BONUS RETURN

Turning waste into circular solutions for the Baltic Sea

POLICY BRIEF SWEDEN

A farmer distributing sewage sludge on farmland.

Implications of new national policies on management of sewage sludge for a Swedish municipality

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In 2018, a Swedish Government inquiry was set up to explore how to implement a ban on the decades-old practice of spreading sewage sludge on farmland and set new requirements for recycling the phosphorus found in sludge. The ban was portrayed as a means to both reduce the environmental and food safety risks of direct sludge application and to accelerate the transition to a complete circular economy for phosphorus, a vital plant nutrient and finite mineral – both laudable goals.

About one-third of all sludge generated in Sweden is currently spread on farmland, which makes it the most common form of sewage sludge management in Sweden, and the practice is expanding, growing 36% between 2014 and 2016. Most of the rest is reused as landscaping soil or to cap old landfill sites.

When the inquiry reported its findings in January 2020, it recommended two alternatives: 1) a complete ban on all agricultural and other reuse options, or 2) a limited ban on reuse, allowing sludge to be spread on farmland if it meets strict quality standards (but not landscaping or landfill capping). Both options included new quantitative targets for recycling of phosphorus.

Both options would impose significant – though different – costs on Swedish municipalities, which are responsible for wastewater management. This brief uses the inquiry's recommendations to look at the impact that national policy directives can have on speeding up the transition to a circular economy, and their implications on the ground – including the potential risks for cities like Uppsala, which has invested heavily in reuse – of being a frontrunner in sustainability policy.

Shifting opportunities and challenges

The debate over the use of human waste in farming is as old as agriculture itself, with different cultures arriving at different and changing practices over time. This is true even between countries within Europe. For decades since the post-WWII establishment of widespread centralized wastewater treatment, Sweden had a policy of encouraging sludge reuse on farmland – but it has not been uncontroversial.

Beginning in the early 1980s and continuing through the 1990s, concerns began to grow around high concentrations of residual heavy metals such as copper and cadmium and organic micropollutants such as flame retardants in sewage sludge. This has led to several instances where the Swedish Farmers Association (LRF) has urged its members to pause the use of sludge on their fields. In order to provide guarantees about the safety of sludge for farmers and the public, a sludge certification programme called REVAQ was developed in the early 2000s and launched in 2008. REVAQ has been considered a success and has encouraged the continued expansion of sludge reuse.

However, recently concerns about other pollutants have initiated a discussion as to whether the REVAQ system is sufficient to ensure that sewage sludge is safe for direct application to cropland. In particular, these concerns are focused on pharmaceuticals and microplastics in the wastewater and how they could affect the environment if they remain in the reused sludge.

The commission of inquiry launched in 2018 by the Swedish government on how to implement a total ban on farmland application of sludge, while improving recycling of phosphorus (MoE 2018), sought to end the debate by recommending new technological solutions.

Uppsala's sludge treatment success

A city of 200 000 people north of Stockholm, Uppsala more than doubled in population between 1950 and 1975 after its first wastewater treatment plant was built in 1945. Uppsala rose to the challenge by implementing a series of innovative approaches. In the late 1970s, Uppsala pioneered (but later withdrew) a sludge-derived fertilizer for retail sale. The early 1990s saw investments that enable the use of biogas – produced during sludge treatment – as fuel for the city's public buses. Having already done "upstream" work with individual households and local businesses to improve the quality of waste coming into the treatment plant for several years, Uppsala entered the REVAQ certification programme in 2013.

REVAQ has contributed to the expanding acceptance of sludge application on farmland and had the secondary benefit of forcing dischargers to reduce their own pollution. These changes involved extensive regulatory programmes and compliance monitoring as well as financial investments both for the city and discharging businesses.

Implications of a total ban

The two pathways recommended by the sludge inquiry have very different implications for Uppsala. They also come at a time when Uppsala has been ramping up the volume of sludge spreading on farmland – reaching 65% in 2018, with a target of 80% by 2020. Half of all sludge in Uppsala was used for covering old landfill sites in 2016, but no new landfills are being created in Sweden.

A total ban on agricultural reuse would require major investment in an alternative means of disposal that allows phosphorus recycling. Currently, the only viable option appears to be incineration, using emerging technologies to recover phosphorus from the ash. Investment would also be needed in processing and marketing the phosphorus. According to companies developing these technologies, the end result is a safe, non-toxic phosphate fertilizer product that can be distributed broadly and expand the use of sludge-recycled phosphorus.

