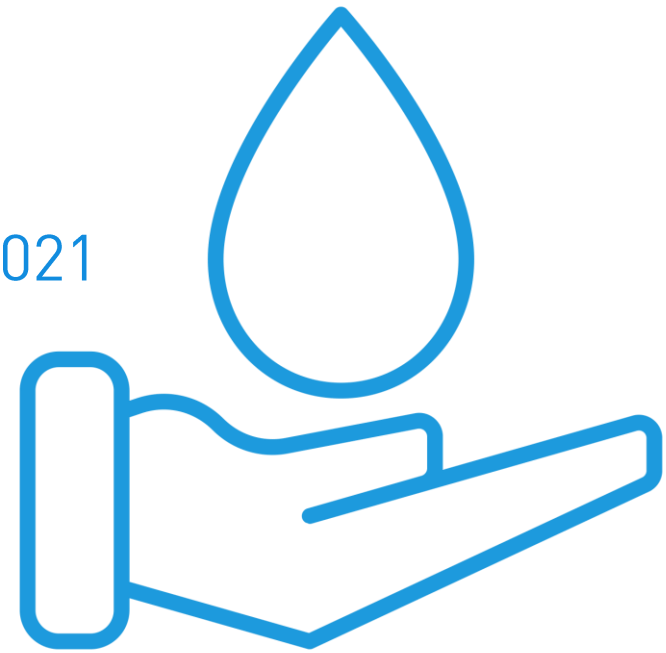
Tallinna Vesi

Loome puhta
veega parema elu!

AS Tallinna Vesi

Environmental Report 2021



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Chairman's Statement

Our most important task is to provide a safe, reliable, and high-quality service to our customers. With our activities, we also have a significant impact on the surrounding environment, which is why we treat the nature around us with respect – from abstracting the water to treating and returning it to the environment. To provide excellent service and reduce the environmental impact, we increased investments in our fixed assets by reconstructing an all-time record volume of water and sewerage networks and introduced electricity from renewable resources in 2021.

Sustainable approach

We have made it our aim to grow investments in fixed assets to secure sustainable infrastructure and continuity of the service. In 2021, we invested nearly €15 million in our assets, increasing, amongst other things, the volume of reconstructed water pipes and sewers to 16 kilometres.

In addition to the reconstruction of the water and sewage network, we also carried out a number of investments in the water and wastewater treatment processes. 2021 saw the completion of one of the major projects, during which the facilities and equipment of the first and most important, i.e. the mechanical treatment stage at the wastewater treatment plant at Paljassaare were modernized. This was the largest investment Tallinna Vesi has made in the wastewater treatment process over the past decade, allowing to maintain the excellent quality of treated effluent discharged to the sea, helping to keep the Baltic Sea clean, and secure more reliable and efficient wastewater treatment for Tallinners.

We aim to further increase our investment volume. The volume of investments in fixed assets planned for 2022 amounts to around €25 million. Over the next years, the investments will be planned based on the public water supply and sewerage development plan for the next 12 years, to be completed in cooperation with the City of Tallinn in 2022, and the pipe reconstruction program prepared in cooperation with the Tallinn Technical University. With the investments made and forthcoming we will secure high-quality drinking water for the people of Tallinn, but also keep the natural environment around us cleaner.

Green processes

Environmental awareness is fundamental in everything we do, starting from ensuring the appropriate management and conservation of our wider catchment area to operating our wastewater treatment plant at Paljassaare. Therefore, in addition to investments in the water and sewage network, we have started to reduce our environmental impact, by mapping the Company's CO_2 footprint in 2021. To reduce that footprint, 100% of the energy used at our facilities and in the treatment process is now generated from renewable energy resources.

In 2022, we plan to set up a cogeneration unit at the wastewater treatment plant at Paljassaare, to allow the use of biogas from the wastewater treatment process to generate 30% of electricity and all the heat energy needed to run the treatment plant. In this way, we will improve the continuity of the plant also in difficult conditions, as well as reduce the pressure on the environment and the costs of electricity.

To provide customers with additional value through digitalization, we started installing remote water meters in 2021. With smart meters, water metering becomes more accurate, there is no longer need for reporting the water meter readings and we can proactively inform customers about water leaks in the future. As the verification period for water meters is 5 years, the plan is to cover the entire service area with remote water meters by 2026.

Consistently high quality of drinking water and treated effluent

Our objective is to ensure the availability of high-quality services to our customers, and the water quality remained stable at a high level also in 2021. The water samples taken from consumers' tap during 2021 were 99.6% compliant with all requirements. Last year, we took a total of 3 058 water samples from consumer's taps

and 12 of them did not meet the requirements. High-quality tap water is ensured with the continuous development and maintenance of the water network across the service area.

Wastewater treated at the wastewater treatment plant at Paljassaare also maintains a high level of quality, being again fully compliant with all the requirements set in the environmental protection permit last year. In order to assess the efficiency of the treatment process and the quality of the treated effluent, the concentration of pollutants in wastewater entering the plant and in effluent leaving the plant is monitored. The exceptionally low levels of nitrogen and phosphorus in the effluent discharged into the sea in 2021 is a proof of the excellent level of treated effluent.

Satisfied customers and community

We have been consistent in growing people's trust in tap water and environmental awareness: delivering bespoke campaigns, promoting the knowledge in media and working closely with kindergartens, schools and local communities.

In 2021, we carried out an outreach campaign "Veendumus ("Conviction"), during which the young students got the opportunity to create their own adverts to convince their parents, friends and fellow students that drinking tap water can bring benefits to the environment, one's own health and budget. Our goal was to raise awareness of the reasons why tap water should be preferred to bottled water.

We will continue to support public events in our service area, by providing them with free drinking water. In addition, in 2021, we also opened 12 new public drinking water taps across the city of Tallinn. We have set the goal of setting up even more public drinking water taps in Tallinn in the coming years to ensure the availability of tap water.

As a provider of vital services to over one third of Estonia's population, it is crucial that we maintain very high standards in customer service. Each year, an extensive customer satisfaction survey is carried out by the independent research company Kantar Emor. The results of the survey map the current satisfaction level of both our contractual customers, and end consumers, who pay indirectly via housing associations. According to the survey carried out in 2021, we continue to see very high levels of customer satisfaction. We will continue to make further improvements in making our service smoother for our customers, and we strive to enhance and simplify customer interaction by adopting new and innovative technology where possible.

Finally, I would like to thank my colleagues in Tallinna Vesi, Watercom and Utilitas, and all our customers, suppliers and business partners who have made 2021 a successful year.

Aleksandr Timofejev

Chairman of the Management Board

TALLINNA VESI IN BRIEF

AS Tallinna Vesi is the largest water utility in Estonia, providing drinking water and wastewater disposal services to nearly one third of Estonian population. We serve 23,900 private customers and businesses and over 470,000 end consumers in Tallinn and its surrounding local governments: City of Maardu, City of Saue, Harku Small Town and Saku Municipality. As of 31 December 2021, AS Tallinna Vesi employed 263 people. The activities of the Company according to NACE are 3600 and 3700.

