens such that they cannot make people sick and contaminate the local water supply without adding financial burden to the community?


Experiment

The Human Factor

- We are “hard wired” to avoid contact with waste
- When offered latrines or portable toilets, people will resist and/or continue to use open defecation
  - India
  - South Africa
- Cultural traditions

Excreta is most common cause of disgust around the world.

Implication for Portable Sanitation

- Billions of people have nowhere to go
- When offered portable units, large numbers choose open fields
- To solve this problem, something different – feasible -- affordable – has to be offered.
- Whatever the “something” is will impact our industry in the developed world too

Part II

THE WORLD COMES TOGETHER

Millennium Development Goals

- Set by UN in 1990
- Goal 6: Ensure availability and sustainable management of water and sanitation for all
- Goal 7c: Halve, by 2015, the proportion of the population without sustainable access to safe drinking water and basic sanitation

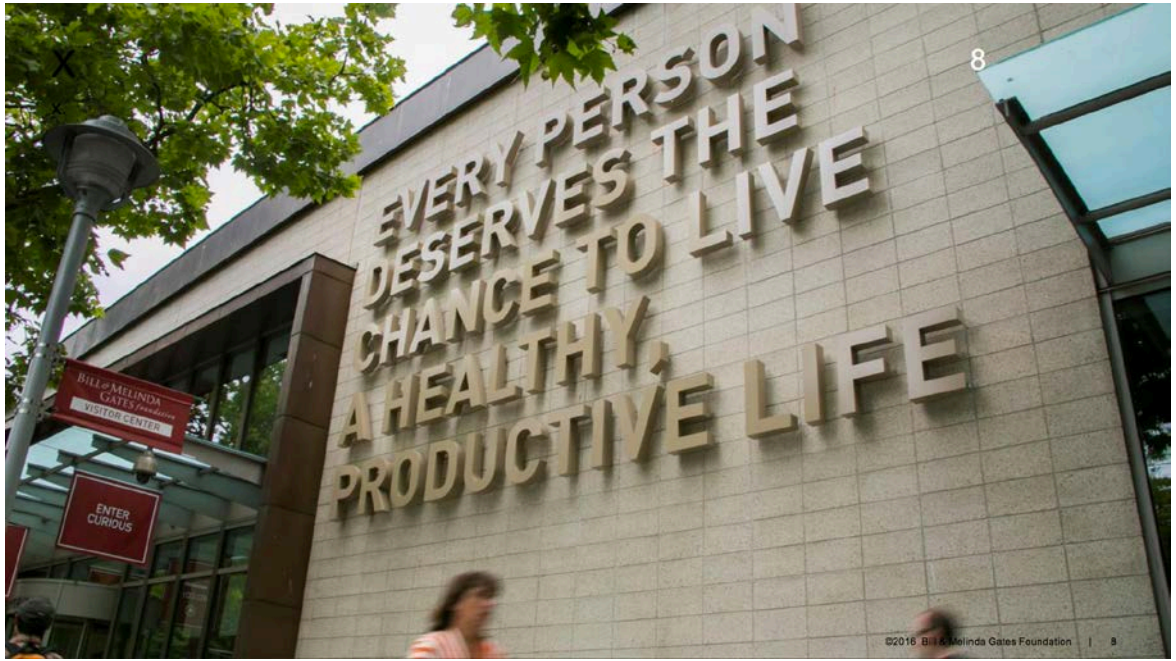
The Good News

- The proportion of the global rural population without access to improved drinking water has declined by more than half since 1990, from 38% to 16% in 2015.
- Since 1990, the proportion of the global rural population without access to improved sanitation has declined by nearly a quarter, and open defecation rates in rural areas have fallen from 38% to 25% in 2015.

