

**H.375 TESTIMONY**  
**PRESENTED ON BEHALF OF:**  
**VERMONTERS AGAINST**  
**TOXIC SLUDGE**

**CRAFTED AND DELIVERED BY:**  
**KAI MIKKEL FØRLIE**

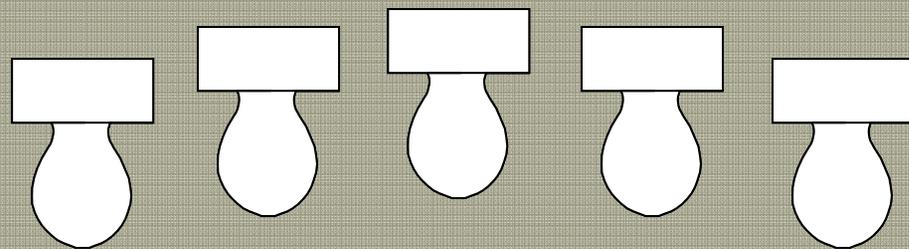
**RECIPIENT:**  
**HOUSE FISH, WILDLIFE AND**  
**WATER RESOURCES**  
**COMMITTEE**

**DATE:**  
**THURSDAY, APRIL 16, 2015**

## **Part 1: The Challenge in Front of Us**

“The toilet was created to solve eighteenth-century problems of decorum, and was spread across society to solve nineteenth century problems of sanitation. Now...we have a few twenty-first century problems: the cost of the sewage infrastructure and its environmental impact. The flush toilet can’t solve the problem this time, because this time, the flush toilet is the problem.” [my underline]

- Dave Praeger, Author of “Poop Culture”



## Pharmaceuticals in Sludge

Codeine, Ibuprofen (Advil), Naproxen (Aleve), Azithromycin (Zithromax), Clarithromycin (Biaxin), Ciprofloxacin (Cipro), Doxycycline (Doryx, Monodox, Vibramycin), Enrofloxacin (Baytril), Erythromycin, Minocycline (Dynacin, Minocin, Myrac), Norfloxacin (Noroxin), Ofloxacin (Floxin), Oxytetracycline (Terramycin), Sulfamethoxazole and Trimethoprim (Bactrim), Tetracycline (Achromycin), Virginiamycin, Carbamazepine (Tegretol), Fluoxetine (Prozac), Miconazole (Desenex, Lotrimin, Monistat), Thiabendazole, Diphenhydramine (Benadryl), Diltiazem (Cardizem), Gemfibrozil (Lopid), Cimetidine (Tagamet), Ranitidine (Zantac), Caffeine, Triclocarban (3,4,4'-trichlorocarbanilide), Triclosan (and its breakdown products, such as 2,8-dichlorodibenzodioxin and Methyltriclosan) and breakdown products of pharmaceuticals like 4-Epianhydrotetracycline, 4-Epitetracycline, Anhydrotetracycline, Cotinine, and Dehydronifedipine.



## Industrial Toxics in Sludge – Part One

**1,2-Dibromo-3-Chloropropane** (a.k.a. DBCP) - EPA has classified DBCP as a Group B2, probable human carcinogen.

**Bis(2-ethylhexyl) phthalate** (a.k.a. DEHP) - EPA has classified DEHP as a Group B2, probable human carcinogen

**Isopropyltoluene** (a.k.a. p-cymene or p-isopropyltoluene) - One or more animal studies show brain, nervous system, or behavioral effect effects at high doses.

**Dioxins and Furans** - The studies show that dioxins and furans have the potential to produce a range of effects on animals and humans including skin disorders, liver problems, impairment of the immune system, the endocrine system and reproductive functions, effects on the developing nervous system and other developmental events, certain types of cancers

**Polybrominated diphenyl ether** (PBDE) flame retardants - EPA is concerned that certain PBDE congeners are persistent, bioaccumulative, and toxic to both humans and the environment.

## Industrial Toxics in Sludge – Part Two

**Triclosan** - Triclosan is linked to liver and inhalation toxicity. It is very toxic to aquatic life.

**Nonylphenol detergent breakdown components** - Endocrine disrupter capable of interfering with the hormonal system of numerous organisms..

**Phthalates** - Phthalates have been found to disrupt the endocrine system. Several phthalate compounds have caused reduced sperm counts, testicular atrophy and structural abnormalities in the reproductive systems of male test animals, and some studies also link phthalates to liver cancer, according to the U.S. Center for Disease Control's 2005 National Report on Human

**Nanosilver** – Linked to fish defomation

Heavy Metals: (**Mercury** - Neurological toxin – bioaccumulates; **Lead** – Neurological toxin

**Human Pathogens**

**Radionuclides**

**BPA** (Bisphenol A)



# CASELLA "EARTHLIFE"

:: Main ingredient is sewage sludge

:: Sold in Vermont



Source: <http://www.thegreenconnection.com/products-and-services/products.html>

**VERMONT MATERIALS MANAGEMENT PLAN:  
Moving from Solid Waste towards Sustainable Management**

**Effective date June 18, 2014**

*"Materials management is an approach to serving human needs by using and reusing resources most productively and sustainably throughout their life cycles, minimizing the amount of materials involved and all the associated environmental impacts."*

*— Sustainable Materials Management: The Road Ahead (USEPA 2009)*



*Photographs clockwise from top left: baled plastics, food scraps fed to chickens, and compost windrows being turned.*

**“Unlike household trash and other closely related streams of municipal solid waste, there is very little that individual Vermont residents can do to reduce the volume of residual wastes that are being disposed versus used. Other than septage removed from on-site septic systems, an activity which itself is not conducted by individual homeowners, residual wastes are almost exclusively produced and managed by municipal facilities or by private sector businesses.”**

**Source: Vermont MMP 2014, Page 53**

**“ANR will:**

1. Continue to look for opportunities to educate and inform the commercial sector and the general public about the sources and potential effects related to contaminants of emerging concern in wastewater biosolids,
2. Work with interested parties to examine and evaluate innovative and alternative uses for wastewater biosolids,
3. Encourage WWTFs and other governmental programs and non-governmental associations to offer tours and educational opportunities to local schools and universities, and
4. Continue to look for opportunities to educate and inform the commercial sector and the general public about the beneficial uses and the opportunities for residual materials.

ANR will continue to look for opportunities to educate and inform the commercial sector and the general public about the beneficial uses of residual wastes. In concert with the ANR’s efforts, it is expected that all solid waste management entities (SWMEs) will have implemented locally specific education and outreach programs for residual wastes.”