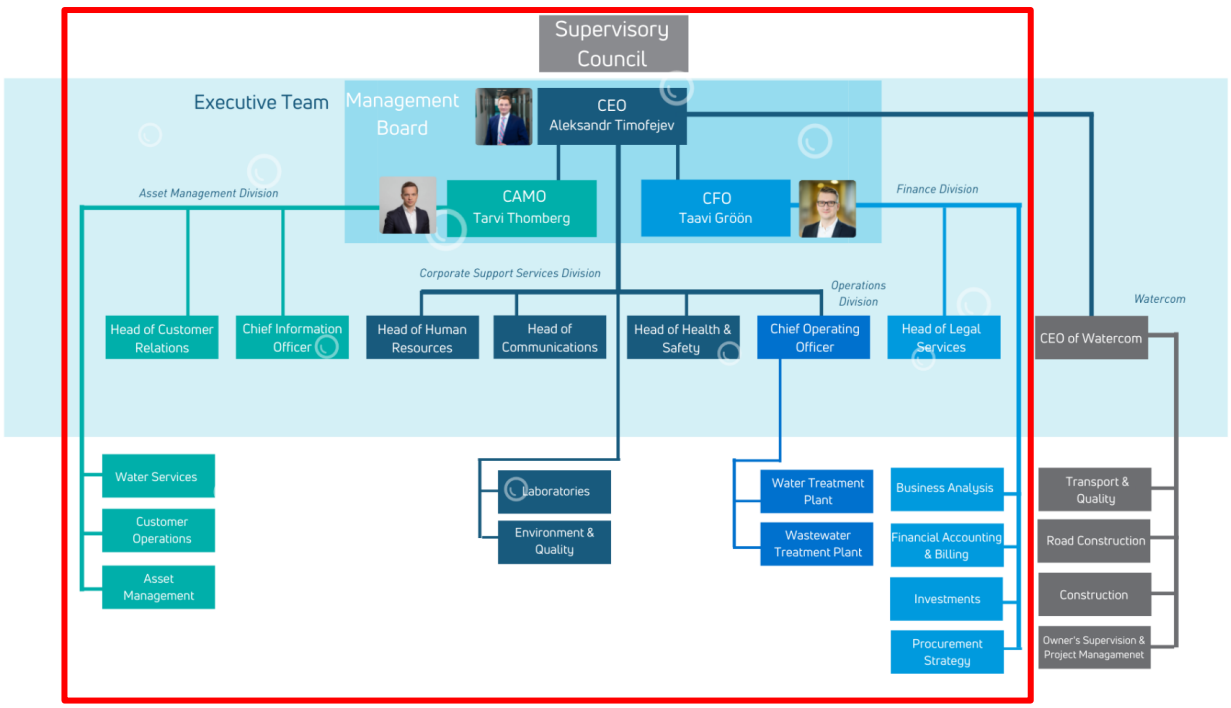


Figure 1: The structures of AS Tallinna Vesi and Watercom OÜ. EMAS is only implemented in AS Tallinna Vesi (marked in red)

The Company has two treatment plants: Ülemiste water treatment plant and Paljassaare wastewater treatment plant. AS Tallinna Vesi also has an accredited water laboratory and an accredited wastewater laboratory.

AS Tallinna Vesi was privatised in 2001. Under the Services Agreement signed with the City of Tallinn upon privatisation, the Company is required to fulfil 97 levels of services. The current mandate of AS Tallinna Vesi to provide water supply and wastewater disposal services in Tallinn service area is effective until 2025. The Services Agreement is currently valid until the end of November 2022 and the new Services Agreement will be concluded at the end of 2022. Given that the Company continues to own the water and sewer network in its service area, the administrative agreement between the Company and the City of Tallinn shall be effective or shall be established for future periods as well.

The public water supply system comprises approximately 1,200 km of water pipes, 22 water pumping stations and 46 ground water pumping stations with a total of 93 boreholes. The catchment area in Harju and Järva Counties covers around 1,800 km^2.

The public sewer system comprises approximately 1,187 km of wastewater network, 520 km of stormwater network and 179 wastewater and stormwater pumping stations across the service area.

MAIN PRODUCTS AND SERVICES

Collection, treatment and supply of water

Collection, treatment and disposal of sewage and storm water

Design works

Water and wastewater services

Laboratory services

Pipe construction works

OPERATIONAL SITES

- Head Office, customer service and support services are located at Ädala 10, Tallinn.
- Ülemiste water treatment plant, water and microbiological laboratory are located at Järvevana tee 3, Tallinn.
- Paljassaare wastewater treatment plant, composting fields and wastewater laboratory are located at Paljassaare põik 14, Tallinn.
- The catchment area of ca 1,800 km^2 is located in Harju and Järva Counties.

OUR MISSION

We create a better life with pure water.

OUR VISION

Everyone wants to be our customer, employee and partner, because we are the leading water services company in the Baltics.

OUR VALUES

Commitment

We work with passion, doing the maximum to achieve the objectives.

Teamwork

We all form one team, whose success depends on my and my colleagues' contribution.

Customer focus

Our actions help our customers and colleagues to find solutions.

Proactivity

Working today for a better tomorrow.

Creativity

We have the courage and the energy to seek for new opportunities and achieve better solutions.

Environmental Policy

We are the largest water company in Estonia and our activity influences nearly one third of Estonia's population. We acknowledge that by providing the service that is compliant with all requirements. We influence the quality of life of the citizens of Tallinn, neighbouring municipalities as well as inhabitants living by the Baltic Sea. Therefore, we take into account the impact we have on the surrounding natural habitat and living environment and consider our association with the interest of various stakeholders.

- We act responsibly – we take into account our impact on the surrounding natural habitat and on the community.
- We follow and fulfil all legal requirements, but we are constantly dedicated to do more than we are expected.
- We protect and value the natural environment we operate in. For cleaner natural environment we continue our efforts to reduce and avoid pollution.
- We use natural resources, including energy and water, sparingly. We consistently seek new ways to make the processes more environment-friendly and efficient.
- We act in an environmentally conscious manner, introducing our knowledge and mindset to the community and partners.
- We continue to improve our environmental management system.

Environmental Management System

We have implemented an integrated management system that meets the relevant quality, environmental and occupational safety standards. The Company's environmental activity complies with the requirements of the international environmental management standard ISO 14001 and the Regulation (EC) No 1221/2009 EMAS (Eco-Management and Audit Scheme), as well as the requirements of amendments thereto enforced by the Commission's Regulations (EU) 2017/1505 and (EU) 2018/2026.

The environmental management system covers all the activities of AS Tallinna Vesi: the abstraction and treatment of ground water and surface water to become drinking water, drinking water supply to the service areas in Tallinn and surrounding municipalities, collection and treatment of wastewater and stormwater, and customer service to provide the relevant services.

The environmental management system forms a part of the Company's management system, as we strive to make the links between the Company and the environment part of our strategy and to take them into account in our everyday operation.

The basis for the environmental management system is the identification of environmental risks, environmental aspects and consequent potential environmental impacts, which form the basis for setting the Company's environmental objectives and tasks to improve the environmental performance. Significant environmental aspects are such activities which, directly or indirectly, influence the nature, quality of services, co-operation with stakeholders, health and quality of life of residents, and our business performance. The assessment is based on the relationship between the activity and legal acts, the frequency of occurrence, the impact on reputation and cooperation with stakeholders, the environmental impact and its extent.

Management of the environmental system has been established in alignment with the company structure. The main responsibility for ensuring and improving the functioning of the environmental management system lies with the senior management and the heads of structural units. Environmental aspects, objectives and targets are prepared at the initiative of the environmental specialist in cooperation with the unit managers, who involve their staff. We measure, monitor and evaluate environmental performance indicators at least quarterly, and based on those results we produce each year our environmental report, which is made available to public.

ENVIRONMENTAL ASPECTS AND OBJECTIVES

Table 1: SIGNIFICANT ENVIRONMENTAL ASPECTS 2021

Activity	Environmental aspect	Direct or indirect impact	Environmental impact of the aspect	Trend of the impact*	Further actions
Maintaining of sanitary protection areas	Land use to support biodiversity	Indirect	The sanitary protection area protects drinking water sources and the natural environment, supports the improvement of the biodiversity around Lake Ülemiste and in the lake, and helps to preserve green areas in the city	+	Maintain the sanitary protection areas, co-operation with the legislator and local governments to retain the areas
Use of biogas to produce heat energy	Methane emissions	Direct	Heat energy is produced on site from biogas, which is a residue of the sludge digestion process. It reduces methane emissions and dependence on non-renewable sources of heat energy.	+	Maximise the use of biogas produced
Use of chlorine in water treatment	Risk of an environmental accident	Direct	Improper handling may result in leakage and environmental contamination, chlorine is an explosive chemical	-	Monitor and analyse the optimal use of chlorine, minimise the risk of possible leaks
Construction waste	Waste generated during the laying and repairing of pipes	Direct	Construction waste has a low potential of being reused and is bulky, causing soil damage	-	Maximise the use of no-dig methods. Reduce size of excavations and extend the use of trench support.
Use of electricity	Production of electrical energy from fossil fuels generates exhaust gases	Indirect	Electricity production emits exhaust gases that cause air pollution and greenhouse effect	-	Analyse electricity consumption, introduce more energy efficient equipment and energy saving modes. Extend the separate sewer system.
Water abstraction	Use of water source	Direct	Has an impact on energy and chemical consumption and the resulting environmental impacts	-	Reduce water leakages and process water consumption, apply new technologies, influence population's consumption habits through awareness campaigns, develop smart metering
Supply of compliant drinking water to consumers	Waste prevention	Indirect	Consumer has the opportunity to prefer tap water to bottled water, thus reducing the impact from the use of disposable plastic bottles. Impact on public health.	+	Constant work in all stages of water treatment and distribution, publish information about water quality, maintain the sanitary protection areas, awareness campaigns

