EVALUATION OF THE URBAN WASTE WATER TREATMENT DIRECTIVE

Kemira Position Paper

The Urban Waste Water Treatment Directive (91/271/EEC) is a central instrument of EU water legislation. While the Directive has improved wastewater treatment practices in EU member states, it has not kept up with technological advances, and some severe shortcomings exist with regard to implementation. According to the European Environmental Agency, European waters remain under pressure from a range of human activities.[1] *A review of the Directive would not only bring benefits for both human health and the environment, but would also serve in meeting the EU's climate and circular economy goals.*

Six actions for cleaner water

1. **The requirements of the Directive must be implemented fully and equally in all member states.**
2. **Emission limit values (especially phosphorus) in water discharges should be tightened.**
3. **Digitalization can improve both the quality of monitoring and the cost efficiency of water treatment.**
4. **Emerging pollutants need to be included in the legislation.**
5. **Pollution from storm-water overflows must be limited and discharges safely disinfected.**
6. **Clearer guidance is needed on applying innovation and sustainability criteria in public procurement for water treatment.**

1. The requirements of the Directive must be implemented fully and equally in all member states.

Implementation of the UWWTD varies substantially across Europe. In some countries water treatment is much more ambitious and efficient than the Directive requires, while in others **there are significant implementation gaps, even though the first collection and treatment requirements of the Directive already entered into force in 2001.** Implementation has been insufficient, especially related to water that is discharged from treatment plants to sensitive areas (see Figure 1).[2]

New member states have been granted excessive transitional periods for implementation, with some having until 2023 to fulfill the requirements of the Directive. Meanwhile, the sanctions for failing to comply with the

[1] European Environment Agency: European Waters. Assessment of status and pressures 2018
[2] European Commission: Ninth report on the implementation status concerning urban waste water treatment

required standards have been negligible. As an example, in July 2018 the European Court of Justice fined Spain a lump sum of 12 million euros for almost 18 years of infringement.[3]

In many cases, the implementation gaps are caused by inefficient treatment methods rather than limited treatment capacity. By combining chemical and biological treatment in an optimal way, many wastewater treatment plants would be able to treat more water more efficiently without the need for major capital investment.

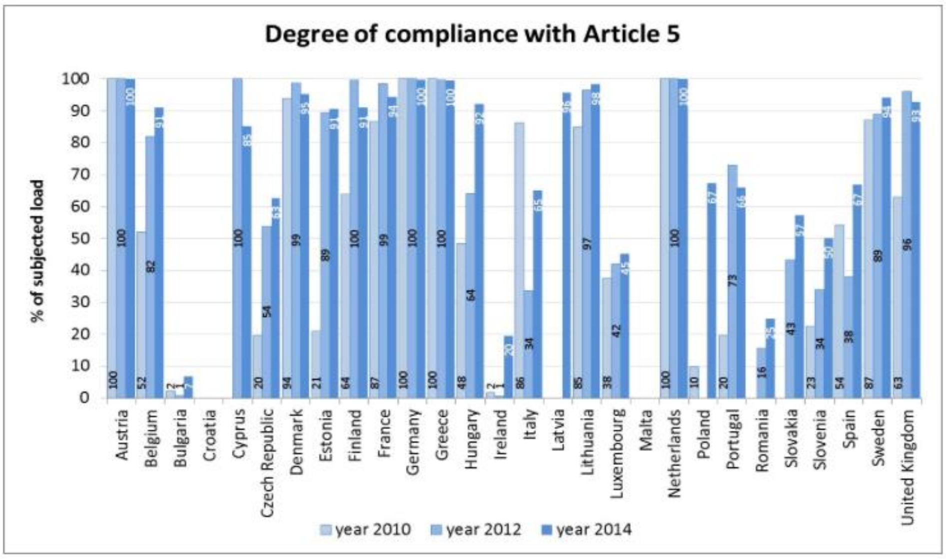

Figure 1. Degree of compliance with Article 5 of the Directive, which sets out the requirements for water discharges to sensitive areas. Source: European Commission

2. Emission limit values (especially phosphorus) in water discharges should be tightened.

The limit values of different pollutants in the current Directive are not strict enough, as the EEA report on the state of European waters illustrates. **Much better results could be achieved with existing technology and without increasing the cost of treatment.** Only political will is needed for setting a new standard for water cleanliness in Europe.

