New wastewater solutions to protect sensitive water recipients
Meeting summary

The Water and Wastewater Association of Iceland (VAFRI, http://www.vafri.hi.is) organized a seminar on the wastewater solutions to protect sensitive recipients on May 8th 2015. The focus was on solutions for decentralized areas that are currently not applied in Iceland. Below is a summary of the presentations and discussions from the event.

Lake Thingvallavatn is the first national park in Iceland. The lake is internationally recognized for its pristine water quality and ecology. The lake ecology, chemistry and physics have been documented under the direction of Dr. Pétur Jónasson. The leading feature of this lake is that it is nitrogen limited. To protect the lake water quality, the nitrogen inputs to the lakes need to be monitored and managed. Research indicates that nitrogen inputs with groundwater, streams and rainfall are 95% of the total of 320 tons N/year. Pollutant pathways associated with anthropogenic activities includes sewage from vacation homes and touristic installations, estimated as 5.5 tons N/year (1.7% of total). Farming and airborne pollution constitute 13.5 tons N/year. It is difficult to control disperse sources, such as groundwater inputs, farming, desertification and air pollution which may stem both from global and local sources. Nitrogen releases from homes and establishments are, however, controllable with alternative wastewater solutions.

Icelanders need to be careful not to take water quality for granted. Experience from abroad suggests that more algae is growing in pristine Alpine streams in Norway than a few decades ago, even if no sewage is released into them. Small increases in nutrient inputs may produce proportionally large impacts on water quality due to complex feedback loops. Increasing air temperatures associated with global warming may escalate the risk of water quality deterioration. Once trophic levels have deteriorated it may be difficult to restore them. Therefore it is important to take preventive measures by reducing anthropogenic nutrient inputs, such as from sewage, even if they constitute a small portion of the total nutrient inputs.

Currently, wastewater treatment in rural areas in Iceland is undertaken with a septic tank followed by an infiltration bed. A recent study from 2012 shows that of the 650 septic tanks around Lake Thingvallavatn, 25% were not emptied either because of restricted access or because they cannot be located. The septic tank solution does not satisfy tertiary treatment requirements as stipulated in operative regulations for sensitive areas. The tertiary treatment requirement is a weak regulatory tool today, both because there is no guideline on the minimum treatment level for installations under 50 persons equivalents and because no guideline is provided on acceptable technologies. The polluting party is to propose a solution, which more than often has not been tested in Iceland. Hence, it is not clear

whether the treatment efficiency stated by the manufacturer is actual for Icelandic conditions.

From a technological point of view, toilets normally flush 6-9 liters of water. Then wastewater from showers and sinks are combined with toilet effluents. Water is a heavy substance, and transporting diluted sewage is not recommended for distances greater than 30 km. Lake Thingvallavatn is 75 km long, and therefore collecting sewage from decentralized homes around the lake, many of which have restricted access, is not a feasible option. Hence a holistic approach needs to be undertaken with local stakeholders, that encompasses the entire collection of wastewater in an establishment and not just the end treatment. The separation of sewage from other wastewater streams that do not contain nitrogen needs to be considered as well as new toilet solutions.

There are several local sanitary solutions that may help protecting water quality of sensitive recipients. Firstly, it is important to recognize that approximately 80% of nitrogen in sewage is from urine alone. Hence urine separation toilets which can be comparatively easily installed by retrofitting existing piping system is an attractive solution for summer houses around Lake Thingvallavatn. Urine can be stored and applied to fields as a fertilizer. Alternatively, dry composting, vacuum toilets and waterless urinals may be good solutions for touristic establishments. Incineration toilets on the other hand, are not recommended as they do not have the capacity to serve many people at the time and release nitrogen in the air. Local small scale end treatment options may be applied in conjunction with alternative toilet options, including soil infiltration systems, bio-filters and constructed wetlands.

It is important to educate the public on the role of alternative toilet installations to gain social acceptance. Equally important is to provide dummy-proof installation and maintenance guidelines to ensure successful long-term operations. The experience of owning and using an alternative toilet needs to be smooth and enjoyable.

Now is an opportune moment for rethinking wastewater solutions for sensitive rural areas in Iceland, as the current regulations on wastewater are under consideration. It is important to monitor the state of the lake and find holistic solutions with the participation of all stakeholders. Performing pilot studies to determine the actual treatment performance achieved under the local conditions and ensuring smooth operations is recommended.

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