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Position paper

Energy and Greenhouse Gas emission reduction objectives for the European water sector under the UWWTD

Summary

The European waste water sector can make a big contribution to reaching climate neutrality objective by reducing Greenhouse Gas emissions and energy consumption. The revision of the Urban Waste Water Treatment Directive can create momentum to build a legal framework to address climate mitigation and the impact of waste water treatment plants. This paper presents how a tailor-made approach could generate the most optimal results.

1. Introduction

In March 2020, the European Commission proposed an EU Climate Law, the cornerstone of the Green Deal, with a climate neutrality goal for 2050 and an intermediate target of reducing greenhouse gas emissions by at least 55% by 2030 compared to 1990 levels. EurEau acknowledges that waste water services, just as any anthropogenic activity, have an impact on the climate, mainly through direct greenhouse gas (GHG) emissions, and fossil energy use but also through infrastructure and chemicals. However, returning untreated waste water into the environment has a much higher GHG footprint than treated waste water[1]. The European waste water sector is willing to do its part in order to mitigate this impact by exploring solutions to monitor and minimise this impact. It is necessary to take into consideration the current measures taken, differences between waste water operators and local situations.

In the context of the revision of the Urban Waste Water Treatment Directive (UWWTD), we see opportunities to define the legislative framework on how the waste water sector should be encouraged to get a more complete picture of GHG emissions and energy use and to define measures to reduce these impacts.

[1] Kim, D., Begum, M., Choi, J., Jin, H., Chea, E., & Park, J. (2019). Comparing effects of untreated and treated wastewater on riverine greenhouse gas emissions. *APN Science Bulletin, 9*(1). doi:10.30852/sb.2019.872.

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2. Assessing GHG emissions

Before defining mitigation measures, the first step is to **monitor and evaluate the current level of GHG emissions and their sources**, taking into account the requirements for waste water treatment. The immediate priority should always be to comply with the defined objectives of the UWWTD (present and future), but the long-term intention is also to contribute to meeting the 2015 Paris Agreement targets and EU climate neutrality goal by 2050. This monitoring and evaluation exercise should be based on CO_2-equivalents, **including the short- and long-term impact on global warming** of the relevant GHGs emitted. Nitrous oxide (N_2O) for example, has a greater global warming potential than methane (CH_4) and carbon dioxide (CO_2). It is necessary to identify what kind of mitigation measures will have the most impact and to prioritise them, and not solely relying on the future climate neutrality of electricity production.

We highlight that the emission **measurement** of substances like methane (from sludge treatment and deposit) or nitrous oxide (from aeration tanks or various denitrification technologies) are difficult to perform. Even though we have seen a rapid development within innovative monitoring systems and techniques recently, there is still need for more innovation and development leading to comparable results that are applicable to appropriate control strategies. Research and innovation within this field should therefore be supported in order to help the waste water sector to better evaluate its climate impact and take necessary actions.

An **audit of GHG emissions should take into account the entire waste water system**, including sewers, pumping stations, waste water treatment plants and sludge management (ie: treatment and disposal) facilities to cover all emissions generated by waste water services. It should also take into account the indirect emissions associated with the infrastructure, the emissions embedded in the existing infrastructure, as well as the use of chemicals during operations. The objective is to optimise investment into the necessary infrastructure while minimising GHG emissions. A guidance document on how to conduct these audits and harvest comparable data should be developed by the European Commission in close cooperation with the Member States.

The whole concept of climate neutrality requires clarification on the waste water collection and treatment processes. Even though the energy produced from renewable energy sources causes less GHG emissions during the development and construction phase, GHG are still emitted and should therefore be taken into account in the audits. Furthermore, a debate is still ongoing as to whether the biogenic CO_2 emissions should be considered in the GHG emissions of WWTPs. For example, some Member States made large investment decisions to incinerate sludge, and require phosphorous recovery. In doing so, they assumed that this biogenic CO_2 would not be counted as GHG emissions. , Innovative technologies to capture CO_2 emitted through the incineration of sludge need to be developed in order to minimise the impact of these existing infrastructures. Innovation and research to develop these technologies should therefore be embedded in Horizon Europe and other EU funding programmes.

The **unit for expressing energy consumption and climate impact** of waste water systems (collecting system, waste water and sludge treatment) should also reflect the level of service and treatment. This would allow to measure progress even if the population connected to the sewer is increasing or the waste water treatment plant is required to implement additional treatment steps (i.e. to treat micropollutants).

3. Towards climate neutrality

Having more **energy efficient facilities** is a necessary step to move towards energy neutrality and ultimately to climate neutrality. However, the energy efficiency potential differs per country and per waste water system and some countries have already completed their conversion to energy efficient systems. Therefore, for the operators that already made investments to implement energy efficient solutions, compulsory straight percentage reduction targets would cause huge extra investment costs for little result.