The Bad News

- That was the easy part
- What's left is more intractable
  - Millions are still getting sick
  - Avoidance of contact with waste means low tech solutions are not good long term solutions (e.g., India, South Africa)
  - Higher tech toilet solutions are a bad fit (lack of infrastructure, poor business prospects)
  - It's also about treatment options
  - Population is growing fast

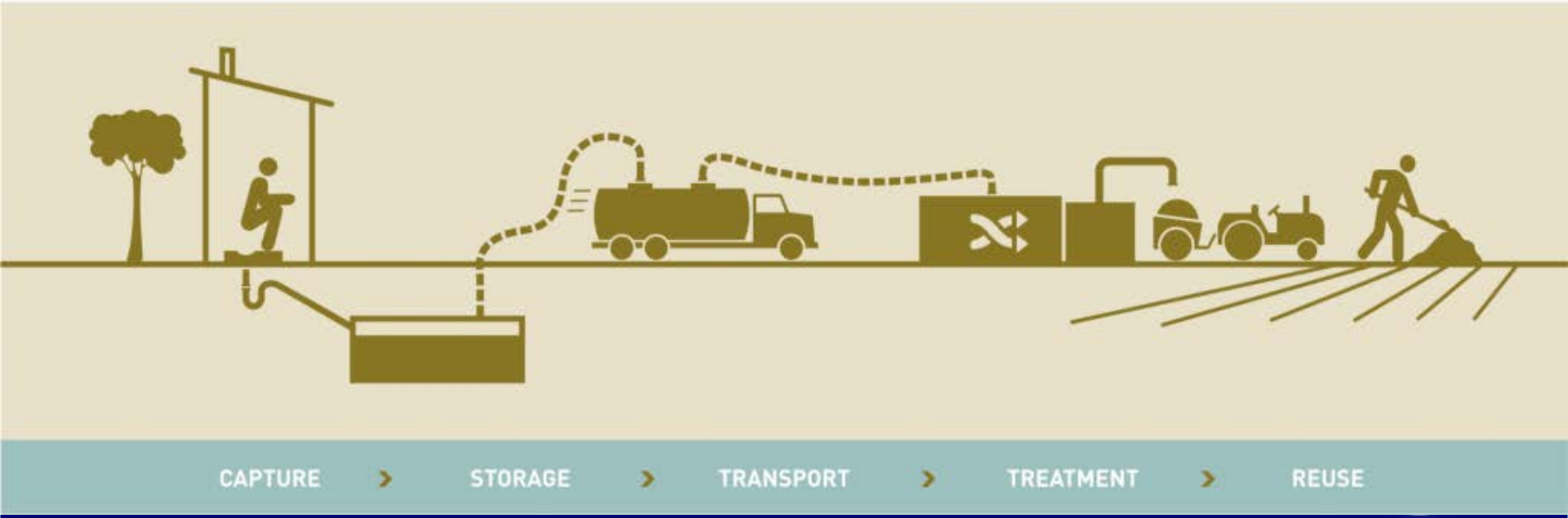
Enter the Bill and Melinda Gates Foundation



The Big Idea

Fix an important market failure by delivering services and products that meet customers' needs AND aspirations, compatible with 21st century technologies