A total ban on reuse could render much of Uppsala's forward-looking investment in REVAQ – both the technology and efforts to build supply chains for the treated sludge – wasted, and likely divert funds from further work to reduce or monitor upstream pollution despite its marked success to date. As the technology for recovering phosphorus from ash has not yet been rolled out at scale anywhere in Sweden, all municipalities would face this investment cost (unless smaller municipalities are excepted from the phosphorus recovery target).

Furthermore, circular phosphorus flows in a system based on sludge incineration will necessitate a high degree of coordination and communication across what is

Transition time in transportation as well?

The ban envisaged when the inquiry was originally mandated in 2018 was partly a response to global technology trends, which have shifted away from direct agricultural reuse and towards incineration. Another area in which Uppsala has been a pioneer in sustainable infrastructure and that could be at risk of stranded investments as a result of international developments is transportation.

In the late 1990s, in an effort to reduce Uppsala's reliance on fossil fuels, the city's buses started running on biogas generated from sludge and food waste - a massive improvement over diesel. The programme was considered a great success and proudly advertised as an urban waste-to-energy solution.

An important question now is how this system, which performs excellently in terms of life cycle greenhouse gas (GHG) emissions and circular resource utilization, will be affected by strong current global trends towards electrification. Like many other cities around the world, Uppsala is now looking to increase the use of battery-electric buses, which are not only potentially low in carbon emissions (thanks to Sweden's clean electricity mix) but also reduce local noise and air pollution. In conclusion, this case also goes to show that the path to a sustainable economy is rarely straight and may require interim steps that include significant sunk capital costs along the way. However, finding approaches that draw upon historical experiences can be highly valuable to enable smooth and speedy transitions.

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Uppsala wastewater treatment plant. Image: SEI

"A total ban on reuse could render much of Uppsala's forward-looking investment in REVAQ wasted"

arguably a more complicated value chain that adds incineration, chemical pre-processing and fertilizer production as intermediate steps between wastewater treatment plant and farm.

The Swedish Environmental Protection Agency (Naturvårdsverket) hosted workshops in April and July of 2019 aimed at supporting the government inquiry through sharing European experiences in phosphorus recycling and defining the path forward for the sludge ban/phosphorus-recycling policy. A transition to a system of sludge incineration with phosphorus recovery would take many years to implement. Germany projects that implementing a recent similar move will take 12 years, although incineration is already the most common form of sludge treatment in Germany, which means that some of the infrastructure needed is already in place. Furthermore, participants in the April workshop agreed that this circular economy transition can only happen with increases in public funding, mostly likely through wastewater fee hikes.

Implications of a partial ban

The second pathway would also imply costs for Uppsala – but no loss of its investments to date. REVAQ quality standards are suggested as the minimum for allowing agricultural reuse under this scenario. This means that Uppsala would be able to draw, and build, on its infrastructure, experience and expanding supply chains.

Thus, Uppsala would be better placed than other Swedish municipalities that have not come so far with REVAQ.

What's next?

The Swedish Government will now need to consider the inquiry's suggestions, and how to implement any subsequent new policy. Either of the inquiry's suggested pathways would accelerate up the transition to a circular economy for phosphorus in Sweden. The second option would also potentially allow development of a circular economy in nitrogen, potassium, organic matter and other resources found in wastewater. But any new policy will need to be implemented primarily by municipalities and ultimately funded by users. It is therefore essential that municipal officials are actively involved in the planning. The following policy recommendations are offered as a guide for discussions on coming national policy between national and local officials.

- As most experts have stated in reaction to the inquiry report, the second option – i.e. the continued use of sludge on farmland but with stricter quality standards – is preferable.
- Protect upstream work such as that under REVAQ, whose value in reducing pollution at the source has been proved by Uppsala and other municipal operators.
- Ensure municipalities have sufficient time to implement whatever new policy is chosen and as far as possible support efforts to build new markets for sludge and/or phosphorus reuse.
- Remember that not all sludge is equal. Sewage sludge can have different attributes pertaining to composition and potential contamination, depending on the inputs and the treatment processes used by the treatment plant.
- Broaden the focus beyond phosphorus. Notably, the organic matter in sludge is valuable for soil improvement, but is obviously lost during incineration. Policy recommendations should leave space for technology options that exploit the full range of societal value contained in sludge.

Cover photo: SuSanA Secretariat / Flicker

This series of three briefs describes real-world examples of policies or programmes intended to accelerate implementation of ecotechnologies that reduce nutrient losses, and encourage nutrient reuse in the three BONUS RETURN case study basins: Fyrisån (Sweden), Vantaanjoki (Finland) and Słupia (Poland).

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