The maximum limits for BOD, COD, TSS, and phosphorus should all be tightened. Phosphorus is especially harmful because it causes eutrophication, which is the excessive growth of algae and flora in lakes or other bodies of water. The consequences of eutrophication can be seen in, for example, the Baltic

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[3] European Court of Justice case C-205/17

BOD Biochemical Oxygen Demand

COD Chemical Oxygen Demand

TSS Total Suspended Solids

Sea, where toxic algal blooms during the summer of 2018 covered almost the entire Gulf of Finland at their peak.[4] In Poland, several beaches had to be closed due to algal blooms.

The current limit of 2 mg of phosphorus (P) per liter of water (population centers of 10,000–100,000 people) and 1 mg of phosphorus per liter of water (population centers over 100,000 people) should at minimum be halved. For example, nearly all wastewater treatment plants in Sweden and Finland achieve a maximum level of 0.5 mg P/l, [5] and many plants have even stricter limits in place. For example, levels as low as 0.2–0.3 mg P/l are the rule rather than the exception in large treatment plants in Finland (see Table 1 below)[6]. This is achieved by combining chemical and biological processes in the most efficient way.

PHOSPHORUS REMOVAL FROM WASTEWATER (2017)				
Water treatment facility	**Incoming phosphorus in wastewater (ton)**	**Discharged phosphorus after treatment (ton)**	**Discharged phosphorus after treatment (mg/l)**	**Removal %**
Forssan kaupungin viemärilaitos	18.12	0.13	**0.10**	99.28
Hämeenlinnan seudun vesi	47.31	0.83	**0.15**	98.25
Joensuun vesi	34.15	0.45	**0.13**	98.67
Kauhajoen vesihuolto oy	14.36	0.09	**0.12**	99.40
Kouvolan vesi oy	14.49	0.68	**0.36**	95.28
Kymen vesi oy	43.51	1.47	**0.19**	96.63
Lahti aqua oy, Ali-Juhakkala	44.11	0.75	**0.20**	98.29
Lahti aqua oy, Kariniemi	44.03	0.86	**0.20**	98.06
Lappeenrannan lämpövoima oy	35.47	2.34	**0.52**	93.40
Loviisan vesiliikelaitos	2.88	0.06	**0.15**	98.00
Mikkelin kaupungin vesilaitos	29.11	0.88	**0.28**	96.97
Napapiirin vesi oy	37.40	0.80	**0.19**	97.86
Nurmijärven kunnan vesihuoltolaitos	12.28	0.23	**0.16**	98.09
Oulun vesi	112.49	2.92	**0.22**	97.40
Pieksämäen kaupungin viemärilaitos	16.54	0.18	**0.16**	98.93
Riihimäen kaupungin viemärilaitos	27.68	0.83	**0.26**	97.01
Tampereen vesi, Rahola	40.13	1.57	**0.36**	96.08
Tampereen vesi, Viinikanlahti	125.37	2.35	**0.13**	98.13
Turun seudun puhdistamo oy	178.31	3.37	**0.18**	98.11
Vaasan vesi	34.49	0.80	**0.16**	97.68

Table 1. Removal rate of phosphorus from wastewater. The table lists treatment plants covering population centers of larger than 100,000 in Finland. Source: Environment.fi, a joint website of Finland's environmental administration

[4] Finnish Environmental Institute: Summary of algal bloom monitoring 2018
[5] Statistics Sweden (SCB): Discharges to water and sewage sludge production 2014
[6] Environment.fi, a joint website of Finland’s environmental administration

The more phosphorus that can be captured from the wastewaters, the more can be recycled. Together with more efficient wastewater treatment in general, this would contribute to the EU's circular economy goals. Phosphorus is listed as one of the 23 critical raw materials that are mostly imported into Europe; increasing recovery from wastewater would limit the need for these imports. In addition, the residual sludge from wastewater treatment can and should be used in the production of biogas. As water resources become more limited year by year, wastewater itself should also be seen as a resource.

3. Digitalization can improve both the quality of monitoring and the cost efficiency of water treatment.

Digital solutions provide numerous possibilities for developing wastewater treatment. Further analysis of treatment processes, including the optimization of chemical dosing and predictive process operation, leads to higher overall treatment efficiency within the boundaries of existing infrastructure.

Smart digital platforms can be used for applications such as real-time phosphorus removal optimization. Kemira's KemConnect™ platform helps wastewater treatment plant operators to dose the right chemistry and the exact amount of chemicals required in each specific case. With the help of the platform, operators can ensure compliance with regulatory limits even when feed rates and phosphorus loads fluctuate; it also eliminates the need to overdose chemicals "just to be on the safe side".