Source: Vermont MMP 2014, Page 53



Owner of the picture: ADB

Taken by Edzel Roman

<https://www.flickr.com/photos/gtzecosan/8619289298/in/album-72157633160171657/>

01 30 2013

HUNDREDS

THOUSANDS

MILLIONS

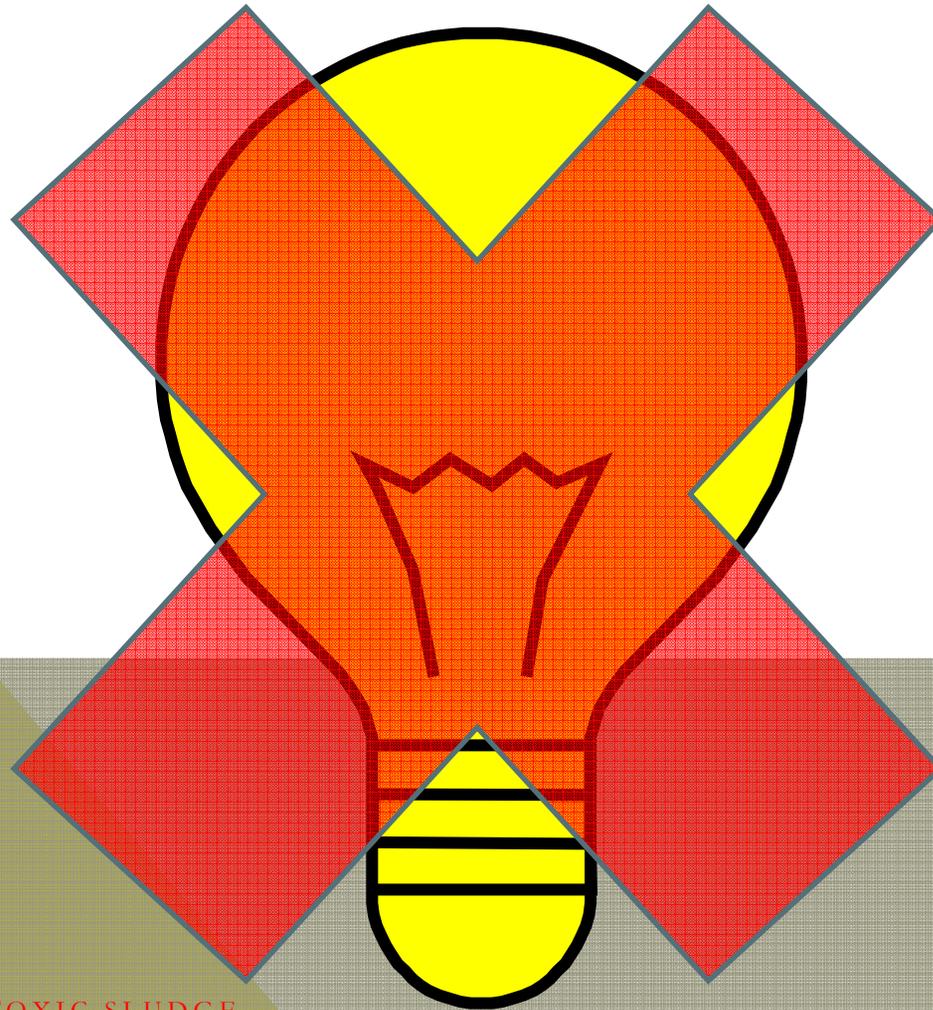
BILLIONS



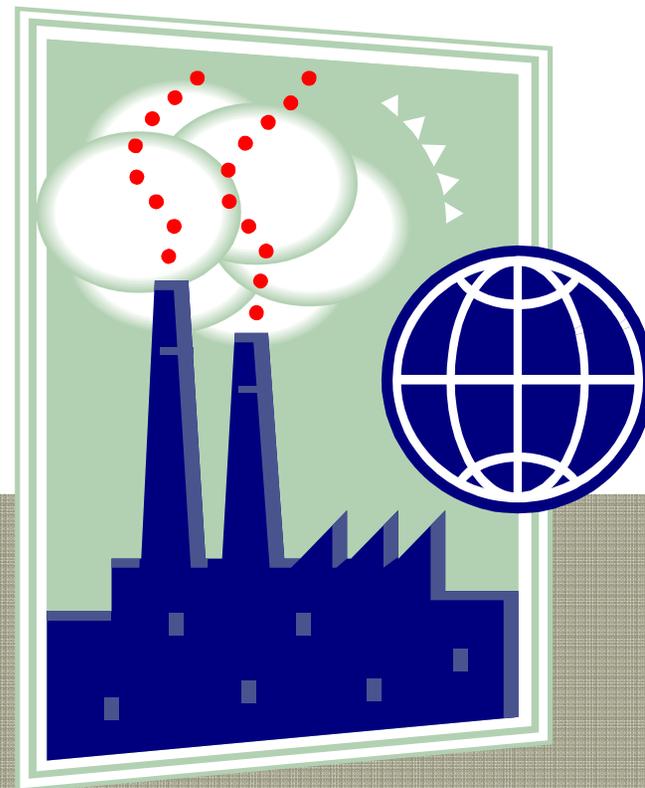


Image courtesy of Stuart Miles at [FreeDigitalPhotos.net](http://FreeDigitalPhotos.net)

Ask any municipality that owns and operates a wastewater treatment plant and you will find that that infrastructure alone is one of, if not the largest single consumer of electricity in the municipal portfolio (owing in large part to the huge energy demands of pumping).



“**Embodied energy** (...) is defined as the available energy that was used in the work of making a product. Embodied energy is an accounting methodology which aims to find the sum total of the energy necessary for an entire product lifecycle. This lifecycle includes raw material extraction, transport, manufacture, assembly, installation, disassembly, deconstruction and/or decomposition.”





"Image courtesy of [africa](#) / FreeDigitalPhotos.net".

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## **Part 2: The Opportunity in Front of Us**

Ecological sanitation: Ecological sanitation (EcoSan) is based on three fundamental principles: preventing pollution rather than attempting to control pollution; rendering urine and feces safe for reuse; and using the safe products for agricultural purposes.

Sustainable sanitation: is a type of sanitation system which was first defined by members of the Sustainable Sanitation Alliance. To be sustainable, the sanitation system should meet the following five criteria: it should be economically viable, socially acceptable, technically and institutionally appropriate, and protective of the environment and the natural resources.

Ecological toilet: An umbrella term used to refer to a composting toilet, urine diverting dry toilet or any other toilet that uses a minimal amount of water or no water at all and is designed primarily to prevent pollution and render urine and feces safe for reuse.

Human excreta: Human feces and urine.

