



# ALL LIVES HAVE EQUAL VALUE

An introduction to the Bill & Melinda Gates Foundation

# TRANSFORMATIVE TECHNOLOGIES FOR A NEW SANITATION INDUSTRY

High-Level panel – UN Commission for Science and Technology for Development

**ENSURING SAFE WATER AND SANITATION FOR ALL A SOLUTION  
THROUGH SCIENCE, TECHNOLOGY AND INNOVATION**

March 28, 2023

Dr. Doulaye Kone, Deputy Director, WSH,  
Bill & Melinda Gates Foundation  
Geneva, March 28<sup>th</sup>, 2023

# PURPOSE AND FOCUS

WE ARE IMPATIENT  
OPTIMISTS WORKING  
**TO REDUCE  
INEQUITY**  
AROUND THE WORLD

FOCUSING ON  
THE AREAS OF  
**GREATEST  
NEED**



**TAKING  
RISKS**  
THAT OTHERS  
CAN'T OR WON'T



MAKING MARKETS  
**WORK FOR  
THE POOR**



# TRANSFORMATIVE TECHNOLOGY COMMERCIALIZATION – THE ROLE OF PHILANTHROPY

## DEVELOP SUPPLY:

Develop compelling products and validate their commercial application to create a supply of NSS solutions

## REDUCE RISK:

For new sanitation technologies, reduce the risk of market entry for commercial partners

## STIMULATE EARLY MARKET

Stimulate the growth of a market ecosystem that drives demand for non-sewered sanitation industries in Launch countries early adopters' market



*We try to be thoughtful about the role of philanthropy – and one of the things we're best placed to do is lower barriers and risk for the private sector and for governments to adopt new solutions to solve big problems.*

*Bill Gates, RTE, Beijing, Nov. 6, 2018*

# IMPACT OF STANDARDS: THE SEWER REGULATIONS IN 1832 UNLOCKED THE POTENTIAL OF SEWER TECHNOLOGY

**Edwin Chadwick 1800 – 1890,**

**The pioneer of the plumbing regulations**

Sir Edwin Chadwick KCB was an English social reformer who is noted for his work to reform the Poor Laws and to improve sanitary conditions and public health.



[Source: Wikipedia, Sept. 2016](#)

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# PERFORMANCE SPECS FOR SAFE OFF-GRID TOILETS ISO30500

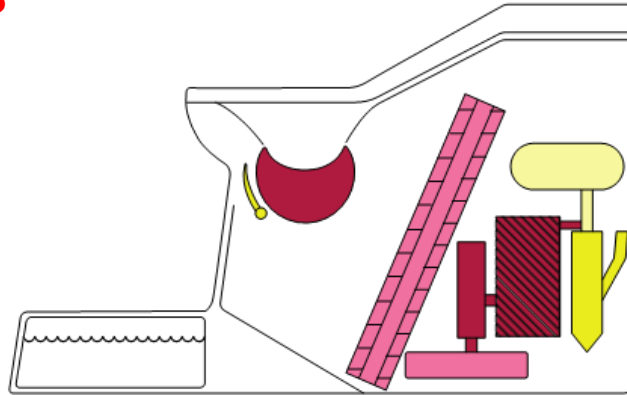
The aim of the Reinvented Toilet is to: destroy all pathogens onsite and recover valuable resources, operate without sewer, water or electricity connections and cost less than \$0.05/user/day in a sustainable business model.

## ELIMINATE PATHOGENS

- Eliminate safety concerns via handling
- Reduce disease burden
- Improve environmental safety

## OPERATE OFF GRID

- Eliminate need for external inputs such as water and energy
- Make portable and easy to install



## CONVEY LOW LIFE-CYCLE COSTS

- Reduce need for pit emptying
- Ensure a sustainable business model, including maintenance via service providers

## PRESENT MODULAR, ATTRACTIVE INTERFACE

- Reduce / eliminate construction costs
- Provide clean and dignified product
- Eliminate odors and waste

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**SANS 30500:2019**

Edition 1

**ISO 30500:2018**

Edition 1

## SOUTH AFRICAN NATIONAL STANDARD

### Non-sewered sanitation systems — Prefabricated integrated treatment units — General safety and performance requirements for design and testing

This national standard is the identical implementation of ISO 30500:2018, and is adopted with the permission of International Organisation Standardization.

**WARNING**  
This document references other  
documents normatively.

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ISO 30500 adopted in 29 countries including, South Africa, Senegal, Nigeria, Cameroon and Benin, USA, Canada, ...