Another example of a solution enabled by smart digital platforms is sludge dewatering. Approximately 10 to 20 percent of the operational costs of wastewater treatment plants are related to sludge disposal. By increasing the amount of dry solids content in the dewatered sludge, plants are able to minimize the amount of sludge that needs to be disposed of and thereby achieve substantial reductions in operating costs and environmental impacts.

Digitalization also provides the opportunity to monitor treatment results online and in real time. Currently monitoring practices vary between EU countries, and the benefits offered by modern technologies are not being exploited. In most cases monitoring is done manually, which means that sampling and lab analysis take days to complete. As a result, operational decisions are being made based on historical data rather than up-to-date information.

The monitoring process should be harmonized and the frequency of monitoring increased.
Automated monitoring could ensure the consistency of water treatment and limit the opportunities for occasional and deliberate non-compliance. Again, improved visibility over key process parameters can be achieved with existing technology and without increasing the cost of treatment.

4. Emerging pollutants need to be included in the legislation.

Since the UWWTD was adopted in 1991, new emerging pollutants have been identified that might be harmful to human health or the environment. These include substances such as pharmaceuticals, endocrine disruptors, and microbiological contaminants. For the Directive to fulfill its aim, it should be updated to include the monitoring and treatment of these substances.

A number of solutions are available to address the need to treat these emerging pollutants. For instance, Kemira has developed a chlorine-free disinfection method, DesinFix™, which has been proven to enable the efficient and highly cost-efficient removal of microbiological contaminants from wastewater.

Microplastics can to a large extent be removed by using similar technologies as when removing other particles.
Endocrine disruptors and pharmaceuticals can be removed by absorption or oxidation technologies. As an example, in some water treatment plants hydrogen peroxide is used to combine the oxidation power of peroxide with UV light to improve the removal rate of unwanted substances.

5. Pollution from storm-water overflows must be limited and discharges safely disinfected.

Climate change is increasing the scale and frequency of extreme weather conditions and flooding caused by storms. Subsequently, the treatment of storm-water overflows is becoming increasingly important. **Overflows are a major concern as they contain untreated wastewater from both municipal and industrial sources, resulting in pollution and the spread of pathogens and diseases.**

In 2010 researchers in Copenhagen studied the sickness rate of participants in a triathlon competition that took place shortly after an extreme rainfall event had resulted in sewage overflows. After swimming in the sea near the city, 42 percent of the participants suffered from a bacterial illness. In the following year, when there was no extreme rainfall prior to the competition, only 8 percent of the participants became sick after the race.[7] Untreated storm-water overflows will also pollute the surface waters used as raw water for drinking water plants, causing an additional risk for drinking water safety.

The Directive is vague in terms of the measures to limit storm-water overflows and the illnesses they cause, with no clear guidelines for management or measurement practices. **Cost-effective solutions for safe disinfection of overflows already exist, and they should be made mandatory at EU level.**

Sudden heavy rainfall events and the resulting high storm-water flows require flexible technologies that are easy to switch on and off. For example, Kemira's DesinFix™ method has been successfully tested in storm-water treatment in Copenhagen.[8] The bacteria reduction result was good, and no residual toxic substances were found after treatment.

Chemical and physical methods like ballasted sedimentation or microfiltration combined with coagulation enable a good reduction of impurities in storm-water. Inorganic coagulants and polymers designed for

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[7] PLOS ONE: Gastrointestinal illness among triathletes' swimming in non-polluted versus polluted seawater affected by heavy rainfall, Denmark, 2010–2011
[8] Technical University of Denmark: Chemical disinfection of combined sewer overflow waters using performic acid or peracetic acids

particle and phosphorus removal have been successfully used in many microfiltration and ballasted sedimentation plants around Europe.

6. Clearer guidance is needed for applying innovation and sustainability criteria in public procurement for water treatment.

Investments in water treatment are mostly carried out through public procurement. **Rather than focusing on the short-term cheapest unit price, innovative and sustainable solutions that can reduce the total cost of ownership (TCO) should be favored in public procurement processes.**

The European Commission needs to develop and publish clearer and more binding guidance on how member states should implement the Public Procurement Directive in national legislation. Currently, the implementation of the Directive varies between member states, and this variation creates inequality and inefficiency in internal markets. Wastewater treatment plants would also benefit from more practical guidance on sustainable procurement for water treatment.

Kemira is a global chemicals company, serving customers in water intensive industries. Kemira is the market leader in chemical water treatment in Europe and North America, and the only manufacturer to offer a full product portfolio of coagulants, polyacrylamide polymers, process chemicals, and other water-treatment chemicals in combination with smart digital technologies. Kemira is present in all European countries, serving most of the major European municipal and industrial water treatment plants.

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