Carl Lindstrom



Stranman84



Wolfgang Berger



Sun-Mar



Wolfgana Berger



Way of Nature



Pete Antos-Ketcham



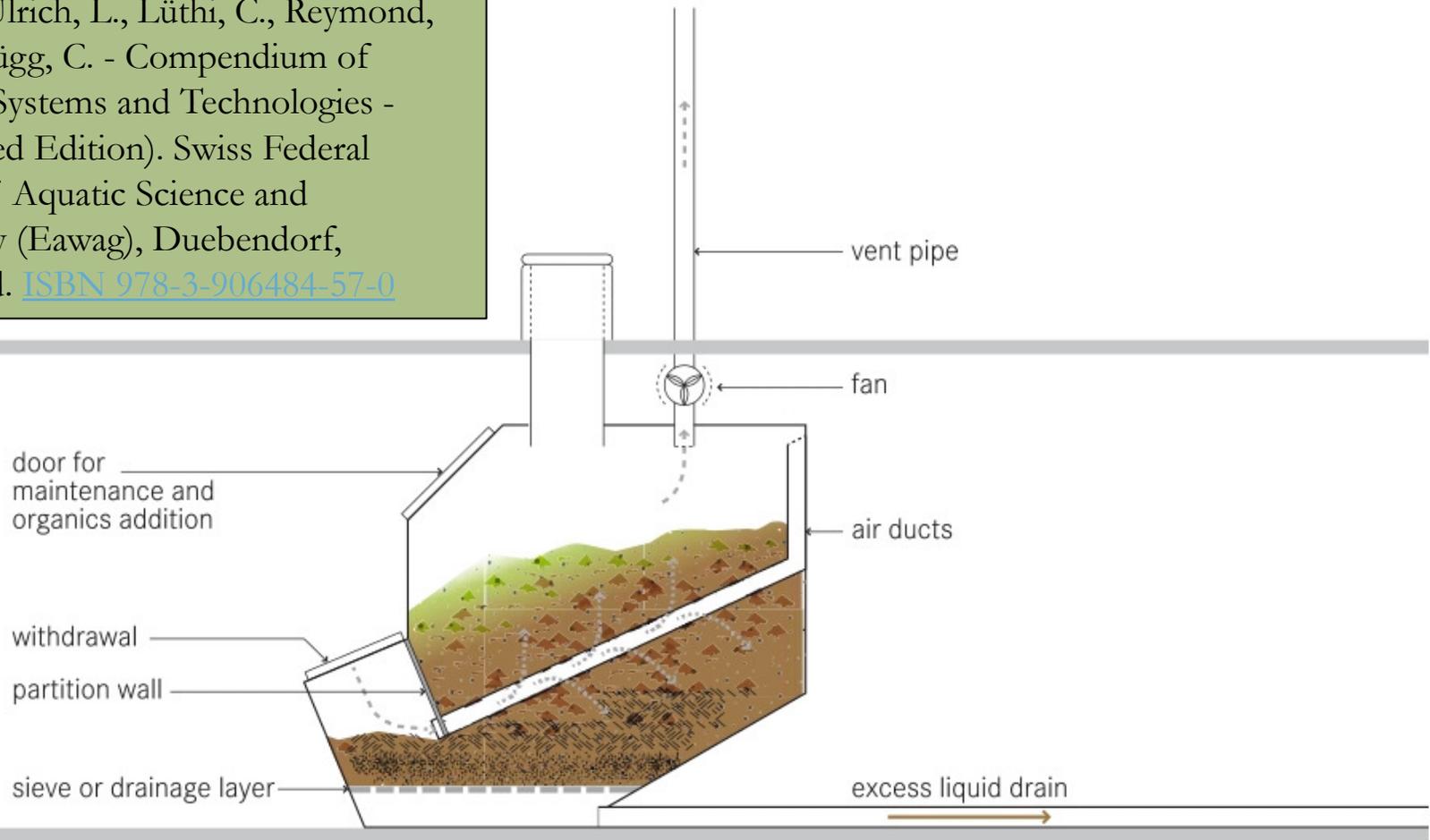
# Composting Toilets

*“A **composting toilet** is a type of dry [or almost dry] toilet that uses a predominantly aerobic processing system for the onsite treatment of human excreta, by composting or managed aerobic decomposition.”*



Image courtesy of [Wolfgang Berger](#)

Tilley, E., Ulrich, L., Lüthi, C., Reymond, Ph., Zurbrügg, C. - Compendium of Sanitation Systems and Technologies - (2nd Revised Edition). Swiss Federal Institute of Aquatic Science and Technology (Eawag), Duebendorf, Switzerland. [ISBN 978-3-906484-57-0](https://doi.org/10.1007/978-3-906484-57-0)



