out think the box

Sanitary Compost Preparedness, Response & Service Opportunity

Everyday brilliance for disaster resilience

Oakland, CA, USA
31 August 2018

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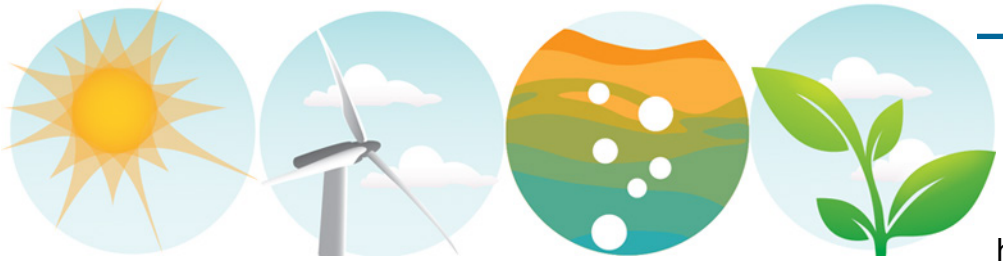

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http://www.outthinkthebox.net/projects/sancompost_svcmkt.pdf

out think the box

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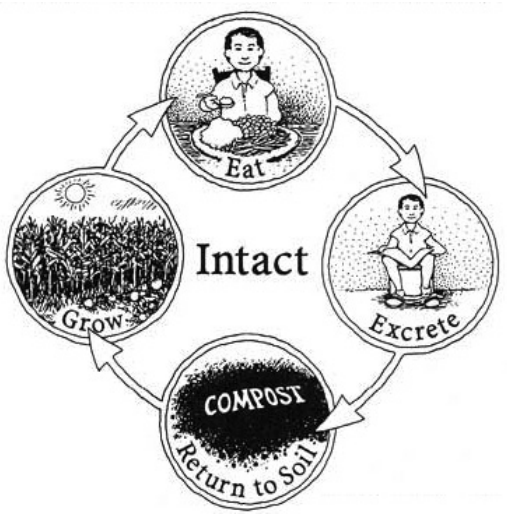
humanure pathway

It's simple—the 4 e's

Eat (human) -> **E**xcrete (human) ->
Enrich (soil) -> **E**merge (plants/food)



Process pathway:

- Human excreta collected
- Thermophilic compost/humus generated (hygienic)
- Humus applied to soil
- Food/Plants propagated
- Food/Plants eaten by humans

Image Citation: Jenkins, J., 1998. The Humanure Handbook, 2nd Edition, http://weblife.org/humanure/chapter2_1.html

anatomy of disgust

Dry/Eco-san toilet adoption problems:

- Mass and energy balance of compost toilet load stream not available [In-progress*]
- Lack of standards [In-progress*, requires AHJ]
- Lack of established design guidelines [In-progress*]
- Disposal and maintenance challenges [Disrupter]
- Monitoring process factors [Guidance is available*]

** 2018 IAPMO WE•Stand Chapter 4 - Water Efficiency and Conservation 403.0 Composting Toilet and Urine Diversion Systems. http://bit.ly/2nhzSTA*

requirements

'Disposal' (Reuse) and maintenance:

- Carbon-based cover material
- Human excreta collection
- Human excreta composted
- Collection toilet manufacture schema