Thereafter, energy neutrality of WWTPs might be a crucial step towards net zero carbon emissions as it pushes operators to reduce their energy consumption and to find alternative and renewable ways of producing the energy to cover remaining demands.

Nevertheless, energy neutrality is not the same as climate neutrality. It is not always clear how 'green' renewable energy is. Moreover, GHGs may still be emitted from energy neutral waste water systems, e.g. from aeration or from unintended methane leakage during the biogas (methane gas) production process, from vehicles and buildings. This might hamper the overall objective of climate neutrality. In this frame, it is still a debate whether the biogenic CO_2 emissions should be considered or not. It is therefore important to **focus on climate neutrality and not only on energy neutrality**. By doing so, a balance is needed between energy efficiency and renewable energy generation on the one hand and reducing N_2O and methane emissions on the other. This is crucial to ensure that the benefits of energy efficiency are not reduced by large-scale emissions of N_2O and methane from i.e. energy recovery.

It should be noted that any change in the installation and processes with the aim to reduce GHG emissions and enhance energy efficiency may cause **undesirable indirect GHG emissions**. For example, upgrading a network with energy efficient pumps will generate GHG emissions during the production phase of the pumps. In this specific case, the optimal moment of replacement of a pump should be chosen to optimise the overall GHG emissions taking into account both the GHG emissions avoided by using the energy efficient pump and the GHG emitted during the production phase of the pump.

Furthermore, it is important that both energy and GHG emissions **audits should take into consideration the level of treatment** required to meet UWWTD objectives. Life Cycle Analyses (LCA) of technologies should be encouraged to allow wise decisions on the technical solutions to apply. For instance, current technologies to treat micropollutants like pharmaceuticals are impactful both in terms of energy consumption and carbon footprint. Depending on the treatment it also has consequences on the solutions for sludge management. LCA guidelines for technologies used in WWTPs are recommended.

Low climate impact technologies for waste water systems are not yet easily accessible. In order to foster investment in low climate impact solutions and enhance the EU production of renewable energy, the carbon emission accounting should **consider on-site renewable energy production** like biogas, solar and wind energy. Likewise, other climate compensation measures such as reforestation and peatland rewetting should be included in the overall GHG emission balance. These would be technically more easily achievable and less burdensome than trying to avoid the last kilogramme of (biogenic) GHG emissions.

For moving the sector towards energy neutrality and GHG net zero emission, **tailor-made targets** can be set at plant level, based on the results of the energy and GHG emissions audits. Assessment and possible measures could be implemented with priority for the **largest systems, serving** more than 100,000 PE. This would capture around 60% of the waste water load in Europe and these larger waste water systems often already have monitoring systems in place. Smaller systems could be the second order priority, depending on the priority of Member States.

4. Conclusion

We are convinced that the waste water sector needs to follow clear steps to move towards climate neutrality by 2050 and that the revised UWWTD should support the move. However due to different local situations, we do not find it feasible to regulate these aspects within the EU-wide requirements of the UWWTD, even when a reliable baseline has been established. The revised UWWTD's role should be to encourage Member States that GHG emissions reduction measures are implemented.

In the first instance, the Impact Assessment for the UWWTD should help to choose the best options to become climate-neutral by 2050 and could explore:

- inclusion of climate audits (GHG and energy) for all large WWTPs and the onward creation of actions plans to:
  - quantify direct and indirect GHG emissions (including methane and N_2O)
  - reduce energy consumption to reduce climate impact and implement renewable energy generation, if feasible. Unwanted side effects in terms of emissions of N_2O and methane must be taken into account
  - identify the measures towards climate neutrality, according to the investment capacity of the utility and the effluent standards to be reached.
- support the development of standardised measurement methods for GHG emissions in waste water systems and carbon neutral technologies
- recognise that the production of renewable energy on the WWTP site is a good step forward for EU renewable energy targets
- provide financial support for the implementation of carbon neutral waste water systems, including prioritising R&D within this field from Horizon Europe and national funders
- underline that EU initiatives, incentives and measures to reduce energy and GHG emissions should be coherent with other water related legislation as some targets might not go hand in hand (energy reduction target versus extra treatment

requirement).

Additionally, EU Member States should support innovation and promote the implementation of economic regulation that rewards actions and investments to reduce GHG emissions from the water sector. The latter is not EU competence, but may be included in the preamble for the UWWTD.

About EurEau

EurEau is the voice of Europe's water sector. We represent drinking water and waste water operators from 29 countries in Europe, from both the private and the public sectors.

Our members are 34 national associations of water services. At EurEau, we bring national water professionals together to agree European water sector positions regarding the management of water quality, resource efficiency and access to water for Europe's citizens and businesses. The EurEau secretariat is based in Brussels.

With a direct employment of around 476,000 people, the European water sector makes a significant contribution to the European economy.