## Basic Operating Components of a Remote Composting Toilet

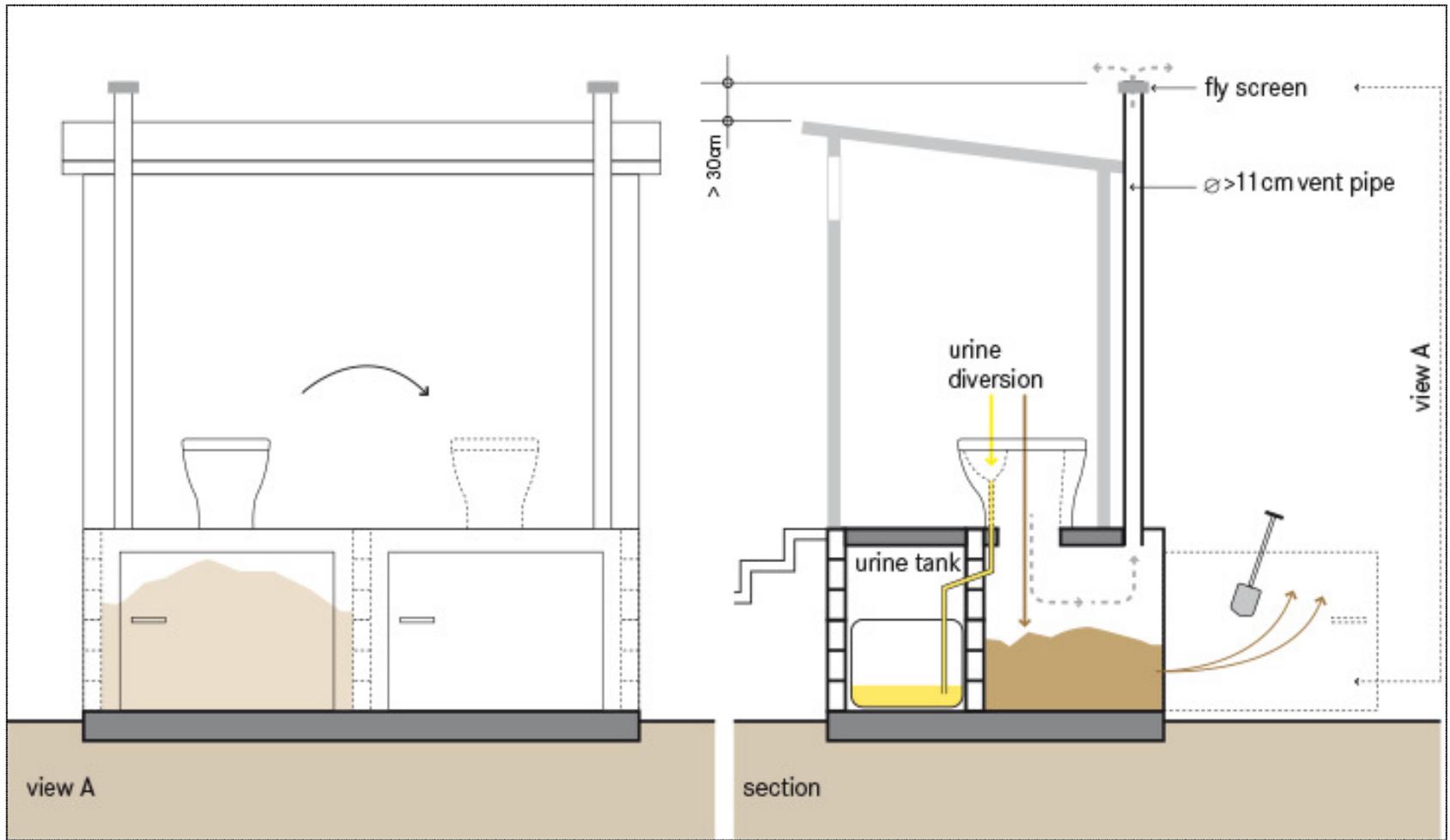
# Urine Diverting Dehydration Toilet

- Portable
- Segregated bowl
- Electrically powered ventilation (DC)
- Trap door covers feces vault
- Agitator for stirring contents of feces container
- Separate urine container
- Easy to clean smooth plastic surfaces
- Dried leaves, sawdust, peat moss, etc.



Author's photo

Tilley, E., Ulrich, L., Lüthi, C., Reymond, Ph., Zurbrugg, C. -  
[http://ecompendium.sswm.info/sanitation-technologies/dehydration-vaults-0?group\\_code=s](http://ecompendium.sswm.info/sanitation-technologies/dehydration-vaults-0?group_code=s)



## Basic Components of a double-vault UDDT

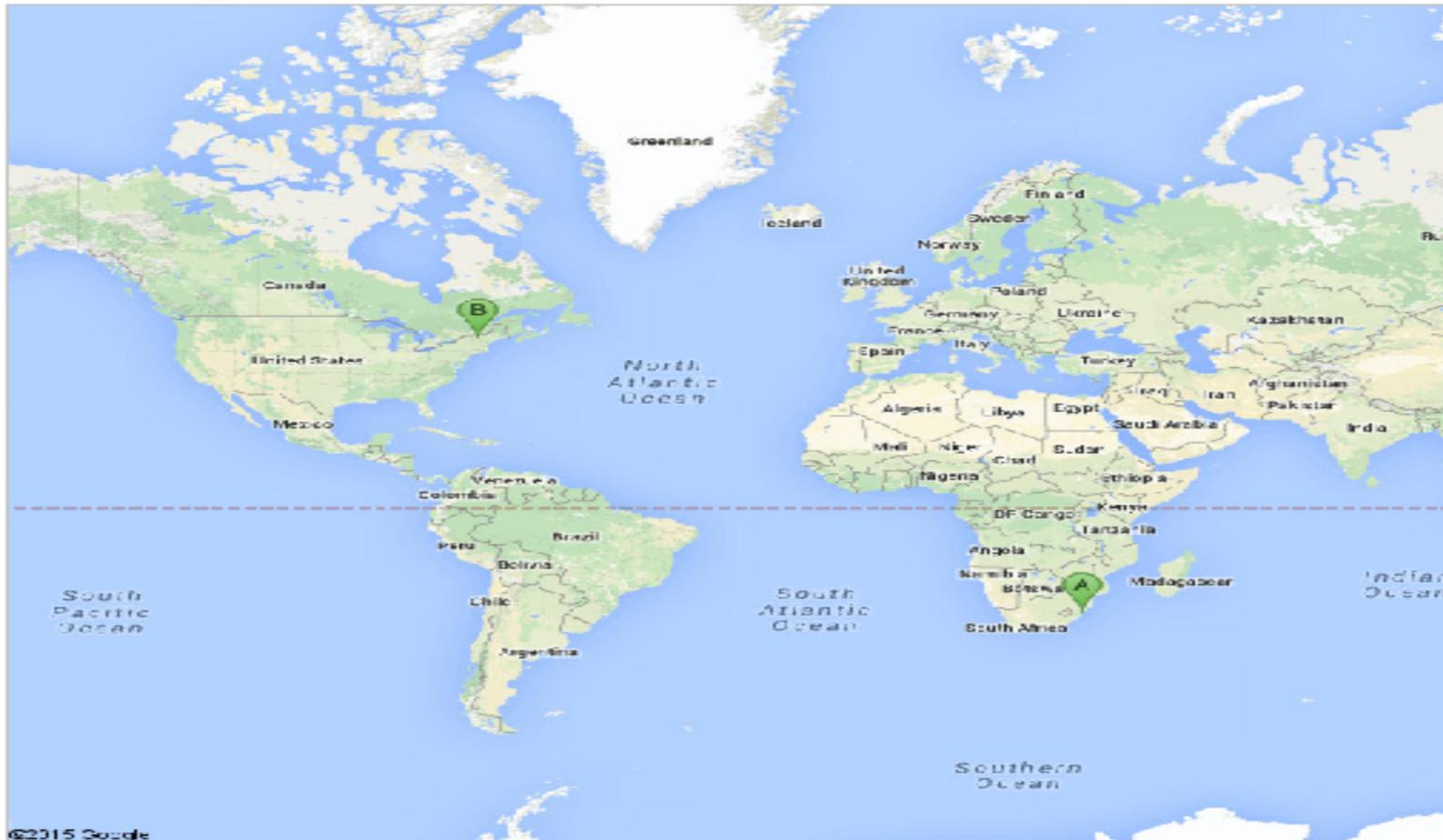
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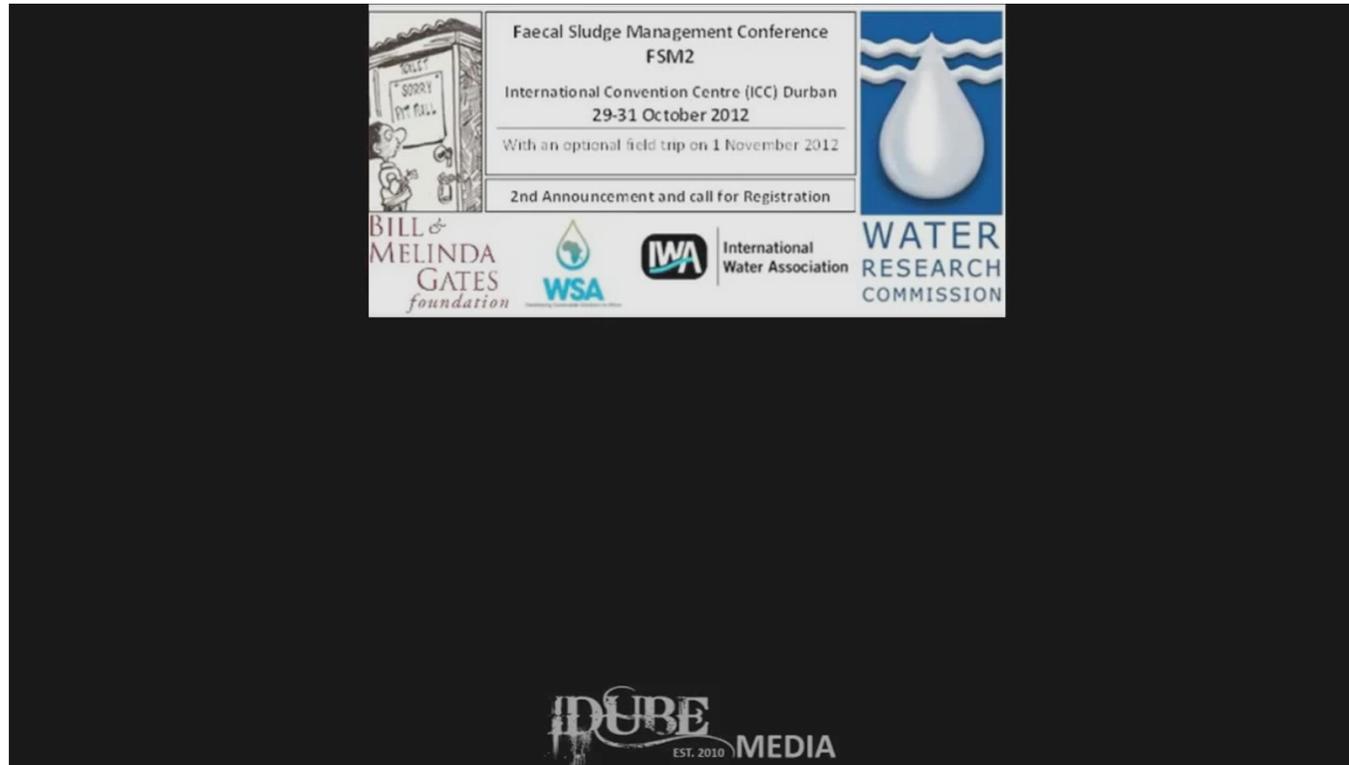
**Part 3: International Sustainable Sanitation Efforts**