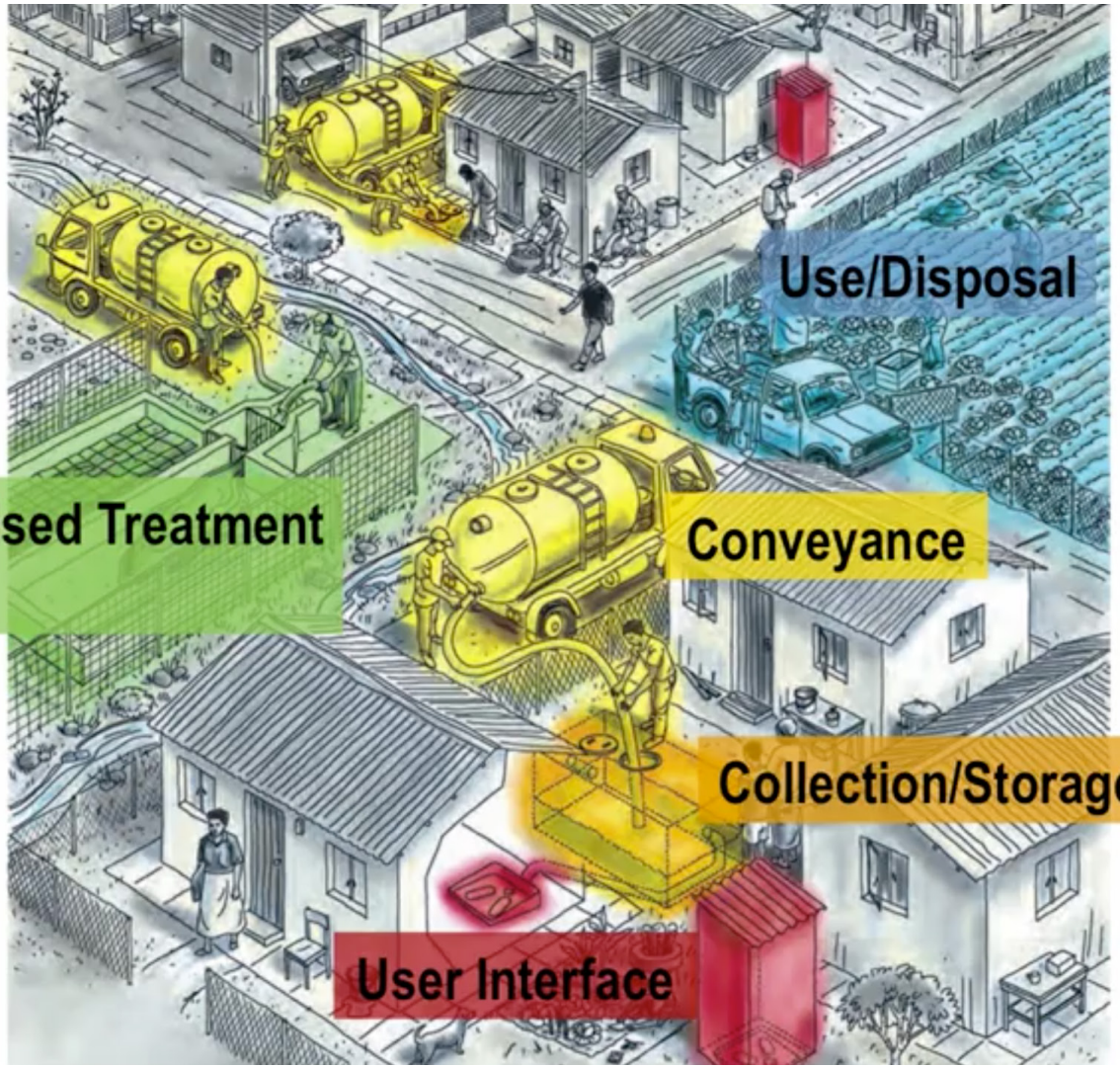
4 problems

Dense settlements in highly densely populated areas with homeless populations need to address:

- Deficient environmental sanitation
  - Curbside community inhabitants
  - Tiny house urban agriculture stewards on tax-defaulted lots*
- High level of pollution
- Management of on-site sanitation
- Inadequate water access
  - Requires a more integrated approach
  - EBMUD assistance

