

Evidence

Transforming wastewater treatment to reduce carbon emissions

Project summary SC070010/S2

A new report by the Environment Agency explores how tighter water treatment regulations may push up carbon emissions, and ways for the water industry to minimise its carbon impact.

Without intervention, the new EU Water Framework Directive (WFD) is likely to lead to more wastewater treatment in the UK, which could boost our carbon dioxide (CO₂) emissions by over 110,000 tonnes a year. This is a small increase compared to the water industry's carbon footprint of five million tonnes a year, but the increase will more than double emissions from treatment plants that will need to carry out additional processes. This report explores ways for the water industry to minimise the carbon impact of wastewater treatment.

Options to offset this increase over the long-term do exist. Widespread use of enhanced anaerobic digestion with combined heat and power (CHP), and of energy-optimised activated sludge, could result in savings of over 102,000 tonnes of CO₂ a year, assuming 50 per cent optimisation in the industry. Assuming that a third of water flowing to a wastewater treatment plant comes from surface runoff, a further carbon saving of 110,000 tonnes of CO₂ a year could be made if plants stop pumping storm water. This could also bring savings in treatment costs, depending on the processes used.

Barriers to these potential carbon savings include changes in the processes or technology currently used; proposed reductions in the Renewable Obligation Certificate value for anaerobic digestion; and the cost and disruption of diverting all runoff to surface water, which is likely to be disproportionate.

The report outlines five key strategies that the water industry and its partners could adopt to mitigate the carbon impact of the WFD:

- Source control - controlling the substance of concern at source, to avoid the need for later treatment. This could bring the greatest carbon savings, but the water industry has limited powers in this area.
- Least-carbon end-of-pipe/process – find the least-carbon treatment solution, accepting that an increase in emissions is inevitable.
- Greater operational efficiencies - reduce demand for power through better design in the catchment, optimising sewage management to WFD criteria.
- Redesigning existing treatment processes - switching to lower energy alternatives, though this could prove difficult.
- Renewable energy generation - reduce plant emissions through on-site generation of energy or within the water industry asset base.

The WFD itself does not provide incentives for water companies to invest in low carbon solutions. Instead the price of energy, Climate Change Act targets to reduce UK emissions, the Carbon Reduction Commitment (CRC) trading scheme, and reporting requirements to include the Shadow Price of Carbon (SPC) in new scheme appraisals, may drive water companies to invest in sewer catchment plans to reduce carbon emissions.

Under the current funding regime, the savings associated with an operational efficiency can only be regarded as additional profit by the water company until the end of each periodic review (five years). After this time, the efficiency is considered base operation and the savings passed to the customer. Consequently if the industry invests in low carbon technology with income arising from efficiencies then it may only have five years to payback. However, low carbon technologies included within price limits as part of the price review cycle are valued in payback terms over their whole lives.

The report makes the following recommendations:

- Joint work between the water industry and Environment Agency investigating pollution source apportionment and modelling catchments to assess the associated risks should consider the carbon impacts of the proposed programmes of measures to determine the least-carbon solutions.
- Source control through product use should be considered for substances that come in contact with water, such as plasticisers that may drive the need for end-of-pipe treatment.
- The potential of sustainable drainage schemes to reduce emissions from water pumping and end-of-pipe treatment should be further investigated, and include local authorities, highways and other agencies that may be able to influence the management of surface water.
- The studies proposed for AMP5 to address the knowledge gap in the performance of existing technologies and end-of-pipe solutions to remove substances should include a detailed assessment of the carbon implications and of the potential impact on sludge management.
- The water industry reviews its trade effluent consenting and charging policies such that, where appropriate, trade effluent controls and charges are aligned under the 'polluter pays' principle. Some sectors may be required to make significant financial contributions, and while this may be an incentive to control emissions it may also lead to carbon-inefficient on-site treatment at the trader site. It is therefore recommended that whole carbon lifecycle risks are assessed for such changes in water industry policy.
- The Environment Agency should undertake environmental regulation in a more holistic manner, where the setting of consents is considered within a framework to ensure the potential carbon emissions of meeting EQS are understood and factored into the consenting regime.
- The Environment Agency continually reviews guidance on how WFD consenting will be regulated, so that the water industry is able to investigate potential efficiencies without the risk of failing consents. When considering disproportionate cost and technical infeasibility, the mitigation steps required to offset the carbon impact should also be considered.
- Research is needed on how major process changes will affect existing systems including whole lifecycle carbon costs, but these site investigations may be time-consuming and extensive. Methods to efficiently assess the carbon impact of redeveloping existing treatment processes should be developed.

- Further understanding is needed on how sludge make-up from new WFD-related treatment processes will affect existing sludge processes and hence CHP opportunities. The proposed AMP5 studies should consider sludge management impacts on the function of CHP.
- The combustion of biogas should be considered for regulation under Environmental Permitting Regulations and a review should be carried out to ensure that biodegradable waste can be used as digester feed.
- A study should be carried out to fully investigate opportunities for renewable energy generation across water industry functions and any blocks imposed by regulation.

This summary relates to information from project SC070010, reported in detail in the following output:

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