©2015 Google

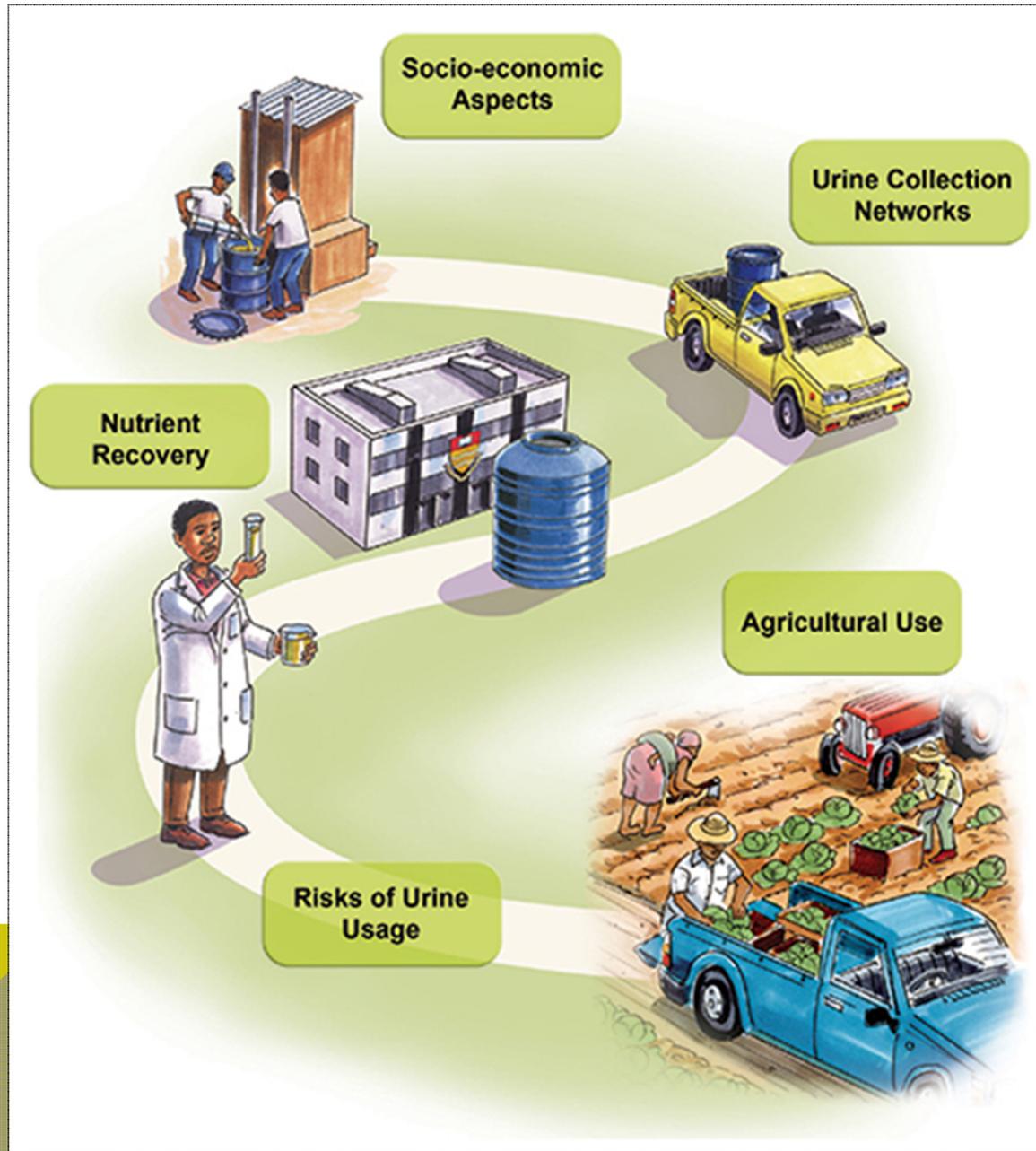
We could not calculate directions between **Durban, South Africa** and **Montpelier, VT**.