Opportunities Along the Chain

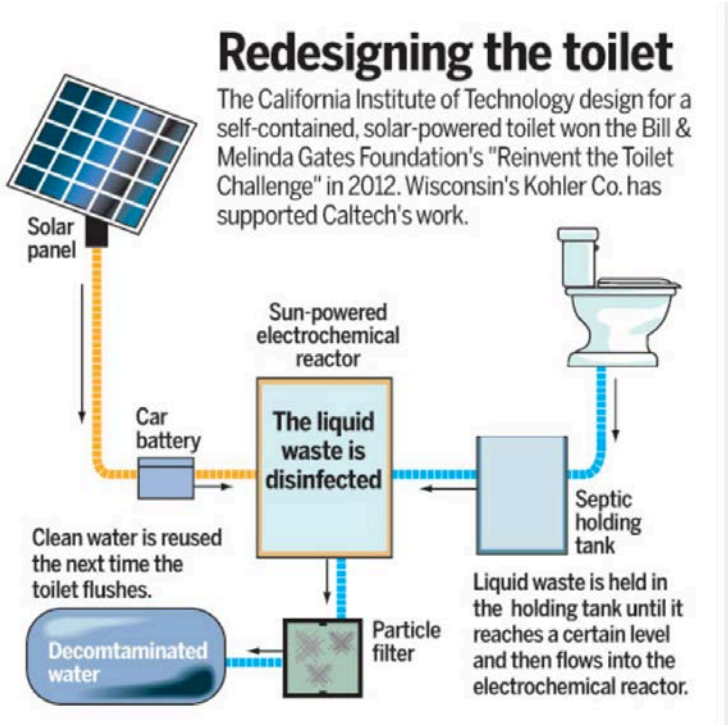


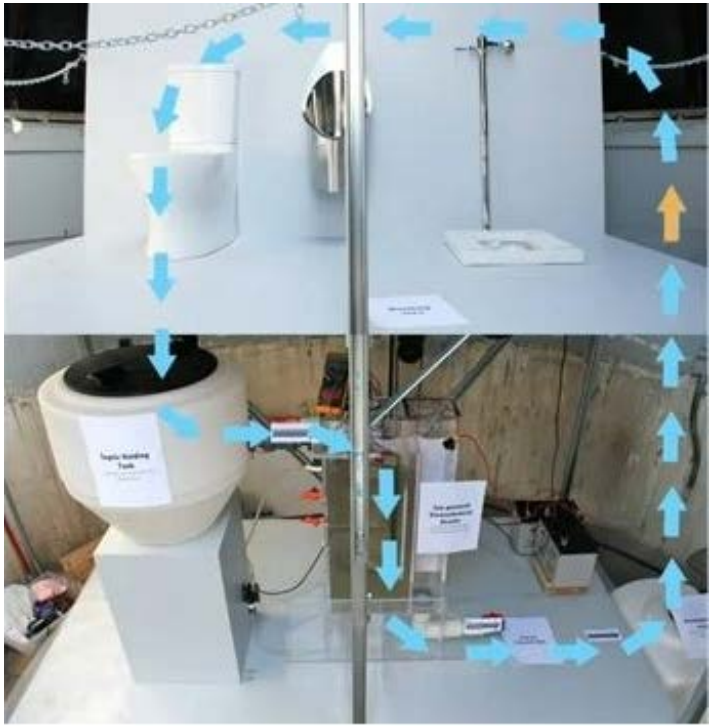
The Reinvent the Toilet Challenge

Aspirational “next generation” toilets

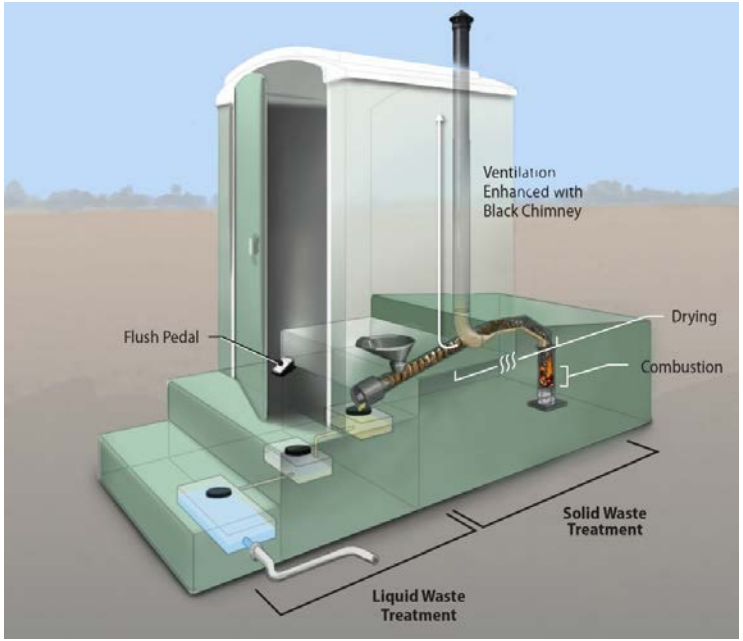
- Standalone toilet unit
- No piped-in water, sewer connection, or outside electricity
- Facility costs targeted at less than five cents per person per day
- Sustainable business model
- User experience is on a par with fully sewered toilet

