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"Solidarity in a competing world — fair use of resources"

Concept Design for a Biochar Sanitation System in Kivalina, Alaska

Theresa Theuretzbacher[1,2], Brian von Herzen[2], Günter Langergraber[1]

[1] *University of Natural Resources and Life Sciences (BOKU), Inst. for Sanitary Engineering and Water Pollution Control, Austria*

[2] *The Climate Foundation, United States of America*

Abstract

Residential homes in Kivalina, an Inupiat village located on a barrier island in Alaska North of the Arctic Circle, lack toilets and running water. Residents use honey buckets (paint buckets lined with plastic trash bags) as toilet replacement to collect human waste.

A concept design for a sanitation system that converts human solid waste into biochar will address key public sanitation issues in Kivalina. The various infrastructural, climatic, economic, environmental, and social contexts were researched and a feasibility study was performed for the planning and implementation of the future Kivalina biochar sanitation system.

During the site visit to Kivalina in fall, 2014 rapid rural appraisal (RRA) and participatory rural appraisal (PRA) as methodologies were applied to collect information about community village sanitation and waste management economics. The survey data was statistically, numerically and graphically analyzed.

Two installation types of the selected UDDT (Urine Diverting Dry Toilet) model Villa 9210, were developed. One version is an underfloor collection system (37 houses) for houses on piles to collect human solid waste outside the home. The alternative is an in-home collection system (48 houses) for houses where underfloor collection is not possible for architectural reasons. A pilot toilet trial in Kivalina to test the operability and function of UDDT technology showed that only minor adaptions on the toilet interface are necessary.

Mapping of local waste management economics revealed, that the current hauling system is socially not fair; wealthier families have to pay less than poorer families. The financial analysis showed that using the UDDT model Villa 9210 is 30 % cheaper than using a honey bucket. The total operational costs of the toilet, hauling system and the biochar reactor are 40 % higher than using honey buckets. The total capital costs of the biochar sanitation system are only 10 % of the capital costs of conventional wastewater treatment systems in Arctic villages.

The proposed biochar sanitation system will reduce handling and open storage of human feces, decrease rates of waterborne diseases and the contamination of aqueous and terrestrial habitats in Kivalina. Further, it will decrease the need for additional village infrastructure and individual investments.

Keywords: Affordability, Arctic, biochar, honey bucket, urine diverting dry toilet

Contact Address: Theresa Theuretzbacher, University of Natural Resources and Life Sciences (BOKU), Inst. for Sanitary Engineering and Water Pollution Control
current address: Vognstølen 10b, 5096 Bergen, Norway, e-mail: theuretzbacher@gmail.com