Sludge handling	Waste prevention	Indirect	Recycling of sewage sludge reduces the amount of waste sent to landfill	+	Look for contract partners, maximise the amount of sewage sludge reused
Discharge of untreated wastewater into the environment	Pollutants contained in wastewater	Direct	Causes environmental pollution, has a negative impact on the marine environment, marine life and the quality of living environment, causes smell problem	-	Reconstruct the treatment process, extend the separate sewer system in cooperation with the Tallinn Urban Environment and Public Works Department, system monitoring
Discharge of treated effluent into the sea	Pollutants contained in wastewater	Direct	Treated effluent (compliant and non-compliant) has a negative impact on the marine environment, marine life and the quality of living environment	-	Analyze, monitor and, if necessary, reconstruct the treatment process

*Aspect with a positive or a negative impact

Table 2: ENVIRONMENTAL OBJECTIVES AND RESULTS FOR 2021

Objective	Indicator	Result by the end of 2021
Reduce the percentage of clean water losses by reducing the number of leakages	Level of leakages ≤ 13.75%	15%
Operations comply with the terms set out in the water permits issued by the Environmental Board	0 non-compliances	0 non-compliances
Stabilised sewage sludge recycling	0 tons of stabilised sewage sludge landfilled	0 tons of stabilised sewage sludge landfilled
Reuse of grit removed from the grit traps	0 tons of washed sediments from the grit traps landfilled	0 tons of washed sediments from the grit traps landfilled
Minimise the evitable sudden discharge of untreated wastewater to the sea	Reconstruction works complete, amount of untreated wastewater discharged into the sea = 0 m^3	New mechanical treatment stage is completed
Reduce energy consumption at the pumping stations by installing ejectors for water aeration. Energy saving ca 24 MWh/a.	Ejectors are installed and running in 10 pumping stations	Ejectors are installed and running in 10 pumping stations
The implementation of the Green Office as a pilot project at the wastewater treatment plant	The wastewater treatment plant office adopts the Green Office principles	The Green Office principles are partially implemented. The Green Office Team carries on its work.

Improve the various stakeholders' environmental awareness reg. the Company's activity to improve and keep the Company's good image (reputation)	Prepare a video lecture for kids/young people	Video lecture is produced
	Draw media attention to environmental issues (≥ 3 media initiatives)	3 initiatives drawing attention to environmental issues
	≥ 2 water- and environment related campaigns or participation in an outdoor event	1 water related campaign and participation in 1 outdoor event
Reduce the amount of paper used for printing by employing digital alternatives	Reduce the amount of paper purchased and used by 5%	Printing has increased 12.7% compared to 2020 In three years (2019-2021) printing has reduced 18.9% Amount of paper purchased for printing has reduced by 16.2% compared to 2020

Table 3: ENVIRONMENTAL OBJECTIVES IN 2022

Objective	Task	Indicator	Due date
Reduce the percentage of clean water losses by reducing the number of leakages	Fast detection and repair of leakages, improving the efficiency of work processes	Level of leakages ≤ 13%	December 2022
Operations comply with the terms set out in the water permits issued by the Environmental Board	The assigned specialists to comply with the obligations arising from the requirements and ensure that they are complied with by their activities	0 non-compliances	December 2022
Disposal of stabilised sewage sludge	To recycle the sewage sludge by producing compost soil that can be used in planting green areas, agriculture or re-cultivation. Find potential partners and customers.	0 tons of stabilised sewage sludge landfilled	December 2022
Reduce the quantities of non-stabilized sewage sludge	To control the sludge balance and treatment in an optimal manner, in order to avoid the need to remove non-stabilized sludge from the process	≤ 500 tons of non-stabilized sludge landfilled	December 2022
Reuse of grit removed from the grit traps	To wash the grit removed from the process and mix with the sewage sludge for the production of compost soil	0 tons of washed sediments from the grit traps landfilled	December 2022
Reduce the Company's carbon footprint	Prepare an action plan to reduce the carbon footprint	Action plan is prepared	September 2022
Set up of a CHP unit at the wastewater treatment plant	Prepare and carry out procurement Construct and commission the CHP unit	> 0 kWh electricity produced	December 2022

Improve the various stakeholders' environmental awareness reg. the Company's activity to improve and keep the Company's good image (reputation)	Organise environmental education classes for various age groups. Organise activities (campaigns, open house, events, cooperation etc.) to raise awareness among Company's employees, consumers and the community	Draw media attention to environmental issues (≥ 4 media initiatives) ≥ 3 environmental and water-related campaigns or participations in outdoor events Organize a month dedicated to the environment	December 2022
The Environment and Quality Department will get an electric car	Prepare and carry out procurement, purchase an electric car with appropriate parameters	The car has been purchased	December 2022
Increase sorting of waste	Review the locations of current waste sorting stations, if necessary, increase the amount of waste sorted at stations In cooperation with the Communications Department, instruct and train staff to better sort waste	Have 25% of generated municipal waste sorted	December 2022

Compliance with Environmental Requirements

To a large extent, the Company's environmental activities are regulated by requirements arising from the European Union (EU) as well as national legislation and the legal acts issued by local governments.

At the EU level, this means ensuring compliance with the EU Water Framework Directive (2000/60/EC). At the national level, compliance with the Water Act, Public Water Supply and Sewerage Act, Waste Act, Chemicals Act, Atmospheric Air Protection Act as well as subordinate legal acts must be ensured. Besides these, we are governed also by other environmental legal acts. Pursuant to the Water Act, we must ensure that the effluent discharged from the wastewater treatment plant complies with established limits, and we act in accordance with the requirements of the Public Water Supply and Sewerage Act in our process of service and connection contracts. In organising the recycling of sewage sludge, we rely on the Waste Act. Under the Chemicals Act, AS Tallinna Vesi classifies a Category B major-accident company and is subject to specific requirements. The Atmospheric Air Protection Act specifies the air quality limit values and reporting obligations.

At the local level, we are obliged to comply with different rules and requirements applicable in Tallinn and in the surrounding municipalities, where AS Tallinna Vesi provides services.

We consistently monitor the amendments being made to the requirements and legislation. If changes are made to the legislation that concerns the Company, those are communicated to the managers and specialists responsible for the relevant areas, allowing them to assess the impact of such amendments on the Company and propose their changes, and upon entry into force amend the company processes accordingly if necessary.

In cooperation with the Estonian Waterworks Association (EVEL), we participate in the drafting and rounds for comments on the draft legal acts pertaining to the water sector and environmental matters, by taking part in the working groups, presenting our opinions and proposing changes to the draft legal acts under discussion. Where necessary, we have also communicated our positions directly to the relevant ministries without doing it via EVEL.

In 2021, we contributed to identifying the bottlenecks in the current legislation, for example, by providing feedback at the request of the Ministry of Environment on the end-of-waste criteria for biodegradable waste, in particular for sewage sludge, that was submitted via EVEL. Also, our specialists continued to participate in the work of EurEau Committees on Drinking Water and on Waste Water, contributing, among other things, to the preparation of the new EU Drinking Water Directive, which entered into force in early 2021. In cooperation with EVEL, we have also continued to express our views and have put forward proposals for a pending draft Act on Public Water Supply and Sewerage, which is expected to enter into force on 1 January 2023.

ENVIRONMENTAL PERMITS

We act in accordance with the requirements as well as the terms and conditions set out in the environmental protection permits issued to the Company. Environmental Board has issued the following environmental permits to us:

- 5 environmental permits for a special use of water (details on page 18);
- 1 integrated environmental permit (details on pages 18, 38 and 42);
- 1 air pollution permit (details on page 42).

REQUIREMENTS OF THE SERVICES AGREEMENT

On 12 January 2001, we concluded the tripartite Services Agreement with the City of Tallinn and investors. Under the Services Agreement, the Company is obliged *inter alia* to comply with 97 Levels of Service, which makes it the most regulated water undertaking in Estonia. Our activities and levels of services are assessed once a year by an independent monitoring unit, Supervisory Foundation for the Water Companies in Tallinn, to whom the Company annually, i.e. by the end of the first quarter of the following year, submits the report on compliance with the levels of service.