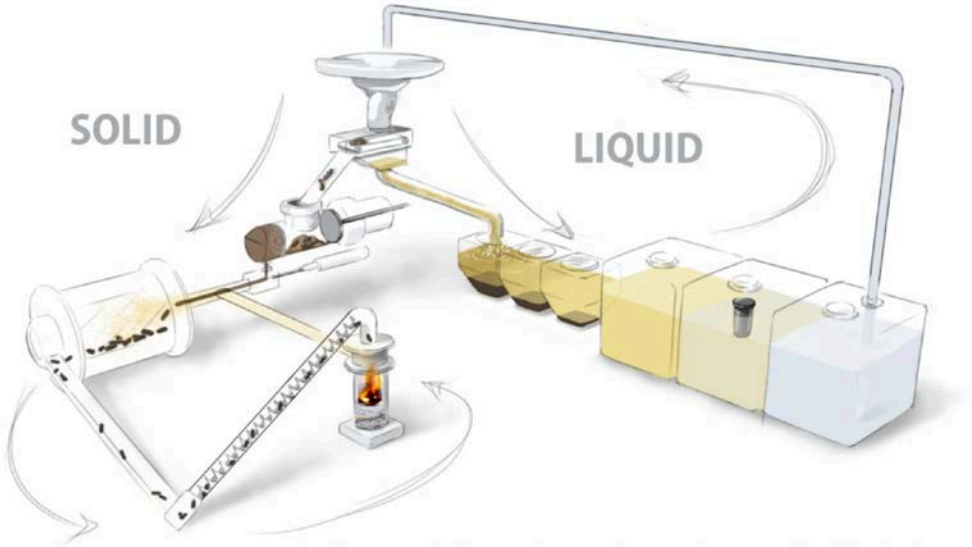
Cal-Tech/ Kohler



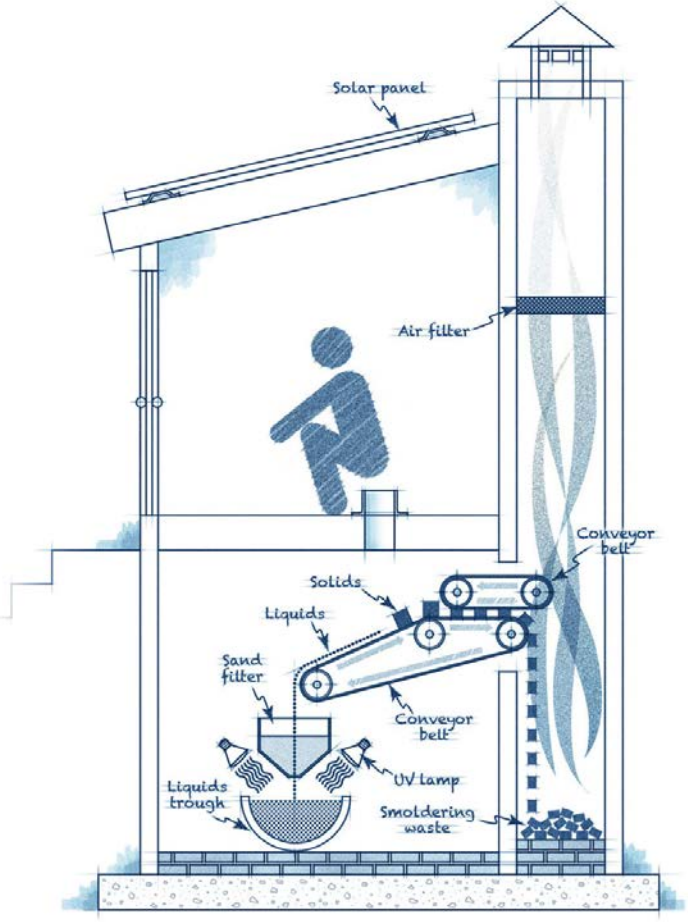


RTI with Duke and Colorado State





University of Toronto

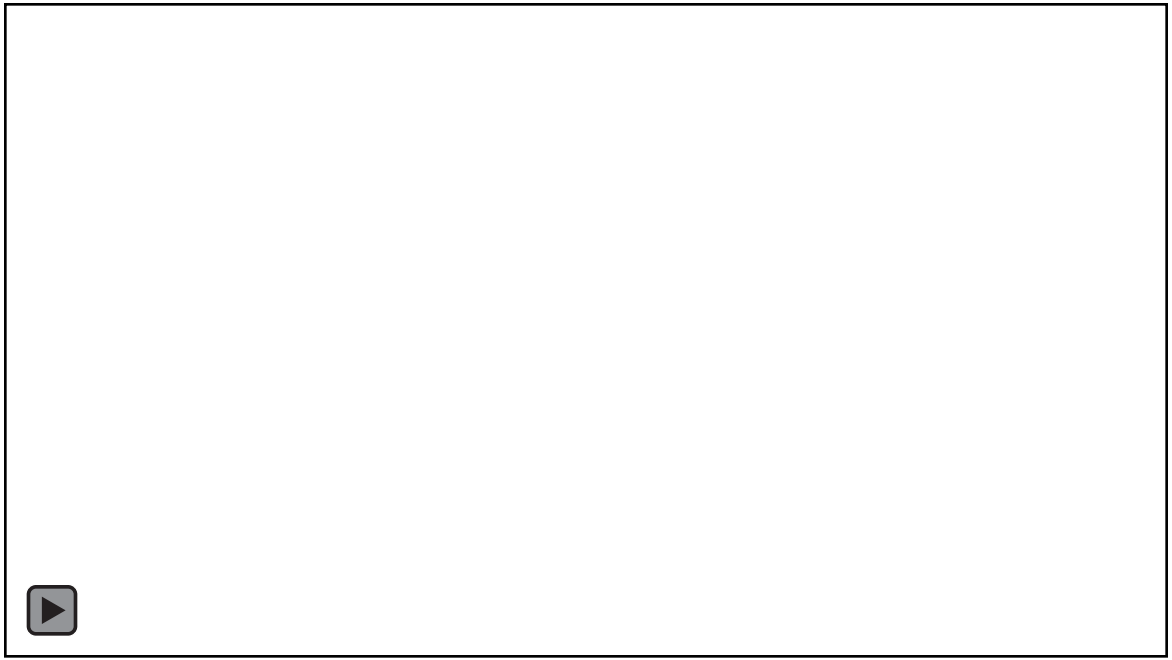


The Diversion Toilet

Cranfield University

Scientists in the UK are currently field testing a waterless and inexpensive Nano Membrane toilet with energy-producing capabilities.