* *Land-action.org 100 Micro-farms Campaign*

5 functional groups



- 5 functional groups used to categorize sanitation technologies

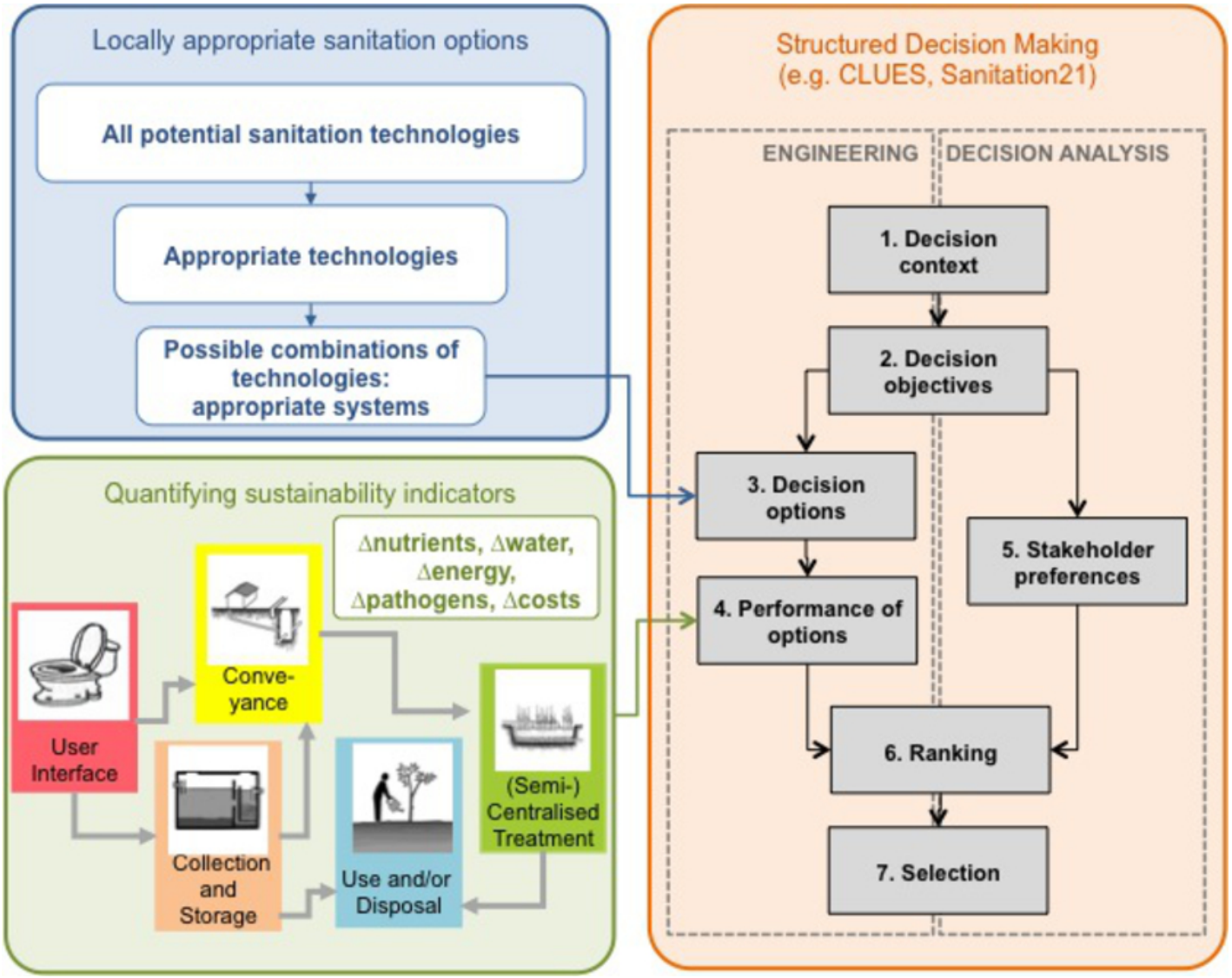
preparedness & response 8

6 major public health response functions requiring extensive planning & thoughtful preparation:

- Preventing epidemics, spread of disease & injuries
- Protecting against environmental hazards
- Promoting & encouraging healthy behaviors
- Disaster response & communities in recovery assist
- Ensuring the quantity & accessibility of health services

This compost sanitation solution offering proposed can address 1-5 and disrupt 4 of the 5 Functional Groups.

decision framework



what is clues?