# Sustainable Sanitation in South Africa



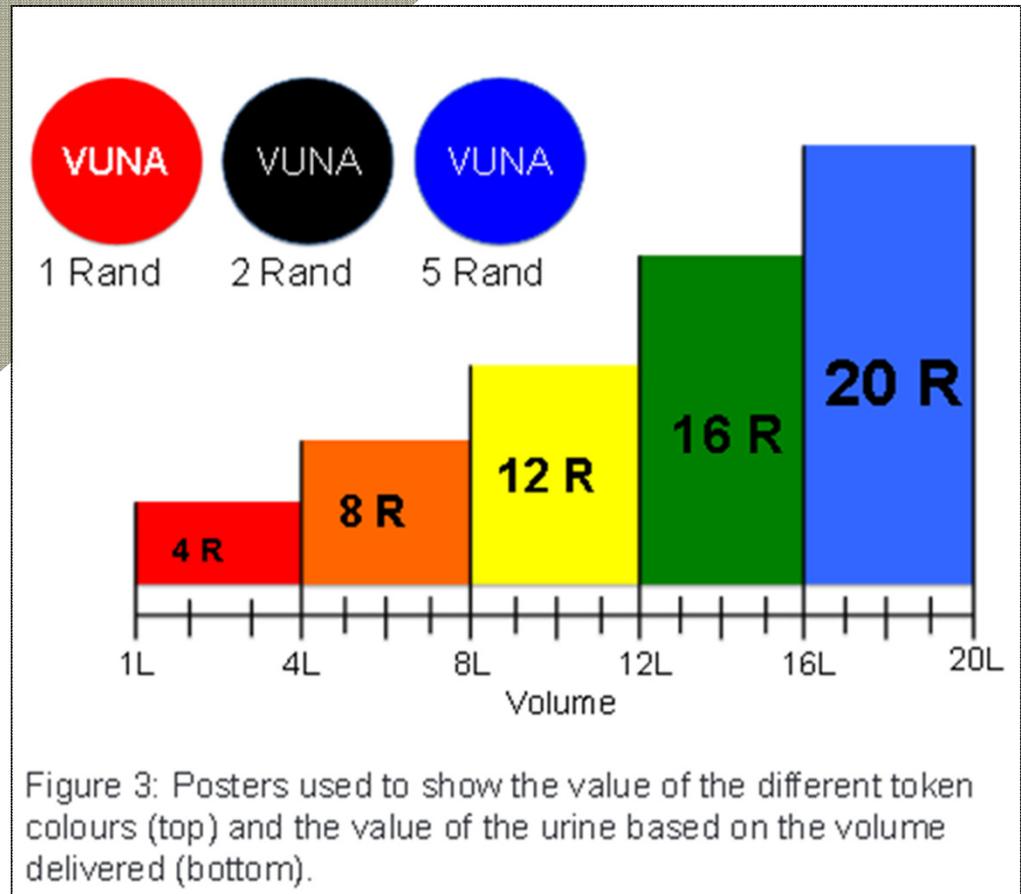
[https://www.youtube.com/watch?v=ithKly\\_52a4&feature=youtu.be](https://www.youtube.com/watch?v=ithKly_52a4&feature=youtu.be)

eThekweni Water and Sanitation has provided ~82,000 UDDTs which serve over half a million people in greater Durban, South Africa. Services provided include free annual emptying of feces vaults and free curbside urine pickup or remuneration if customers deliver their urine to centralized collection facilities.



[Source: <http://www.eawag.ch/forschung/eng/gruppen/vuna/index> EN]

# URINE PAYMENTS BASED ON VOLUME



[http://www.eawag.ch/forschung/eng/gruppen/vuna/documentation/3-1\\_131203\\_VUNAbrochure\\_economics](http://www.eawag.ch/forschung/eng/gruppen/vuna/documentation/3-1_131203_VUNAbrochure_economics)

1. The production of struvite (perhaps most familiar to us in this room as kidney stones) in which upwards of 90% of the phosphorous and a portion of the nitrogen (but none of the potassium) was precipitated out of urine using some form of magnesium.



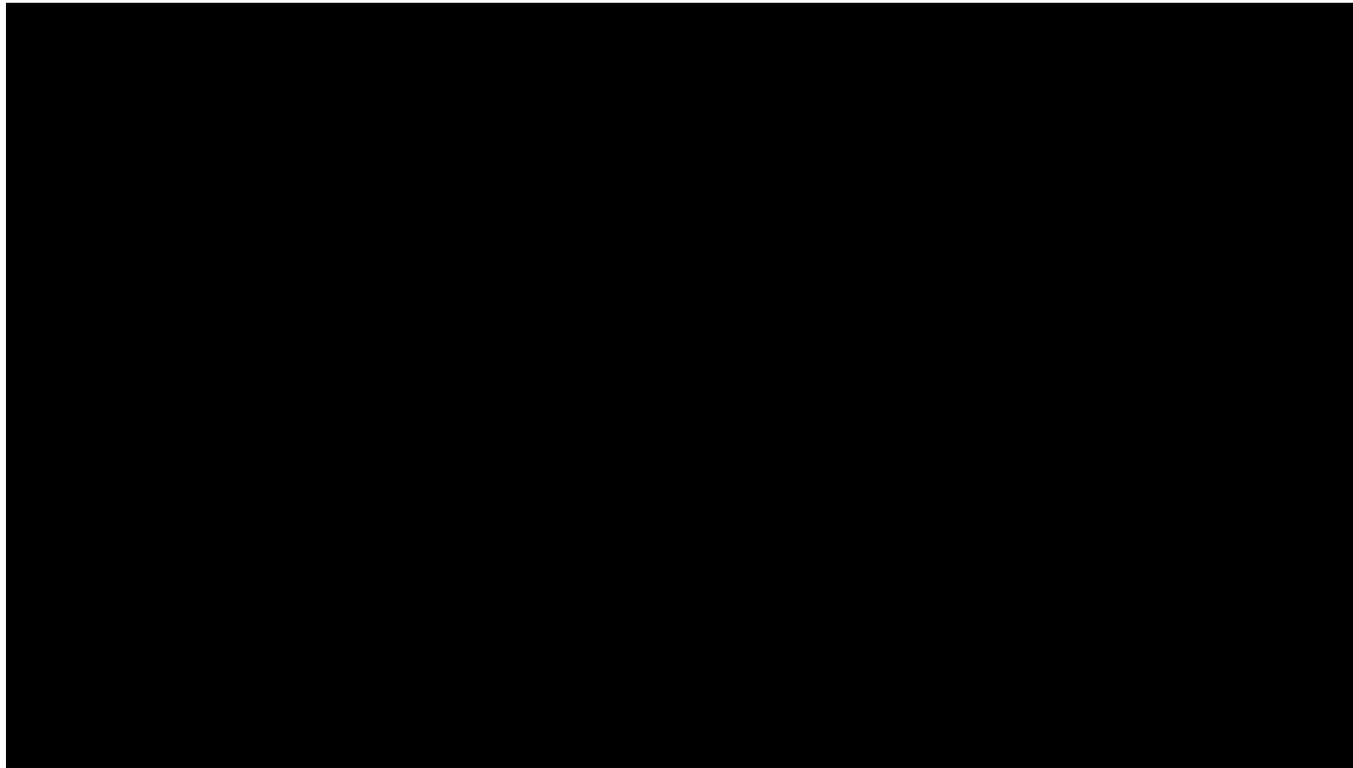
This struvite was produced in the first runs of the precipitation reactor of Huber SE.