Standards All about ISO Taking part Store

ISO

ICS > 13 > 13.020 > 13.020.20

## ISO 30500:2018

Non-sewered sanitation systems — Prefabricated integrated treatment units — General safety and performance requirements for design and testing

ISO/PC 305  
Sustainable non-sewered sanitation systems

About 47 countries participated in the development of the ISO 30500

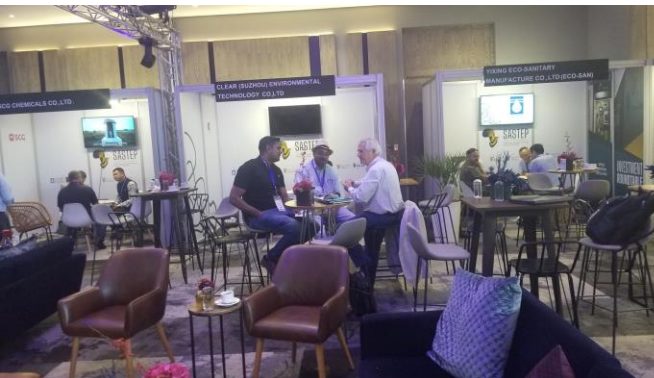
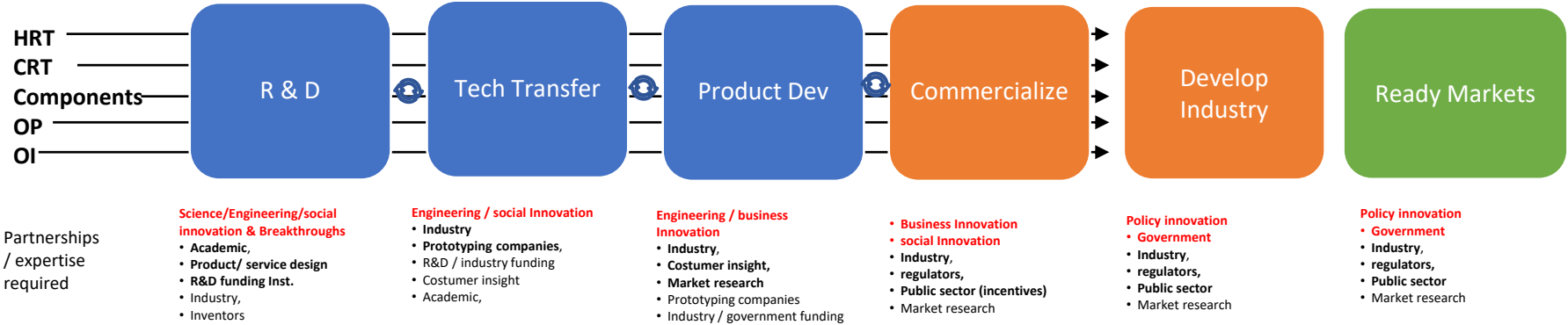
Secretariat ■  
United States - American National Standards Institute (ANSI)

Twinned Secretariat ■  
Senegal - Association Sénégalaise de Normalisation (ASN)