	Action		Cross-cutting Tasks		
			EXPOSURE & COMMUNICATION	CAPACITY DEVELOPMENT	MONITORING & EVALUATION
Step 1	**Process Ignition** and demand creation				
Step 2	**Launch** of the planning process	 *workshop*			
Step 3	**Detailed Assessment** of the current situation	 *report*			
Step 4	**Prioritisation** of the community problems & validation	 *workshop*	expose community to facilities and pilots		
Step 5	**Identification of Service Options**	 *workshop*		train and develop skills	
Step 6	Development of an **Action Plan**	 *report*			develop monitoring plan & assess progress
Step 7	**Implementation** of the Action Plan	 *final workshop*			monitoring & evaluation of implementation

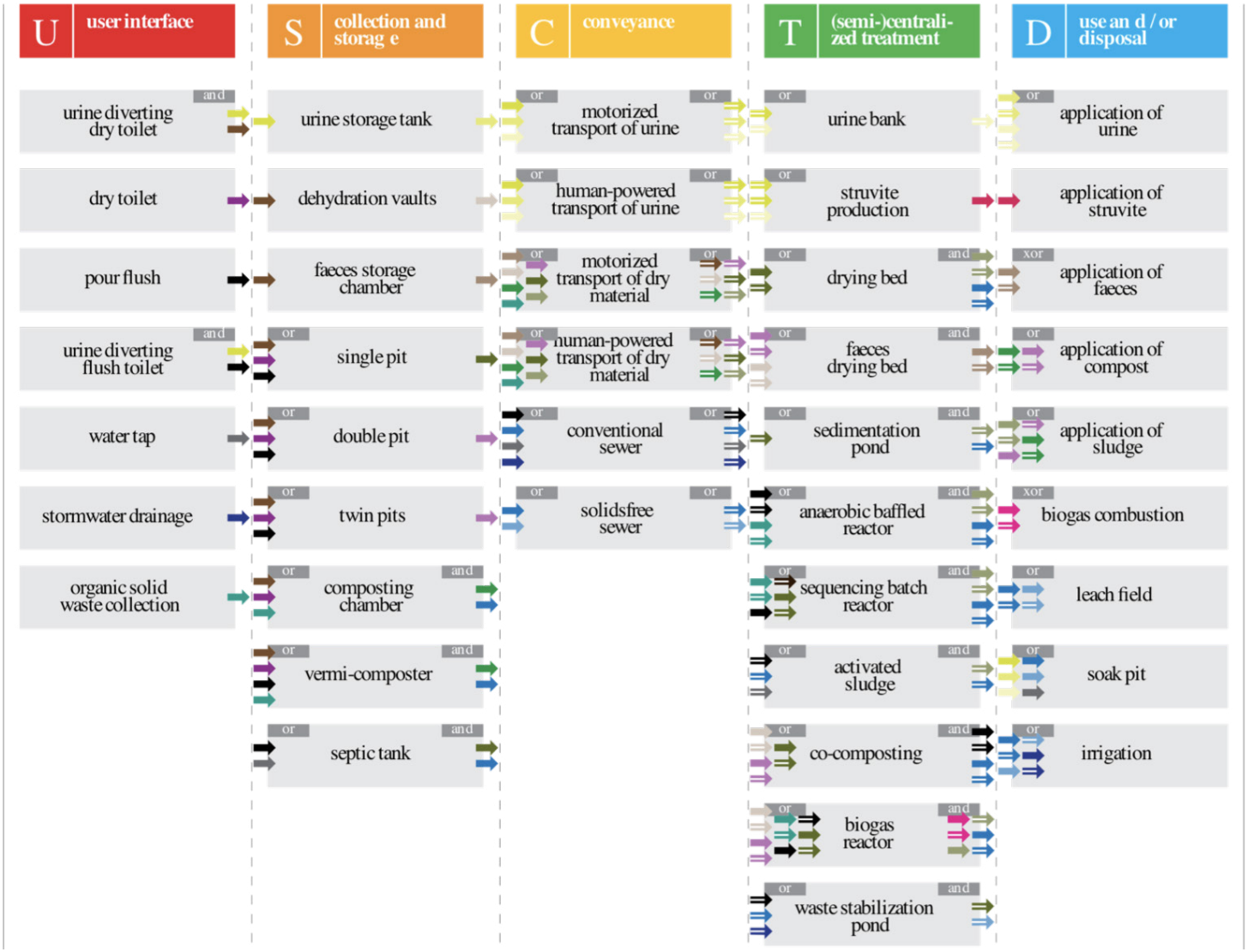
multiple criteria

Criteria requiring consideration:

- Health and hygiene
  - Pathogen emissions*
  - Staff exposure
- Technology
  - Spare parts
  - Space requirements*
  - Energy requirements*
- Environmental
  - Nutrients emissions*
  - Resource recovery*
- Financial
  - Construction costs*
  - O&M costs*
- Socio-cultural
  - Odor emissions*
  - Landscape
  - Equity and inclusion*
- Legal and institutional
  - Project duration
  - Compatibility w/current policies

** WHAT THIS SYSTEM WE PROPOSE DISRUPTS*

systems configurations



Using CLUES Step 5 (Identify Service Options)

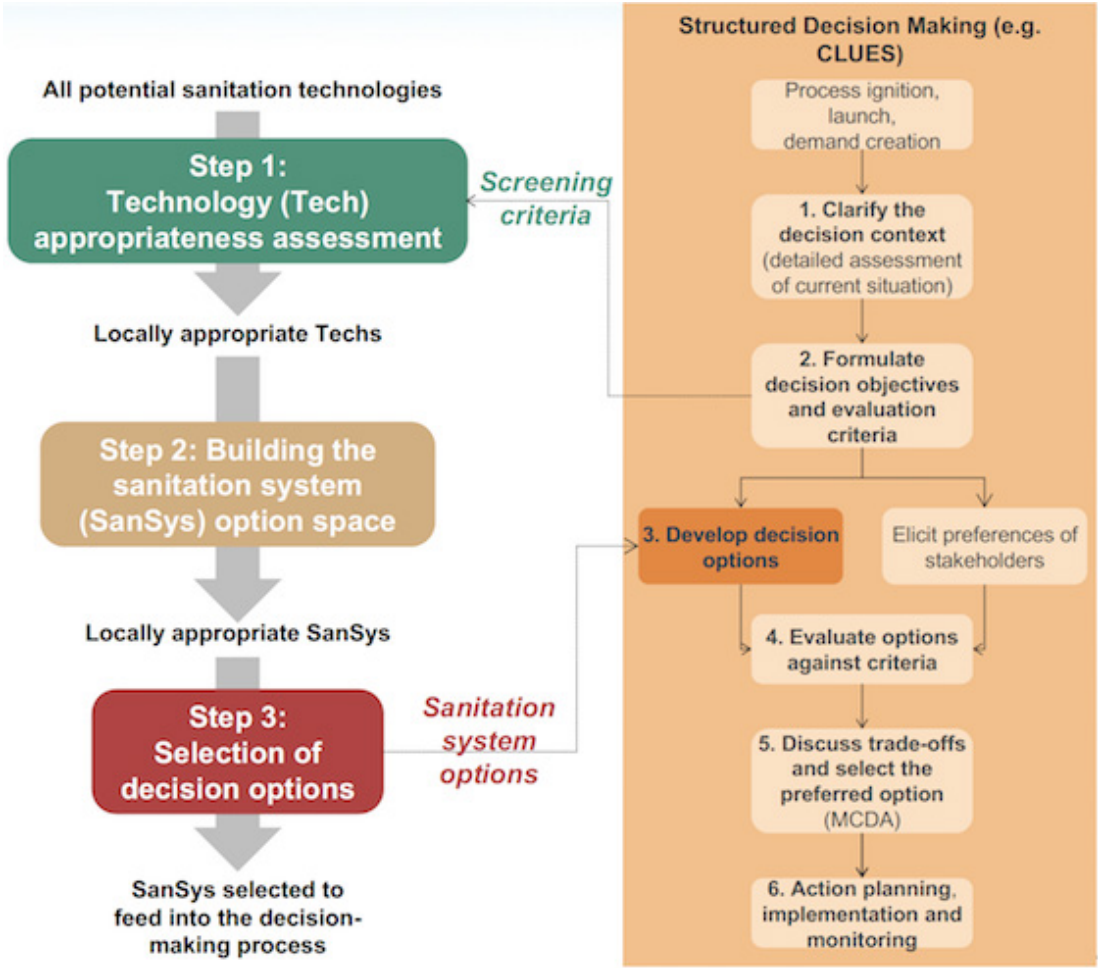
- A pre-selection model to:
  - Generate all possible sanitation system options
  - Quantify N, P, H_2O and Total Solids (TS)