([Photos: M. Winker, July 2010](#))

2. The more complex dual processes of nitrification and distillation. Remarkably, this combined process yielded, “...practically all the nutrients [present in urine] in one concentrated solution.”

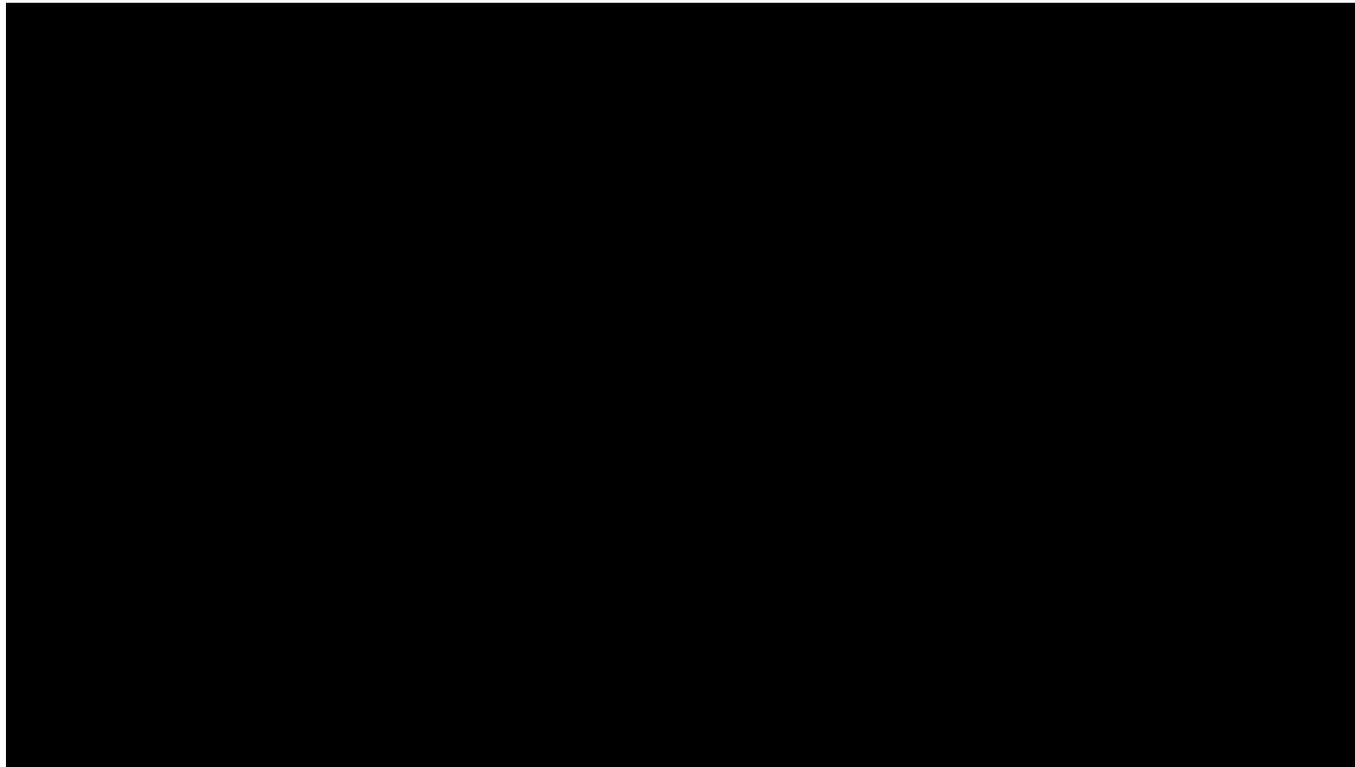
3. Several different forms of electrolysis which were found, respectively, to, “...prevent environmental pollution and malodour,” aid in the nitrification process and better facilitate the extraction of nutrients when undertaking a struvite precipitation process.

# Sustainable Sanitation in Sweden



<https://www.youtube.com/watch?v=8NXEPy41pUw&feature=youtu.be>

# Sustainable Sanitation in El Alto, Bolivia



<https://www.youtube.com/watch?v=D6-pdoVHslk>

“The above project, undertaken by Fundación Sumaj Huasi and Abona in collaboration with the Stockholm Environment Institute, “Constructed 897 UDDT units and benefited around 4,485 persons. It was implemented...[in]...a peri-urban area with an estimated population of...27,000.”

# Sustainable Sanitation in Haiti

From SOIL's (Sustainable Organic Integrated Livelihoods) [website](#):

“Since building the first waste treatment facility in Haiti in 2009, SOIL has gone on to become one of the largest waste treatment operations in the country, treating over a quarter of a million gallons of waste each year.”

“SOIL produces over 100,000 gallons of Konpòs Lakay, SOIL's EcoSan compost, each year. This compost is used to rebuild the productive potential of Haiti's soils.”

From [Wikipedia](#):

“SOIL continues to provide humanitarian relief in some of Haiti's most vulnerable communities – notably those that have been particularly impacted by the cholera epidemic – by providing free access to public container-based UDDTs for over 3,500 people. In addition, over 2,000 people are currently accessing a SOIL "EcoSan toilet" through the "EkoLakay" business pilot, with a growing waitlist of people wanting to join, thus demonstrating the market demand for affordable sanitation, even in the world's most economically impoverished communities.”