Nano-Membrane Toilet in Action



Loowatt

- Waterless and chemical-free technology
- Biodegradable film lines the toilet bowl
- “Flush” seals the film and waste, carries it to sealed storage area
- Clean toilet bowl for every visitor
- The film and waste are then treated in energy-generating systems
- Produces biogas and fertilizer

Eram Scientific e-Toilet

Meanwhile Everyone Knows

- Current wastewater treatment systems are expensive to build/operate
  - Infrastructure crisis in the US
- The growing world population means huge growth in human and animal waste
  - Often in places lacking water, power, good roads, and other infrastructure

Evolving Waste Processing Concepts

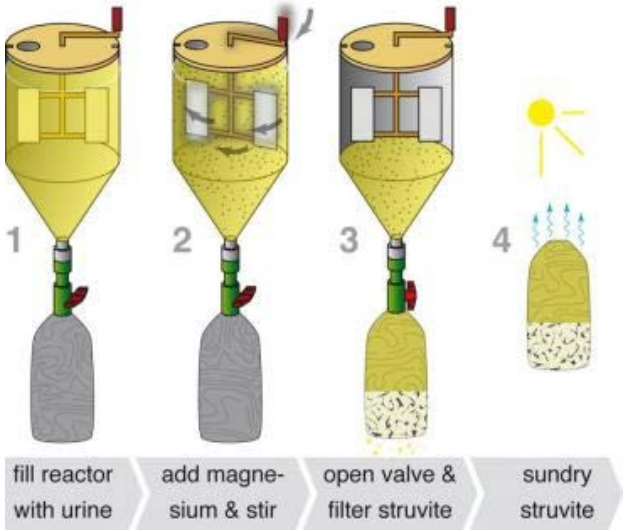
Focus on recovering resources from waste in a manner that is environmentally and economically positive