- A procedure to:
  - Quantify appropriateness of the technology options
  - Identify drivers
  - Identify a set of sanitation system options which are locally appropriate and manageable size

Citation for Slides 16, 17, 18: Spuhler, D., Maurer, M. and Lüthi, C. (2018) Generation of sanitation system options for urban planning considering novel technologies.

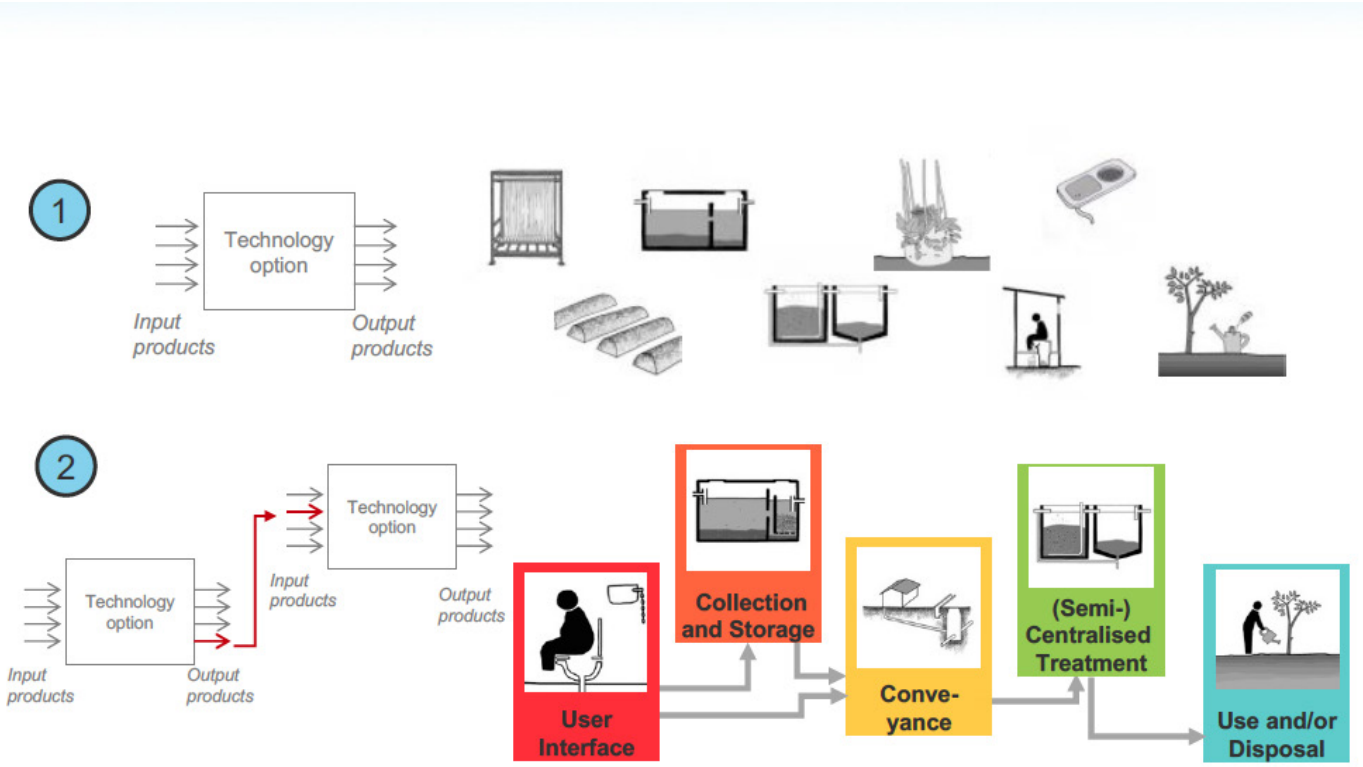
clues procedure I step 1

Identify appropriate technology [DONE]