Participating Members (31) ■

Observing Members (14) ■

# PRIMARY FRAMEWORK: PATH TO COMMERCIALIZATION AND SCALE



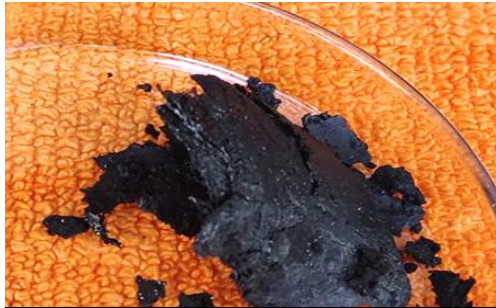


# OVERVIEW OF OUR PORTFOLIO: MORE THAN 25 ADVANCED TECHNOLOGIES READY FOR COMMERCIAL PARTNERS

<p>Single-Use Reinvented Toilet</p> <p><b>1</b></p> <p><b>HTClean</b></p> <p>Helbling (Switzerland)</p> <p>helbling</p> 	<p>Single-Use Reinvented Toilet</p> <p><b>2</b></p> <p><b>Firelight Toilet</b></p> <p>Sedron Technologies (USA)</p> <p>SEDRON TECHNOLOGIES</p> 	<p>Multiple-Use Reinvented Toilet</p> <p><b>3</b></p> <p><b>Integrated Unit Back End</b></p> <p>Yinxing Eco-Sanitary</p> 	<p>Multiple-Use Reinvented Toilet</p> <p><b>4</b></p> <p><b>NEW generator 100/1000</b></p> <p>University of South Florida (USA)</p> <p>USF UNIVERSITY OF SOUTH FLORIDA</p> 	<p>Multiple-Use Reinvented Toilet</p> <p><b>5</b></p> <p><b>TT-1, TT-3, TT-5E TT-6</b></p> <p>Clear Technology (China)</p> <p>CLEAR</p> 
<p>Omni Ingestor (OI)</p> <p><b>6</b></p> <p><b>Oystra®</b></p> <p>Crane Engineering</p> <p>CRANE ENGINEERING</p> 	<p>Omni Processor (OP) Large OP- JOP</p> <p><b>7</b></p> <p><b>JOP / OP CS50 Processor</b></p> <p>CRRC / Beijing Feb. 7th Locomotive Industry (China)</p> 	<p>Omni Processor (OP) Large OP- SCWO</p> <p><b>8</b></p> <p><b>Supercritical Water Oxidation Sys. (SCWO)</b></p> <p>Duke University (USA)</p> <p>Duke</p> 	<p>Omni Processor (OP) Small OP- POP</p> <p><b>9</b></p> <p><b>5 Biogenic Refinery Models</b></p> <p>Biomass Controls PBC (USA)</p> <p>BIOMASS CONTROLS</p> 	
<p>Components</p> <p><b>10</b></p> <p><b>Entrustech ETEST (plate electrode)</b></p> <p>Yinxing Entrustech (China), Caltech (USA) Caltech</p> 	<p>Components</p> <p><b>11</b></p> <p><b>Reactive Electrochemical Membrane (REM)</b></p> <p>Caltech (USA) Caltech</p> 	<p>Components</p> <p><b>12</b></p> <p><b>Seva</b></p> <p>Self-diagnosis and smart maintenance solution</p> <p>Caltech (USA) Caltech</p> 	<p>Components</p> <p><b>13</b></p> <p><b>Trash Excluder</b></p> <p>North Carolina State University (USA)</p> <p>NC STATE UNIVERSITY</p> 	<p>Components Front-end</p> <p><b>14</b></p> <p><b>Cranfield / MSR (Front End) Module</b></p> <p>Cranfield University (UK) in partnership with Cranfield Designs</p> 
<p>Interface</p> <p><b>15</b></p> <p><b>Urine Trap</b></p> <p>EOOS (Austria)</p> <p>EOOS</p> 	<p>Liquid only</p> <p><b>16</b></p> <p><b>CalTech Electrochemical Reactor - Ultron Liquid Treatment System</b></p> <p>Caltech (USA) Caltech</p> 	<p>Liquid only</p> <p><b>17</b></p> <p><b>Cranfield / MSR (Liquid Treatment only)</b></p> <p>Cranfield University (UK)</p> <p>Cranfield</p> 	<p>Liquid only</p> <p><b>18</b></p> <p><b>Reclaimer Liquid Treatment Module (SURT), Reclaimer (SURT), Reclaimer Liquid Treatment Module (MURT)</b></p> <p>Duke Center for WaSH-AID (USA)</p> <p>Duke WaSH-AID</p> 	<p>Liquid only</p> <p><b>19</b></p> <p><b>UWE Pee Power - Microbial fuel Cell (MFC) technology that turning</b></p> <p>UWE BioEnergy Centre, University of the West of England (UWE)</p> <p>UWE</p> 

> 20 licenses executed for product development and commercialization since 2018

## Example of solids output for safe discharge



1 hour @ 0.5 RPM, 300°C



1 hour @ 1.0 RPM, 300°C

## Example of liquid output for safe reuse for flushing

- No pathogens
- Treated to meet ISO 30500 specs
- Safe to discharge in waste bin or garden/plants
- Safe to recycle water for flushing



Liquid Waste Feed

Cold Tank at Start (Tap Water)

Distillate from Overflow Weir

Distillate from Carbon Filter

# Households Reinvented Toilets Products/Technologies in the pipeline

All systems use combustion for solids processing, recycle water for flushing, and can fit indoor bathroom, or configured to have the treatment systems outside, in cold or dry climate.