Onsite Waste Treatment

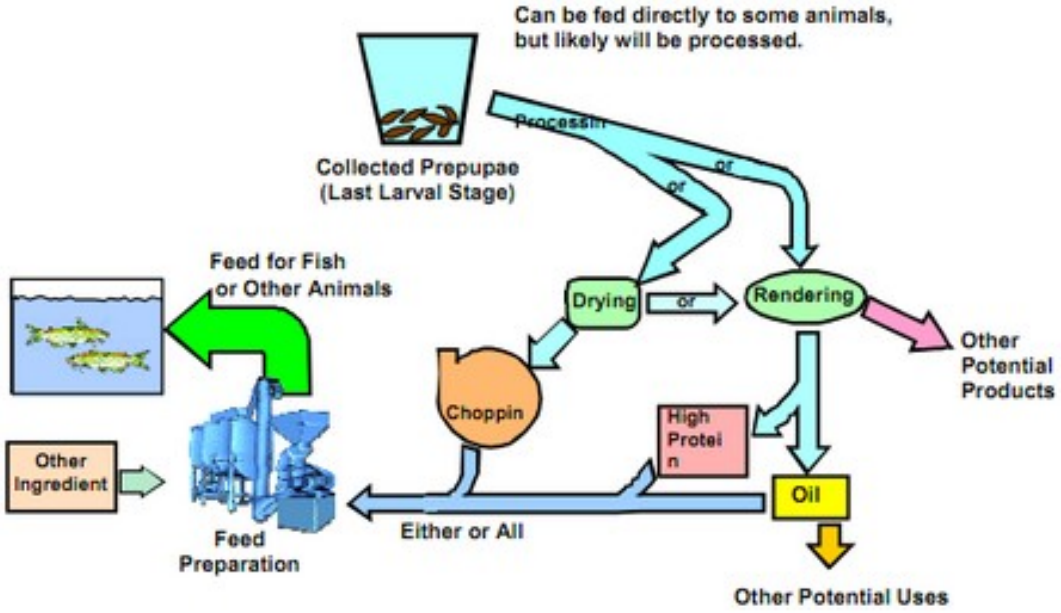
Urine Diversion and Reclamation

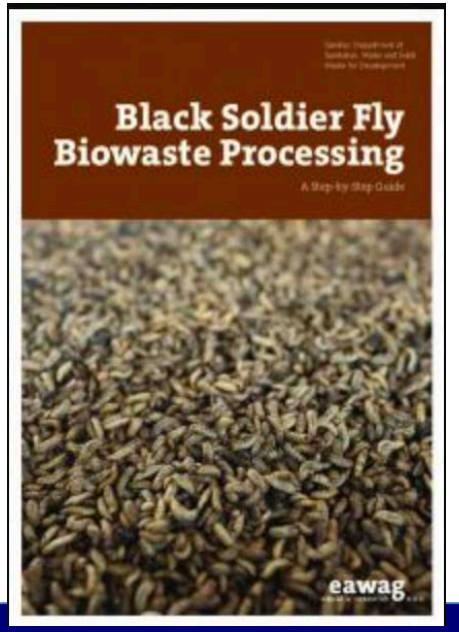
Direct land application

Struvite recovery



The BSF Waste Recycling Process





Janicki Omniprocessor

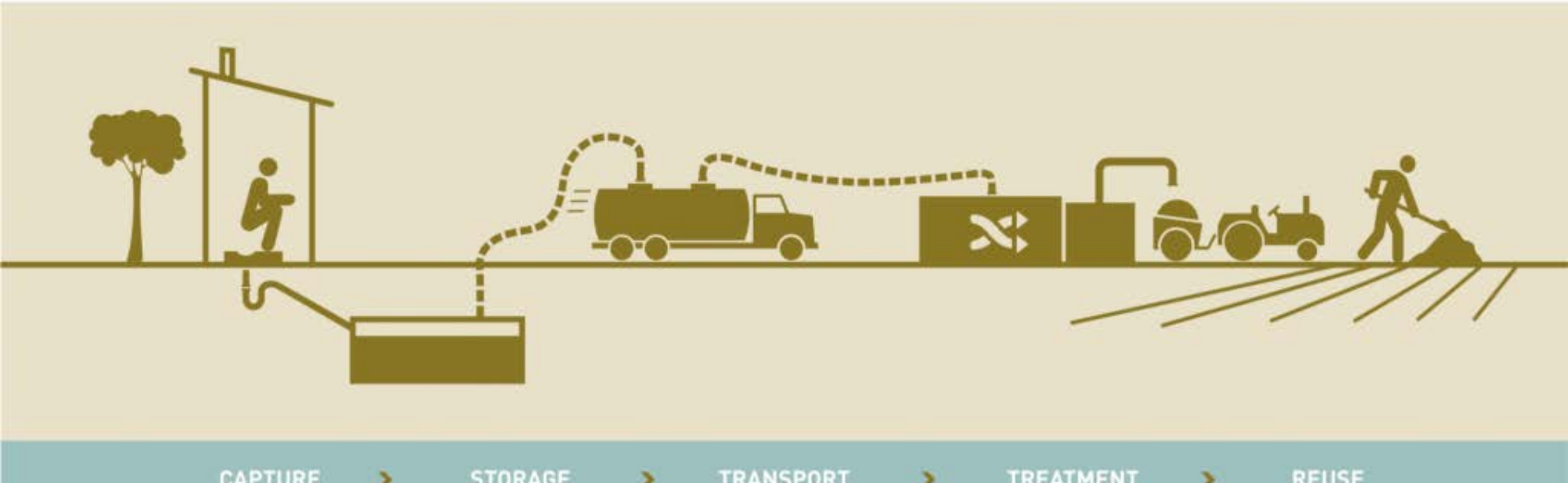
What Will Happen

Part III

IMPACTS ON PORTABLE SANITATION

New/Updated Management Standards

- Address operations for existing systems
- Eventually will likely address operating the new systems



New Technical (Manufacturing) Standards

- Aspirational – “impatient optimists”
- Gates grants spurs speed, lowers cost of development
- Proactive standards will guide industry, be a resource for governments and users
- PSAI is participating, via ANSI

Currently

- ISO 30500 Standard for non-sewered sanitation systems
  - Next generation toilets that are prefabricated with integrated treatment units
  - General safety and performance requirements for design and testing
- IWA on fecal sludge treatment units
  - Prefabricated, community-scale resource-recovery units
  - Safety and performance

New Standards

- It's not as easy as you think!
  - Simulating odor, texture, diarrhea for testing
  - Sitters vs squatters
  - Balancing priorities
  - Cost to certify
- If/when governments and NGOs adopt these standards, expect:
  - More market entrants
  - Variations on the technology (portable?)
  - Comparatively rapid departure from anything involving open solutions/contact with waste

What Does this Mean?