In 2021, all of the contractual levels of service, agreed upon by the parties to the Services Agreement, were delivered, and in many cases, outperformed. Water quality at customer taps was 99.61% compliant with the standards in 2021, outperforming the quality level specified in the Services Agreement by 4.61%. Also, the level of leakage continues to be below the 26% limit. In 2021, the leakage rate of 15% was achieved. The number of blockages in 2021 was 553.

REQUIREMENTS FOR CONTRACTUAL PARTNERS

Given the strict requirements applicable to our activities, it is fundamental that our suppliers and contractors meet the environmental and occupational safety requirements as well. Among other things, the contractors must confirm that they comply with occupational safety and environmental protection requirements at our repair and construction sites. We have established several criteria in our procedures allowing us to have control over our partners with regard to our expectations. Our specialists monitor the occupational safety and environmental performance in the activity of suppliers/contractors at sites on a daily basis.

MANAGEMENT SYSTEM CONTROL AND AUDIT

In May 2021, AS Metrosert, accredited certifier, carried out the certification audit of the management system. Due to the national restrictions put in place to avoid the spread of COVID-19 virus in Estonia, the audit was partly carried out remotely on the basis of documents provided by the Company, in accordance with the audit objective and the timetable coordinated with the Company. The objective of the audit was to assess the performance and compliance of the Company's quality management system, environmental management system and occupational health & safety system with the requirements of the standards ISO 9001:2015, ISO 14001:2015 and ISO 45001:2018, with the statutory requirements of the industry and the documentation established in the Company.

The audit concluded that the Company's documentation of the quality, environmental and occupational health & safety management systems comply with the requirements of the standards ISO 9001:2015, ISO 14001:2015 and ISO 45001:2018. The audit report also stated that the management system of the Company is able to meet the legislative, regulatory and contractual requirements.

The audit to verify the EMAS certificate was carried out in May 2021. The objective of the audit was to confirm the compliance of Company's environmental management system and environmental report with the requirements of EMAS Regulation (EC) No 1221/2009, amended with the Regulations (EU) 2017/1505 and (EU) 2018/2026. The audit was partly conducted remotely as a video conference. The audit established one non-conformity – the use of BOD_7 to mark the biological oxygen demand in the environmental report instead of BOD_5 as provided for in the EMAS Regulation. The difference was due to the fact that the environmental permits issued to the Company require the monitoring of BOD_7 whereas BOD_5 is normally used everywhere else in Europe. This error was quickly

corrected by converting the indicators. The audit report stated that based on the audit results and after remedying a non-conformity, the Company's environmental management system would comply with the requirements set out in the EMAS Regulation (EC) No 1221/2009, amended with the Regulations (EU) 2017/1505 and (EU) 2018/2026.

Besides external audits, ordinary internal audits were carried out in the Company as per the internal audit plan to assess the performance of the management system. The internal auditors of the Company did not establish any non-conformities during the internal audits. As a result of the internal audits, our internal auditors put forward 22 improvement proposals, which have been analysed by the responsible managers and corrective actions have been performed.

In 2021, the Estonian Accreditation Centre carried out a surveillance visit to the Company's laboratories to verify the compliance with the requirements of EVS-EN ISO/IEC 17025. The surveillance visit did not establish any non-conformities.

Environmental Education and Consumer Awareness

We keep working hard to promote an environmentally-conscious ways of thinking and acting amongst our community members. We encourage people to drink tap water and explain how to contribute to the environmental handling of wastewater. We highlight the stable quality of tap water that meets high standards, and encourage our consumers to prefer tap water at home as well as when dining out. In 2021, we took part in public events and supported a number of community initiatives by providing free drinking water with tanks. In cooperation with the City, we set up a total of 12 new public drinking water taps in 2021. The public water taps are open for all Tallinners from the warmer spring days until the weather gets cold in autumn. The locations of public drinking water taps can be found here. Confidence in tap water shows a steady growth. The annual customer satisfaction survey of 2021 indicates that 89% of end consumers drink tap water.

- We work consistently to contribute to the environmental education of children whom we want to value the nature around us. Each year, we carry out water-themed group discussions in kindergartens and schools, discussing matters relating to water cycle, sustainable water consumption and sewer blockages. We also organize water seminars for adults. In 2021, we were able to hold significantly lower number of group discussions due to the pandemic, with 150 adults participating. We intend to continue with our group discussions as soon as the situation returns to normal. We have also developed an inclusive animation, allowing to study and discuss water themes independently in school and kindergarten lessons. We share materials with schools and kindergartens in our service area.
- In 2021, we carried out an outreach campaign "Veendumus ("Conviction"), during which the young students got the opportunity to create their own adverts to convince their parents, friends and fellow students that drinking tap water can bring benefits to the environment, one's own health and budget.
- We also continued to support sports and community events, by delivering free drinking water. In 2021, we provided free drinking water at more than 40 public events, including running and walking events organised by Stamina, the Gymnastics Festival, the Investment Festival, summer youth festivals organised by the Tallinn Sports and Youth Department, and many other events.

- In May 2021, once again, we organised another environmental education month to improve the environmental awareness of our employees, focusing on the more environmentally friendly choices. We guided our colleagues to pay attention to how saving food can save the environment, and to share tips on how to avoid wasting food. We talked about the pharmaceutical residues in the environment and gave some tips on how to get one's bike ready for spring. We also educated our colleagues by organising a climate change quiz. Care for the environment and behaviour that appreciates nature are very important for us and we intend to further improve environmental awareness among our staff.
- Over the years, we have prepared many educational study materials about water and environmental subjects for children and teachers. These include, for example, a study material series "Blue Classroom" for the teachers in nature studies, supporting the national study program in water-related classes. Furthermore, we have prepared game and puzzle books for kindergartens and primary schools, e.g. Tilgu play cards and a puzzle book „Puzzle with Tilgu". The latest material prepared in 2021–an educational animation on matters relating to water cycle, saving water and sewer blockages – also targets the kindergartens and primary schools.

- In 2021, we were present at Tallinn Old Town Days festival. Public events allow us to discuss with our consumers and customers the subjects related to environmental approach in our water consumption and prevention of sewer blockages.
- We were active in sharing the news related to the environmental education and tap water via social media and press. We also joined the environmental Green Tiger initiative.

Besides our main activities, the production of drinking water and treatment of wastewater, our treatment plants are also important for their role in improving environmental awareness. Unfortunately, we had to postpone our traditional open-door days at the treatment plants due to the spread of COVID-19 virus also in 2021. We intend to continue with our guided tours and open-door days as soon as it becomes possible again.

Quality and Use of Water Resources

ENVIRONMENTAL PROTECTION PERMITS FOR SPECIAL USE OF WATER

Our activities in using water resources are regulated by the Water Act and its implementing acts. As a water company we must hold valid environmental protection permits and pay environmental charge for the water resource we have used. The permit sets us certain obligations and restrictions. For instance, it determines the allowed water abstraction volume (m^3), obligation of keeping account over the water quantities used, requirements for sampling, monitoring and analysis as well as the allowed limit values for pollutants in effluent, requirements for monitoring of pollutants and the measures to reduce the impacts arising from special use of water.

All requirements established in the permits were met in 2021. The water abstraction charge is paid for the quantity of water taken from Lake Ülemiste into the water treatment plant and for the ground water pumped from the aquifers. In 2021, the water abstraction charge amounted to 3.9% of the costs of products/services sold (2020: 4.2%).

Table 4: VALID ENVIRONMENTAL PERMITS REGULATING SPECIAL USE OF WATER, ISSUED TO AS TALLINNA VESI

Number of the permit for special use of water	Valid until	Description of the special use of water
L.VV/331954	31/12/2030	**Area of public water supply and sewerage service in Saue City** Ground water abstraction from four boreholes, over 5 m^3/day.
KL-506050	indefinite term	**Main area of public water supply and sewerage service in Tallinn, area of Tallinn surface water catchment system facilities in Harju and Järva Counties** Regulation of the surface water resources in water bodies of Ülemiste-Pirita-Jägala surface water system, surface water abstraction from Lake Ülemiste, ground water abstraction from Ordovician-Cambrian, Cambrian-Vendian and Quaternary aquifers and discharge of storm water into a recipient.
L.VV/328381	31/12/2042	**Harku Municipality** Ground water abstraction from boreholes, over 5 m^3/day.
L.VV/328349	indefinite term	**Area of public water supply and sewerage service in Maardu City** Industrial and drinking water abstraction from Cambrian-Vendian aquifers in order to supply water to Maardu City, Kallavere and Muuga areas and discharge of storm water into a recipient.
L.VV/333205	19/08/2024	**Building of an alternative water intake for Lake Ülemiste** Drowning of solid substances into Lake Ülemiste to allow water intake mainly from the waters of the surface water catchment system, where appropriate.
Integrated environmental permit No KKL-509326	indefinite term	**Paljassaare wastewater treatment plant** Regulating the discharge of biologically treated effluent into Tallinn Bay using a deep-sea outlet and the use of emergency overflows.