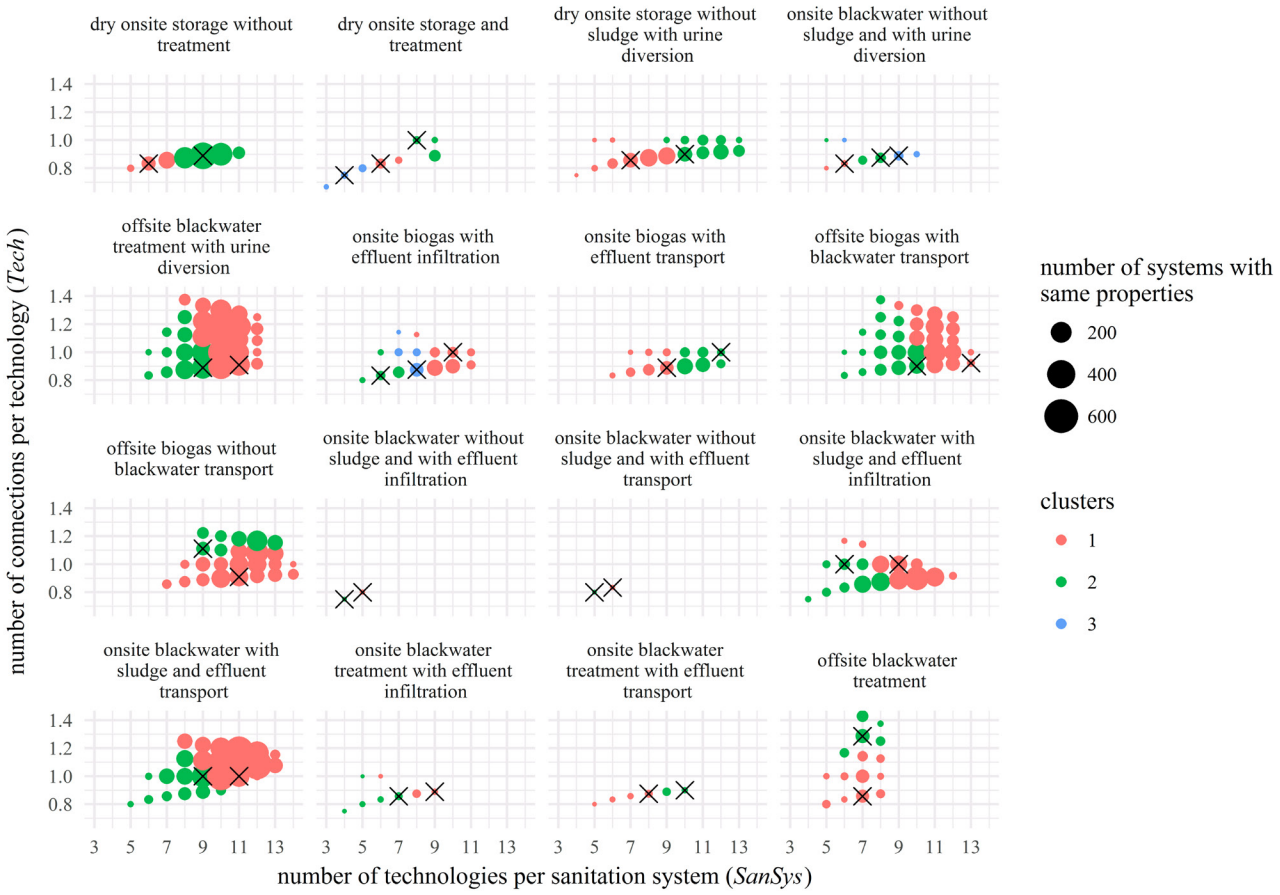
clues procedure I step 2

Generating entire systems (Slide 11) [DONE]



clues procedure I step 3

Selecting sanitation strategy to implement [In-progress]



proposition*

For urban curb communities and tiny houses:

- Stop defecating in water and compost instead
- Dry/Eco-san toilet manufacturing
- Curbside comunity inhabitants trained to manage, maintain, and gain transferrable skills
- Sanitary compost/humus management

*First proposed to City of Oakland on 23 May 2016

recycling opportunities

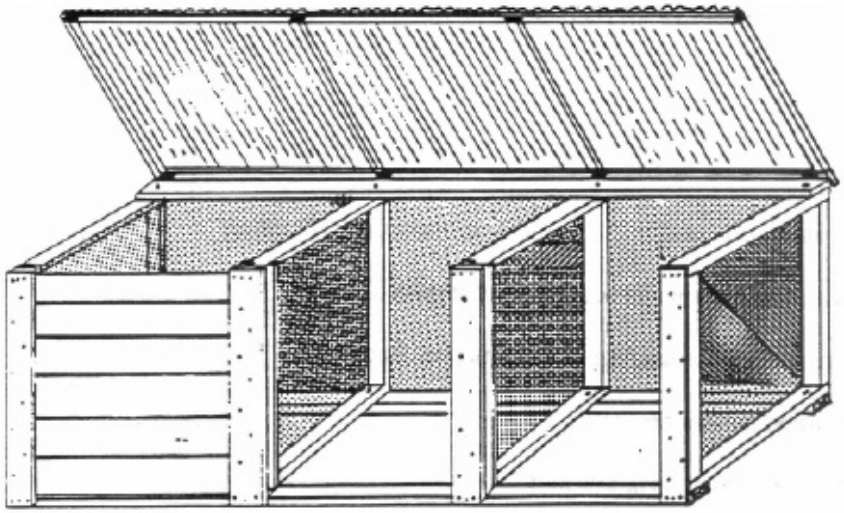
On-site compost ecological sanitation (eco-san) recycling opportunities:

- Jobs creation
  - Curbside community inhabitants
  - Tiny house urban agriculture stewards
- Revenue generating streams
  - Dry/Ecosan toilet fee use
  - Dry/Ecosan toilet construction & sales/rentals
  - Compost sales
  - Cover material sales
  - Tipping fees for other organic material e.g. food scraps, etc.

design considerations

What makes a good dry/ecosan toilet schema?

- Comfort?
- Cleanliness?
- Smell-free?
- Affordable?
- Convenience?
- Accessible?
- Timely collection service?



the technology solutions

Dry/Eco-san Toilet Types

- Dry Toilet (DT)
- Urine Diverting Dry Toilets (UDDTs)
  - Liquid fertilizer production source-separated urine

On-site Humanure Production Treatment

- Thermophilic (high-temperature/heat) composting
  - 122°F (50°C) maintained in the faeces pile > 1 week
  - > 140°F (60°C) maintained for a 24-hrs (complete pathogen die-off)
  - Solar drying (sanitizing)
- Vermi-composting (pathogen re-dux 'insurance')
  - Earthworms
  - Other mesophilic micro-organisms

the tech solutions (cont'd) 21

Derived from hot composting, field-tested, proof-of-concept & PHLUSH recommendation estimates for a pilot in Alameda County:

- 15-20 people/encampment
- 42 5-gal, 80% full toilet receptacles/week
  - poo l 4 receptacles/day x 7 days = 28 receptacles/week
  - pee l 2 receptacles/day x 7 days = 14 receptacles/week
- 3 4'hx4'wx4'd hot compost processor bins needed
- 71 ft^3 (2.6 yd^3) toilet material collected/week
- 162 ft^3 (or 6 yd^3)/encampment/month cover material

Citation: Jenkins, J. Dec. 2014, THERMOPHILIC COMPOSTING AS A SANITATION ALTERNATIVE

parting thoughts

Out think the box.
Prepare. Respond. Adapt.

People who compost humanure are recycling —there is no waste in nature.

Mother Nature is the expert. (Wo)Man are the amateurs.

It's only called human waste if we waste it. - H. Skermer