Designed by Georgia Tech  
Tech transfer/licensing in  
process



Designed by Cranfield University,  
licensed by Huatie and JOMOO

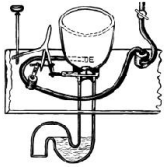


Designed by Samsung / tech  
transfer/licensing in process

# THE TOILET REVOLUTION

1775

FIRST FLUSH  
TOILET PATENT



1836-1910

THOMAS CRAPPER  
POPULARIZED FLUSH TOILET



1778

THE BRAMAH IMPROVED  
WATER CLOSET



## TODAY

ECOSAN TOILET



NANOMEMBRANE TOILET



RECYCLING TOILET



OMNI-PROCESSOR



HELBLING TOILET

Design requirements  
(ISO 30500 / ISO 31800)

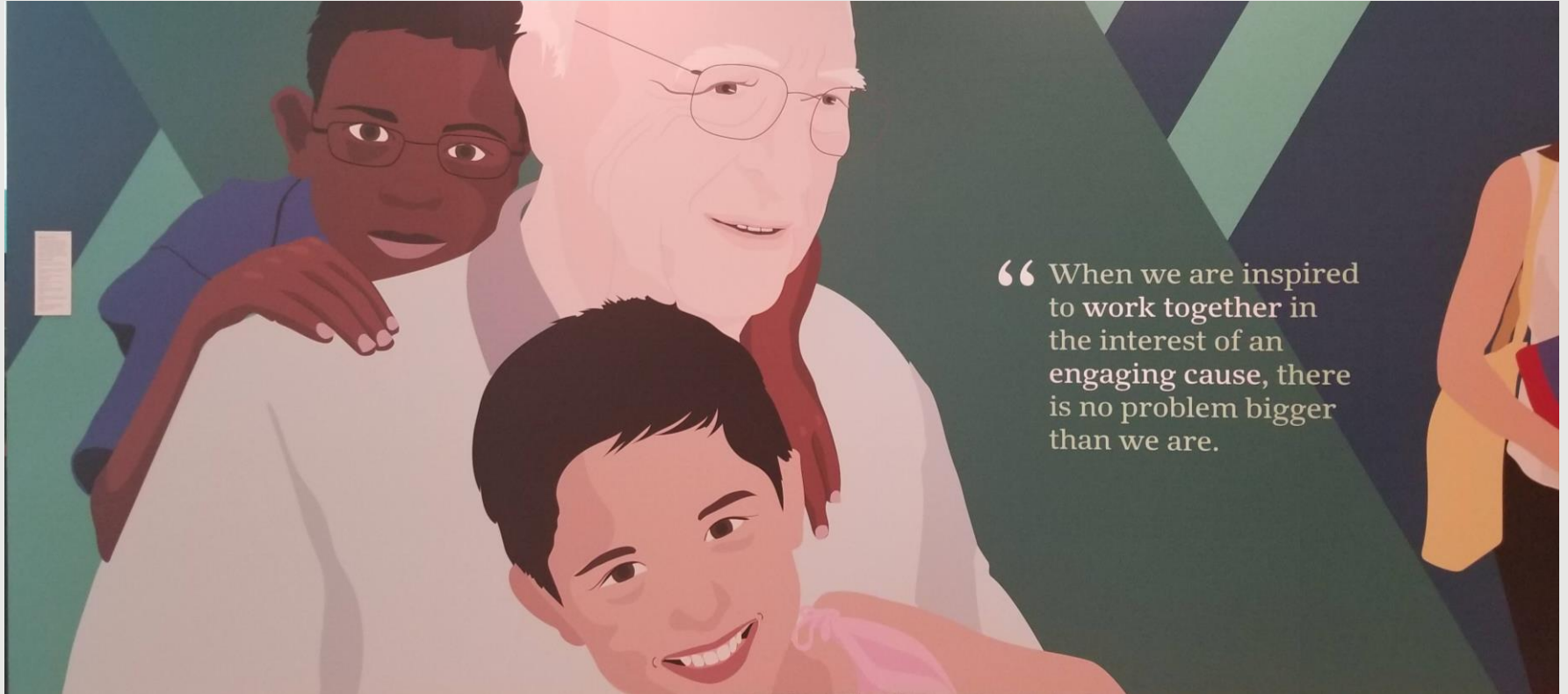
- **Pathogen kill**
- Water saving/recovery/reuse
- Energy efficient /self-sustain
- Affordable / appealing
- Attractive value proposition

# Learn more...

- [This Toilet Works Off the Grid](#)
- [The future of sanitation: 10 years of reinventing the toilet](#)
- [Flush with innovation: 10 years of reinventing the toilet](#)
- [Why the world deserves a better toilet](#)
- [ISO 30500:2018 - Non-sewered sanitation systems — Prefabricated integrated treatment units — General safety and performance requirements for design and testing](#)

# THANK YOU !

## Let's go together, faster and farther



“ When we are inspired to work together in the interest of an engaging cause, there is no problem bigger than we are.