WATER CATCHMENT

Nearly 90% of our consumers in Tallinn and Maardu get their drinking water from surface water resources. Even though Lake Ülemiste is the main drinking water source for people in Tallinn, the natural catchment of the lake itself is small. To increase the water volume and ensure that the needs of City of Tallinn are met, we have established a water catchment system, which consists of hydropoints constructed on rivers as well as water reservoirs and channels connecting those. Our water catchment system mainly comprises Harju sub-basin and the river basins of Soodla, Jägala and Pirita rivers, with a total area of ca 1,800 km^2. Paunküla water reservoir on the headwaters of the Pirita River (9.9 million m^3) and Soodla water reservoir on the Soodla River (7.4 million m^3) supply additional water reserves for Lake Ülemiste and can also be used if there is a need to improve the raw water quality in Lake Ülemiste.

The volume of water resources in Tallinn surface water catchment system primarily depends on the annual amount of precipitation. Constant information on the flows enables us to use the water resources most efficiently. To regulate the water resources in an optimal and accurate manner we have established water metering units at all hydropoints, which enable us to meter the flows conducted to the channels as well as the sanitary flows in the rivers. We perform metering regularly, as per the requirements of the permit for special use of water.

The first half-year of 2021 in the rivers of the catchment area is generally characterised by average flow rates. Winter was snowy, forming a permanent ice cover on water reservoirs, and the snowmelt caused a medium-impact highwater in March. The summer period was characterized by low rainfall and higher than average air temperatures, which lasted until November. From November, the flow rates in the rivers of the catchment area began to increase. The water regime during the year can be described as follows: the winter temperatures were close to normal, forming a permanent ice-cover, and winter was relatively snowy. Water temperature in Lake Ülemiste reached a steady 10 °C in May. The summer period was drier than average, which significantly influenced the flow rates of rivers in the catchment area. The improvement in water regimes started with the effect of more rainfall in November and continued until the end of 2021.

In order to protect the water resources and the water body used for the abstraction of drinking water, a sanitary protection zone has been established around Lake Ülemiste. Sanitary protection zone, comprising Lake Ülemiste, water catchment facilities, bank reinforcements and the land in close vicinity of the lake, needs to be kept in its natural conditions. Such sanitary protection zones have also been formed in the catchment area to protect the dams and other facilities of Soodla, Kaunissaare, Paunküla and Aavoja water reservoirs.

USE AND QUALITY OF SURFACE WATER

According to the environmental permit No KL-506050, the Company is allowed to abstract up to 47.60 million m^3 of surface water per year from Lake Ülemiste. The actual surface water abstraction in 2021 was 25.85 million m^3.

Table 5: USE OF SURFACE WATER FROM LAKE ÜLEMISTE AND COMPLIANCE WITH THE PERMIT FOR SPECIAL USE OF WATER NO KL-506050, mln m^3

	2017	2018	2019	2020	2021
Use of surface water from Lake Ülemiste	23.72	24.31	25.00	25.24	25.85

Maximum volume permitted is 47.6 mln m^3/year

Water quality in surface water sources is monitored in line with the program determined by the permit for special use of water. We take raw water samples from the intake of our water treatment plant on a daily basis to ensure compliance. Nitrogen and phosphorus compounds and total organic carbon are determined in raw water once a week. Furthermore, an in-depth analysis of raw water is carried out once a month in accordance with the quality monitoring programme established for a drinking water source. We study the results of the analyses to understand the changes and processes in the catchment area and decide upon the necessity to replenish the water stock in the lake.

In 2021, the water quality of Lake Ülemiste in terms of organic matter was similar to the quality of 2019, with both permanganate index and total organic carbon levels remaining below average. The levels of total

phosphorus and total nitrogen dropped also to record low. These indicators were likely to be affected by the lower than normal levels of precipitation.

Table 6: WATER QUALITY IN LAKE ÜLEMISTE IN 2017-2021

Parameter	Unit	Average results				
		2017	2018	2019	2020	2021
Colour	mg/L Pt	38	39	31	39	37
Turbidity	NTU	10.5	9.6	6.9	6.9	6.2
pH		8.27	8.23	8.19	8.43	8.22
Permanganate index (CODMn)	mg O_2/l	11.1	11.8	9.8	11.1	10.1
Total organic carbon (TOC)	mg C/l	10.7	11.2	10.1	11.0	10.4
Total phosphorus	mg/l	0.038	0.047	0.048	0,048	0.029
Total nitrogen	mg/l	1.60	1.50	1.30	1.43	1.20
Ammonium, NH4+	mg/l	0.112	0.085	0.074	0.019	0.085
Phytoplankton abundance	objects/ml	7,168	7,500	6,300	16,804	21,975

The phytoplankton abundance has increased because their species composition has changed, in addition, the abundance has also been affected by the extreme weather conditions that have occurred in recent years.

USE AND QUALITY OF GROUND WATER

Approximately 10% of consumers in Tallinn are supplied with water abstracted from the Cambrian-Vendian and Cambrian-Ordovician aquifers. Ground water is supplied in Saue City and districts of Nõmme, Laagri, Merivälja, Pirita and Tiskre in Tallinn. A total of 2,954,269 m^3 of ground water was abstracted in 2021.

Table 7: USE OF GROUND WATER AND COMPARISON WITH THE MAXIMUM VOLUMES SET BY PERMITS FOR SPECIAL USE OF WATER, th m^3

Parameter	Maximum volume permitted	Average results				
		2017	2018	2019	2020	2021
Tallinn (Permit No KL-506050)	7,749.8	2384.2	2323.8	2,349.1	2,400.4	2,603.6
Saue (Permit No L.VV/331954)	445	283.9	290.5	309.4	331.2	350.0
Harku (Permit No L.VV/328381)	40	42.3	41.1	21.1	0.11	0.4
Maardu (Permit No L.VV/328349)	720	0.48	0.28	0.39	3.1	0.1

According to the EU Water Framework Directive (2000/60/EC), the qualitative or chemical conditions of ground water are regarded to be good if the concentration of pollutants does not indicate any inflow of salty water or other water, nor exceed the relevant quality standards. In 2021, the quality of drinking water at the borehole pumping stations complied with the requirements of the Regulation issued by the Minister of Social Affairs. There were no ground water pollution incidents or potential pollution incidents demanding us to notify the City of Tallinn and the Health Board.

We monitor the ground water quality parameters in accordance with the permits for special use of water, and if necessary, the ground water undergoes a treatment process. On a monthly basis we monitor the treated ground water quality (content of iron, manganese, and ammonia) in 21 ground water pumping stations, which have filters installed and constantly provide water to the public network. All currently used borewells are equipped with automatic hydrostatic pressure sensors allowing to measure the static and dynamic level of ground water. Those results enable us to assess the recovery of ground water resources, and the last years' trend has been positive, indicating the recovery of resources.

Ground water in Northern Estonia (Cambrian-Vendian aquifer) contains natural radionuclides. The natural radioactivity of Estonian ground water has been thoroughly studied by Eesti Geoloogiakeskus OÜ as well as by Estonian Radiation Centre. To assess the health impacts of radioactivity, the Radiation Centre together with the Health Board carried out a health risk assessment in Tallinn ground water areas in 2010. Based on the results of the risk assessment, any random health damage resulting from the content of radionuclides in the water of Cambrian-Vendian borewells is unlikely. Repeated radiological analyses in all the borewells are carried out every ten years, in accordance with the requirements.

Drinking Water Production and Quality

Last year we supplied 27.89 million m^3 of pure drinking water to our consumers. Drinking water quality is required to comply with the Regulation No 61 "Quality and Control Requirements and Analysis Methods for Drinking Water", issued by the Minister of Social Affairs on 24 September 2019 (hereinafter referred to as the Regulation No 61), originating from the Estonian Water Act and the European Union Drinking Water Directive 98/83/EC. The water quality is monitored in accordance with the monitoring programmes approved by the Health Board's North Department. Samples are taken from the raw water (Lake Ülemiste, its catchment area, and ground water), treatment process, water tanks at the ground water pumping stations as well as the customer taps. The quality indicators of the drinking water supplied from Ülemiste water treatment plant as well as the drinking water supplied from ground water resources in 2021 are attached to the report.