## SOIL's "EkoLakay" Urine Diversion Dry Toilets

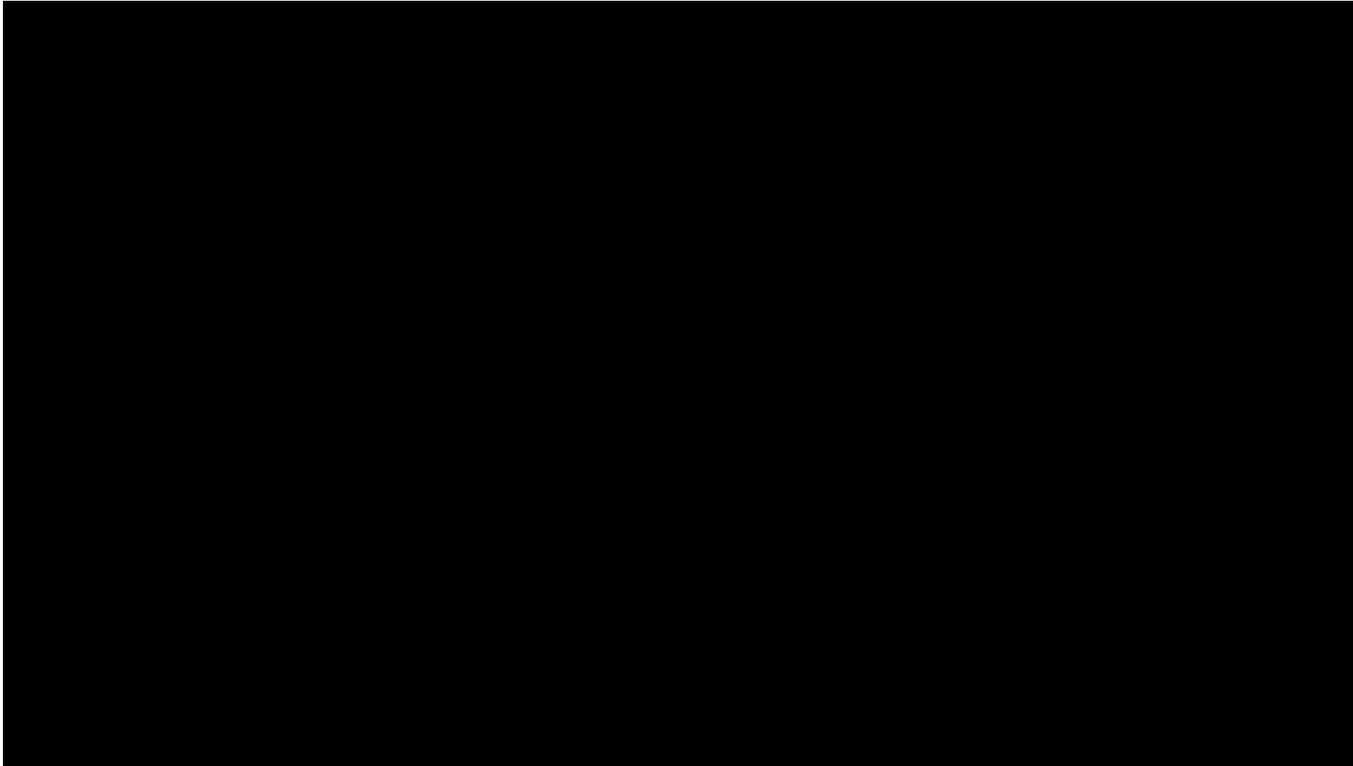
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# Sustainable Sanitation in Finland

“Leading Finnish composting toilet manufacturers and the Global Dry Toilet Association of Finland estimates that in Finland, “[s]ome 200,000 manufactured composting toilets are thought to serve holiday homes, matched by the number of other dry toilets.”

- Wikipedia article on Composting Toilets

# Sustainable Sanitation in Lima, Peru

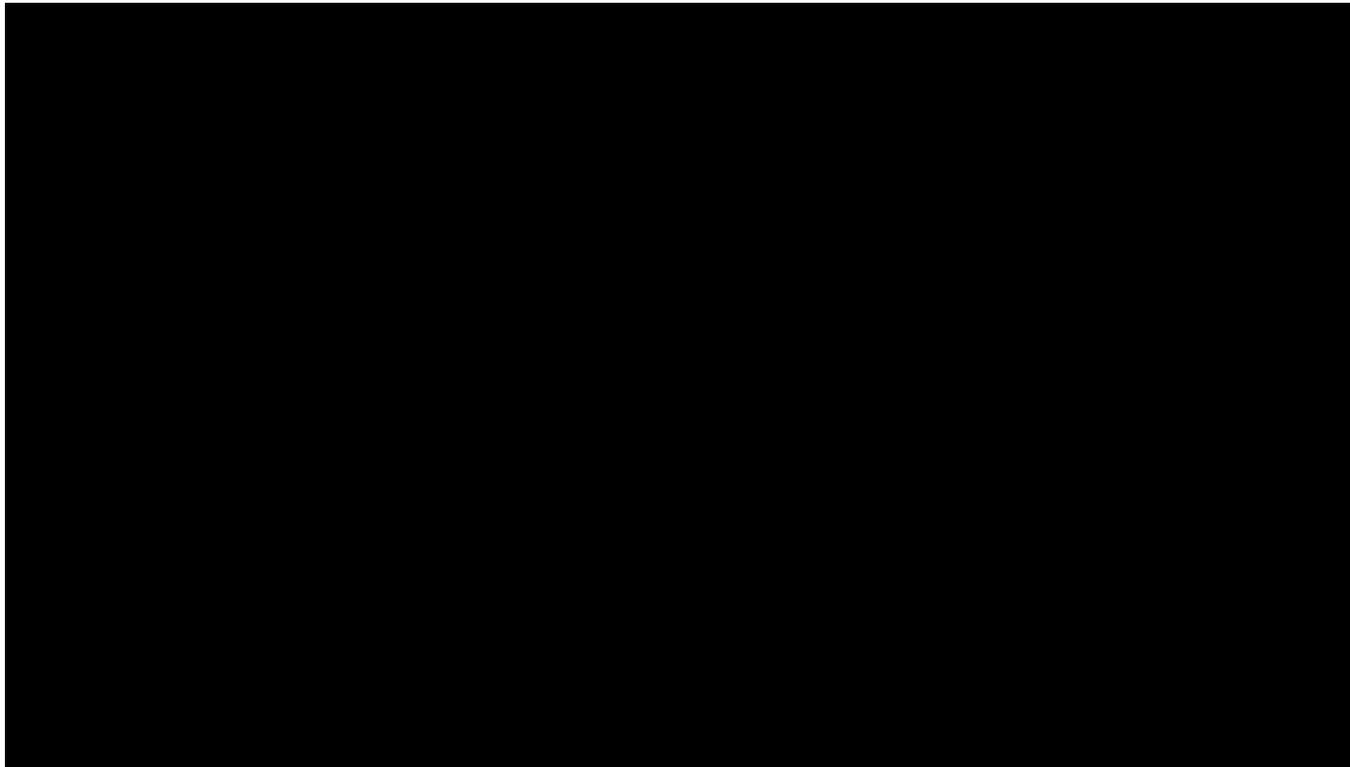


<https://www.youtube.com/watch?v=SQU5Gun4Lys>

“X-Runner’s mission is to bring reliable and sustainable sanitation to low-income urban households that do not have a toilet. We improve their daily lives and create a cleaner, healthier environment for the entire family.” -

<http://www.xrunner-venture.com/home/4583965215>

# Sustainable Sanitation in Tianshui City, China



<https://www.youtube.com/watch?v=W8Mlbv1Le7k>

This excerpt from the documentary "Urine Superpowers" details the efforts of Scott Chen (a.k.a. Chen Xiang Yang), an apple/cherry/vegetable farmer in Tianshui, Gansu Province, China who - along with the assistance early on of the SOHO China Foundation - has been working since 2008 with local schools to collect urine which he then uses to fertilize the apple and cherry trees in his orchard. [[Mona Lisa Production](#)]



**THE END**

VERMONTERS AGAINST TOXIC SLUDGE