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LOCAL RECYCLING OF WASTEWATER AND WET ORGANIC WASTE – A STEP TOWARDS THE ZERO EMISSION COMMUNITY

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EXTENDED ABSTRACT

If blackwater and wet organic wastes are source separated and co-treated, approximately 90% of the nitrogen, 74% of the phosphorus and 79% of the potassium can be reclaimed and recycled. Blackwater is collected with a vacuum toilet. More than 4-years experience with vacuum toilets in two housing developments has provided data on their effectiveness. The latest toilet development is vacuum on demand (VOD), i.e., vacuum is generated only when flushing. The system, which is also available in a solar powered version, is more robust than earlier vacuum systems and consumes less energy (<10 kWh/person/year). Organic waste from households and the food processing industry is collected for co-processing with the blackwater. Co-processing increases dry matter, nutrient and energy content of the effluent for recycling. A liquid-composting reactor stabilizes and sanitizes the effluent according to European standards. The reactor is fed semi-continuously and generates surplus heat energy. Seven liquid-composting reactors are currently operating in Norway. The end product is a nutrient-rich liquid intended as fertilizer. The liquid may be spread to land by Direct Ground Injection, an energy efficient, high pressure slurry injector well suited for stony soils. Crop yields are comparable to the yields achieved using mineral fertilizer. Future activities for utilising organic waste resources include development of a small-scale bio-gas reactor for cold climates, and use of algal or bacterial cultures to convert waste into hydrogen energy and feedstocks for agriculture and aquaculture.

Greywater contains small amounts of nutrients and pathogens, but often more than 50% of the organic matter in wastewater and more than 60% of the wastewater volume flow, hence removal of organic matter and pathogens is a key issue. In Norway, systems consisting of a pre-treatment biofilter followed by a subsurface horizontal flow constructed wetland have been very successful in reducing organic matter and suspended solids. Levels of indicator bacteria meet European swimming water standards and the nitrogen concentrations in the effluent meet the WHO drinking water standards. The quality of the effluent is suitable for a number of discharge and reuse options. It is possible to discharge to open streams and waterways, both in urban and rural areas, thus reducing the need for a secondary sewer collection system. Irrigation and groundwater recharge is also possible. The excellent effluent quality also simplifies additional treatment, yielding water that is suitable for in-house reuse. Reuse of greywater facilitates water savings exceeding 50%.

Key words: Wastewater, blackwater, greywater, nutrient recycling, wet organic waste, aerobic/anaerobic treatment, biogas, greywater treatment, water saving and reuse.