Water analyses are carried out by the Company's water and microbiology laboratory, which is one of the largest water laboratories in Estonia. The quality of analyses is guaranteed by certified samplers and laboratories accredited with the quality management system (EVS-EN ISO/IEC 17025 standard), modern equipment and professionals. In 2021, our water and microbiology laboratory performed a total of 199,000 analyses.

As a result of the high quality of drinking water and improved awareness of consumers, the number of people drinking tap water has shown a steady growing trend over the last years.

SURFACE WATER TREATMENT PROCESS

At the Ülemiste water treatment plant, the water abstracted from the lake is treated with a treatment scheme widely used in the world. Due to the quality of surface water in Lake Ülemiste, the law stipulates that in order to ensure the drinking water quality, the surface water must undergo mechanical and chemical treatments – preliminary ozonation, coagulation, clarification, filtration, and disinfection.

In 2021, investments were made in several major projects at the water treatment plant. These included, for example, replacement of mesh in microfilters, launch of reconstruction project on sand filter walls, and construction of reserve pipeline for coagulant that significantly facilitates maintenance and mitigates operational risks.

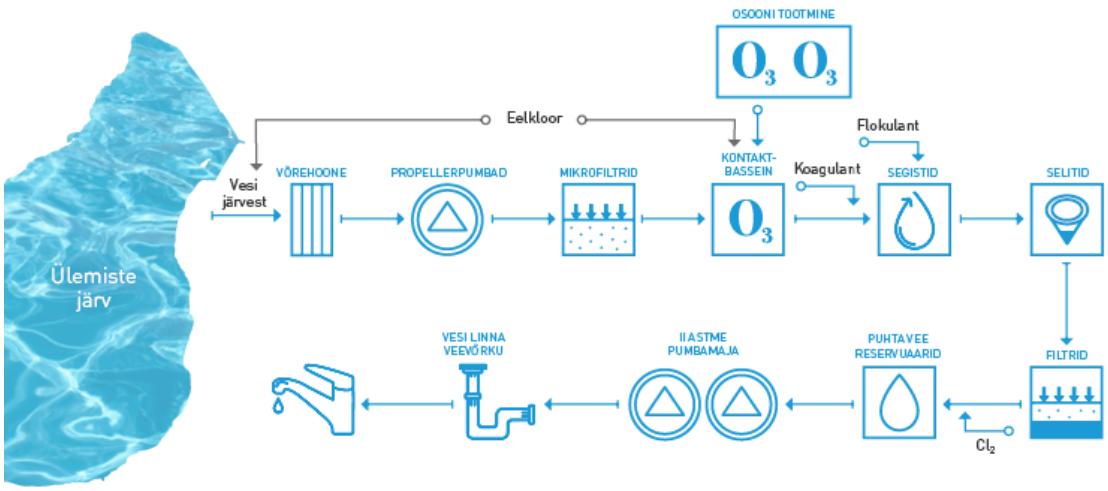


Figure 2: Water treatment process at Ülemiste water treatment plant

Figure 3: Description of water treatment process at Ülemiste water treatment plant

GROUND WATER TREATMENT

The Water Act requires ground water to be preserved as similar to its natural conditions as possible, therefore, as a rule, no chemicals are used in treating ground water. To supply compliant drinking water, we treat ground water by filtration and aeration to remove excess iron, manganese and ammonium from the water. Samples taken after the ground water treatment process show that the treatment significantly reduces the turbidity of the water, the content of ammonium, iron and manganese, improves the colour and stability index, and increases the oxygen content of the water.

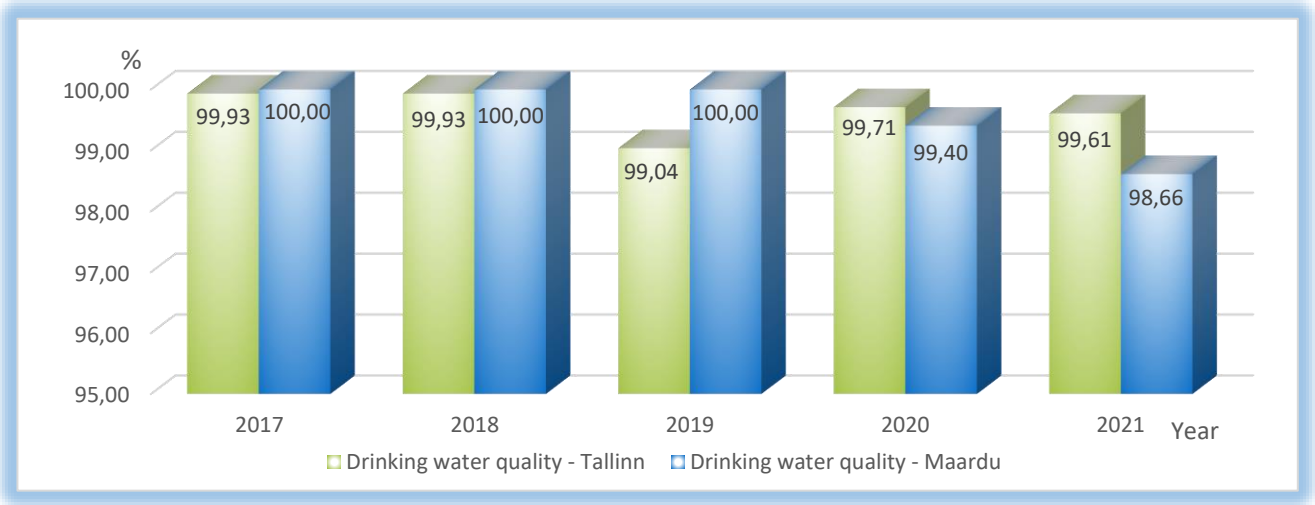
DRINKING WATER QUALITY IN THE NETWORK AND AT CUSTOMER PREMISES

The quality of drinking water in Tallinn and Maardu remains excellent. Throughout the year, we took samples at the sampling points (at customer premises), which had been specified based on the monitoring programmes approved by the Health Board, twice a month.

We took a total of 3,058 samples across the Tallinn service area (besides Tallinn also in Saue and Harku Small Town) in 2021. The quality of drinking water taken from the customer taps was 99.71% compliant with the requirements. Consistently high quality of tap water is ensured with the continuous development and maintenance of the water network across the service area.

98.7% of the 149 water samples taken in Maardu in 2021 complied with the requirements.

Chart 1: COMPLIANCE OF THE DRINKING WATER QUALITY WITH THE REQUIREMENTS SET OUT IN THE REGULATION NO 61 IN 2017-2021, %



WATER NETWORK MAINTENANCE AND RELATED INVESTMENTS

We are constantly performing maintenance and rehabilitation works on the network to retain and improve the drinking water quality. To guarantee the availability of high-quality drinking water to our consumers we regularly clean and flush the water network. During the cleaning process the sediment build-up is removed from the pipes, which is one of the key methods for improving water quality in distribution networks. In 2021, the Company performed air-scouring works on a total of 136 km of water network. We also continued flushing the network to reduce water retention time in the pipes.

Table 8: WATER NETWORK CLEANED IN 2017-2021, km

	2017	2018	2019	2020	2021
Cleaned water network	137	135	40	136	136

Investments in the replacement of old water pipes have facilitated an improvement in water quality at customer premises and a more efficient use of water resources. Each year, we renovate at least 5 km of wastewater network and 5 km of water network, in line with the Services Agreement signed with the City of Tallinn. In 2021, 48,9% of the total amount of reconstruction works were performed using no-dig methods.

LEAKAGES AND INTERRUPTIONS TO WATER SUPPLY

One of our key objectives is to keep the loss of water in the water distribution network at a minimum level. The Services Agreement applying to the service area in Tallinn sets out the obligation for the Company to reduce the level of leakages to 26%. We have managed to keep the leakages at considerably lower levels than required for several consecutive years already, achieving 15% in 2021. Leakage level is slightly higher compared to previous years as there were several major leaks in 2021, and the long winter period and frozen ground made it difficult to find and repair leaks.