Facts and Educated Guesses

#1 Fact: This is happening, with or without the industry. We can be on the bus or under it.

Facts and Educated Guesses

Fact #2:
It's all about developing nations – except that it isn't.

Facts and Educated Guesses

Educated Guess #1: Global movement away from open tanks/users experiencing contact with waste

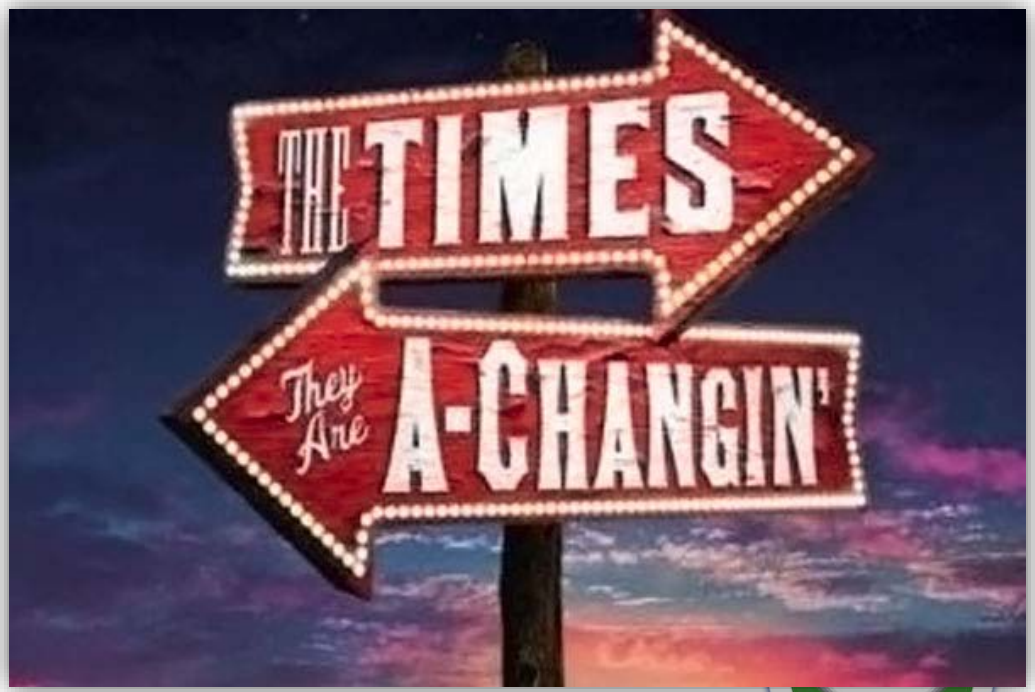
- Already not allowed in many countries
- As new affordable technologies and standards become the norm, the market will likely seize the opportunity to provide the no-contact experience everywhere

Facts and Educated Guesses

Educated Guess #2: Some of the new technologies will be adaptable to developed markets and to portable scenarios within the next 5-10 years.

Why?

- Possible alternative to septic tank and current models for waste disposal
- Large market for use in fragile environments
- May dramatically impact portable rental business over 10-20 years



Implications

- LPs → Tapes → CDs → MP3s
- Equipment evolution (units, trucks, trailers, etc.)
- Service evolution
- Possible easing of pressure/dependence on treatment infrastructure
- New/different business opportunities
  - Long term, stationary rentals and service contracts
  - Sale of waste byproducts

Timing is Everything

- Public demand/desire for closed system: the lesson of cupholders
- Sustainable business models
- Regulatory/tax incentives

Thank You!