Table 9: LEAKAGE LEVELS IN 2017-2021, %

	2017	2018	2019	2020	2021
Leakage level	13.82	13.71	12.98	12.42	15.00

The monitoring of daily water loss helps to find leakages as fast as possible and reduce the leakage level. Our specialists use specific equipment for finding leakages which, along with the zoning of network and remote reading system, allow them to detect the leakages in the network faster. In order to mitigate the inconveniences resulting from an interruption to the service, we always strive to notify our customers in advance of any emergency water interruptions. In 2021, we gave prior notifications of unplanned water interruptions in approximately 98.7% of the events. As a provider of vital services, we deem it important to provide customers with a temporary water supply with water tanks in case of interruptions.

WATER METERING

The water meters we install to measure consumption are of high quality. All new water meters comply with the current European standards and European Measuring Instruments Directive along with the relevant accuracy requirements established therein. The expert studies and verification of water meters are performed by AS Metrosert, the national Central Office of Metrology.

We have installed a total of 25,094 water meters to customers' connection points. Verified water meters allow accurate measurement of water consumption.

Under the currently applicable Metrology Act, we are required to organise the verification of the water meters every five years, and the readings of those meters serve as the basis for billing between the water company and customers.

In line with the previously prepared plan, we changed a total of 5,727 water meters in 2021. We will continue our work in 2022 to make sure that all our customers have water meters that are verified on time.

With regard to the expectations of the various interest groups, we launched a pilot project on smart water meters in August 2021. The meters being tested work on an ultrasound principle and in a Narrowband Internet of Things network. We installed 218 water meters across the service area to test the reliability of meters on our water network and the possibility of remote reading. Upon completion of the project, the full transition to remote reading is planned during the five following years.

Collection of Wastewater

WASTEWATER NETWORK AND COLLECTION OF WASTEWATER

Wastewater is directed to the wastewater treatment plant through the combined sewer system, collecting both sewage and stormwater. Some parts of our service area are also covered with a separate storm system with stormwater outlets. However, most of the stormwater is collected via the combined sewer system and is led to Paljassaare wastewater treatment plant.

The number of blockages is a good indicator for reflecting the conditions of the wastewater network. Blockages are mainly caused by sediments build-up in the wastewater network or the misuse of wastewater network by consumers. Initially, the pipes were sized for higher flows, so today's lower water consumption has led to reductions in flow rates and flow speed, which in turn increases the risk of blockages. Continued extension of the sewer network is also affecting the total number of blockages.

Table 10: NUMBER OF BLOKAGES IN 2017-2021, pcs

	2017	2018	2019	2020	2021
Number of blockages	699	650	573	485	553

The number of blockages in 2021 was similar to 2019. The number of blockages is affected by extreme weather conditions (both downpours and droughts). We have been able to achieve a steadily good level of blockages in the recent years due to numerous preventive actions, such as for example preventive jet washing of pipes. Jet washing uses high pressure to generate a fast flow that carries sediments inside pipes into the nearest cesspool. Sediments are then collected by jet-washing trucks and transported to Paljassaare wastewater treatment plant.

Furthermore, the rehabilitation of at least 5 km of problematic sewers by the Company each year also contributes to the effectiveness of wastewater disposal process.

DISCHARGING

To serve the inhabitants whose properties have not been connected to the sewer system, the Company has provided two discharge places in Tallinn where septic trucks bring sewage from septic tanks. The availability of discharge places helps to ensure that the sewage from septic tanks ends up in the wastewater treatment plant and gets treated to the required degree. Consequently, it diminishes the risk of environmental pollution that could, in the absence of a discharge place, result from discharging sewage in a manner and place not intended for such discharge. Since the second half of 2020, the Company has wastewater meters in discharge places to measure all the volumes of discharged sewage.

The discharge services, allowing the sewage from septic tanks to be delivered through the discharge places to Paljassaare wastewater treatment plant, are provided by our partners in Tallinn. Although the number of inhabitants, whose properties are not connected to the sewer system, remains below 1%, the volume of sewage transported from the septic tanks in Tallinn and neighbouring municipalities to our discharge places amounted to 54,845 m^3 in 2021.

POLLUTION LOAD FROM WASTEWATER AND STORMWATER

In order to ensure a stable pollution load in the wastewater entering the Paljassaare wastewater treatment plant, we regularly monitor the wastewater led off from sites in Tallinn and Maardu as well as in the surrounding areas, and check the compliance of pollution parameters with statutory requirements. In 2021, we took a total of 1,055 wastewater samples to determine the wastewater pollution load at various sites and 440 storm water and other samples for monitoring purposes.

In 2021, the level of precipitation in Tallinn was 620 mm per area unit on average, being lower than in 2020 (753.2 mm). Consequently, the amount of stormwater and pollutants discharged to the environment through stormwater outlets decreased in 2021.

Table 11: STORMWATER VOLUME IN 2017-2021, mln m^3

	2017	2018	2019	2020	2021
Stormwater volume	6.6	3.8	4.2	4.9	3.9

According to the requirements specified in the permits for special use of water, we monitor 29 stormwater outlets, of which Lasnamäe, Rocca-al-Mare and Mustjõe outlets are the largest. To prevent any potential environmental pollution, we have equipped four stormwater outlets (in Olevi, Kaare, Raba and Vabaduse Streets) with regularly maintained sand and oil traps. Since 2015, we have been monitoring the content of hazardous substances in wastewater and treated effluent based on the Regulation No 61 of the Minister of Environment.

Table 12: POLLUTANTS FROM THE MAIN OUTLETS IN 2017-2021, t

	2017	2018	2019	2020	2021
Suspended solids	130	84.3	112.0	139	56
Oil products	0.6	0.2	0.6	0.4	0.2

The quantities of pollutants depend on the amount of precipitation, the change of seasons and the time of sampling.

Wastewater Treatment

We treat the wastewater, collected from Tallinn and surrounding areas, at Paljassaare wastewater treatment plant. We are committed to maintaining the high standards and outperforming the standards set for the treated effluent discharged into the Baltic Sea. A total of 48.2 million m^3 of wastewater was treated at Paljassaare wastewater treatment plant in 2021.

Table 13: TREATED WASTEWATER VOLUME IN 2017-2021, mln m^3

	2017	2018	2019	2020	2021
Treated wastewater volume	51.49	43.92	49.67	52.34	48.20

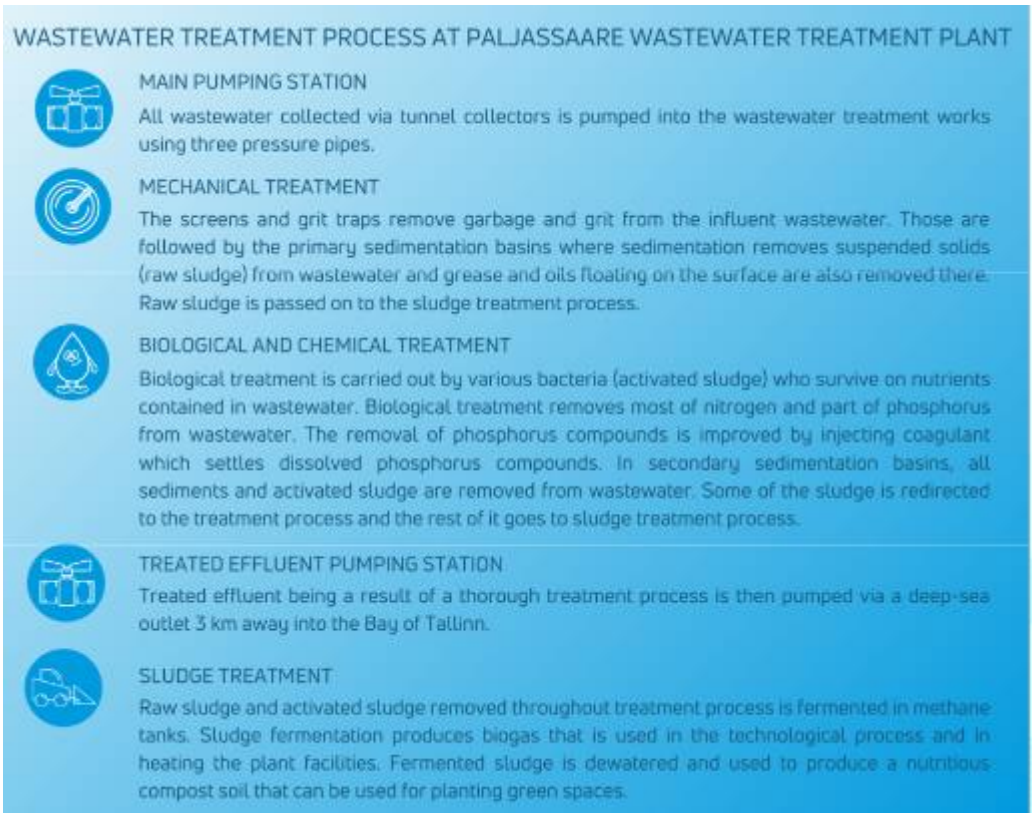


Figure 4: Description of wastewater treatment process at Paljassaare water treatment plant

The important pollutant parameters for us are as follows:

- BOD_7 – biological oxygen demand shows the amount of oxygen it takes to decompose the organic matter in the course of 7 days;
- COD_{Cr} – chemical oxygen demand is an indicator of the decomposition of organic matter, measuring the amount of oxygen consumed in chemical oxidation process of all the organic matter in water;
- SS – suspended solids show the volume of solid matter in water which is caught in a filter with a defined mesh size;
- N_{total} and P_{total} – total phosphorus and total nitrogen are nutrient salts, which foster the growth of plankton in water. Nitrogen compounds and phosphorus compounds serve as nutrients, high quantities of which lead to the eutrophication of water bodies;
- oil products – shows the amount of non-volatile oil products in water.

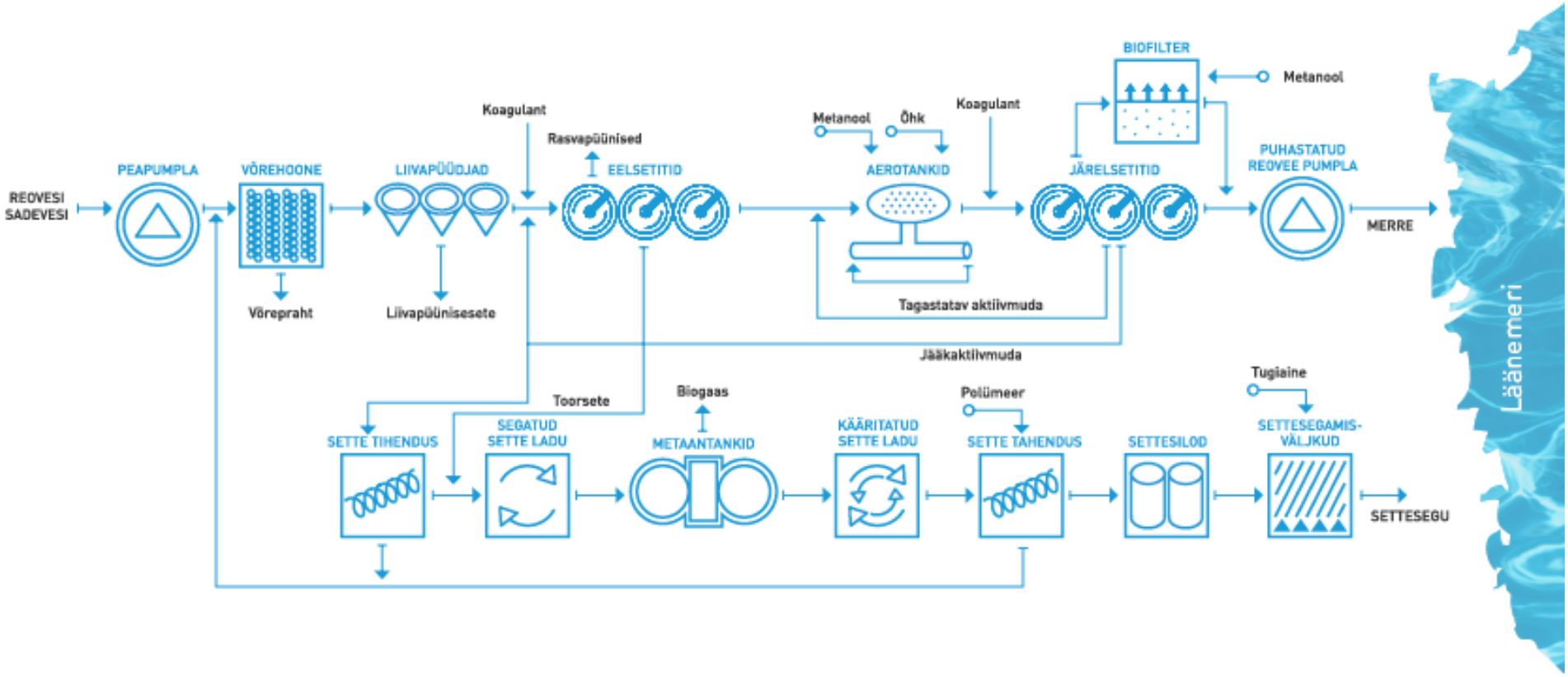
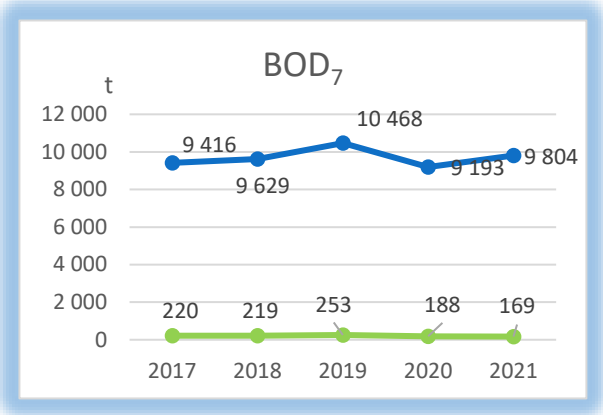
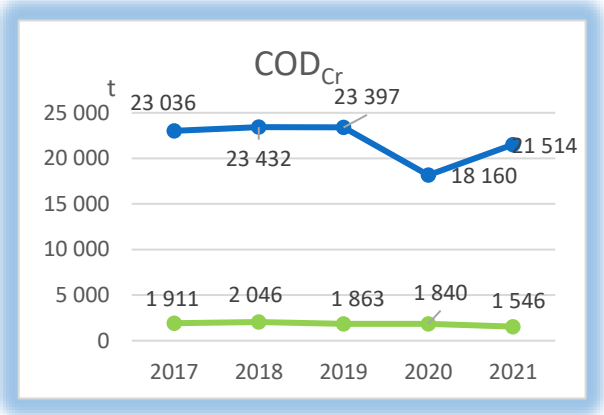
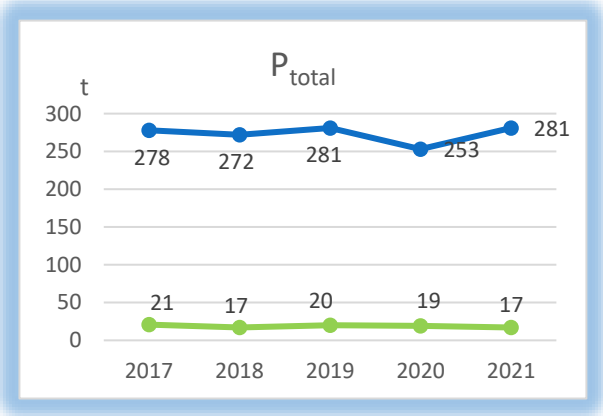


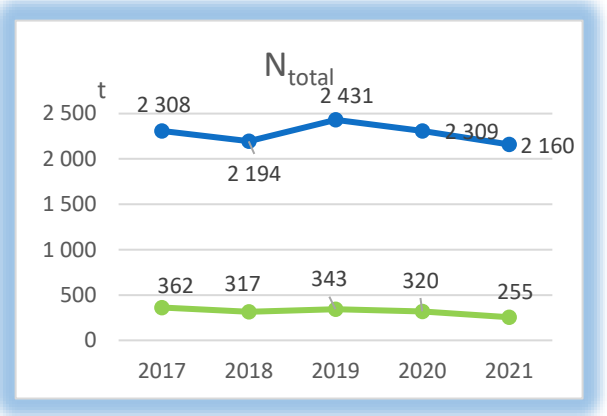
Figure 5. Wastewater treatment process at Paljassaare wastewater treatment plant

Chart 2: Incoming pollutants (in blue) to the wastewater treatment plant and pollutants discharged from the plant (in green) into the sea in 2017-2021, t/y









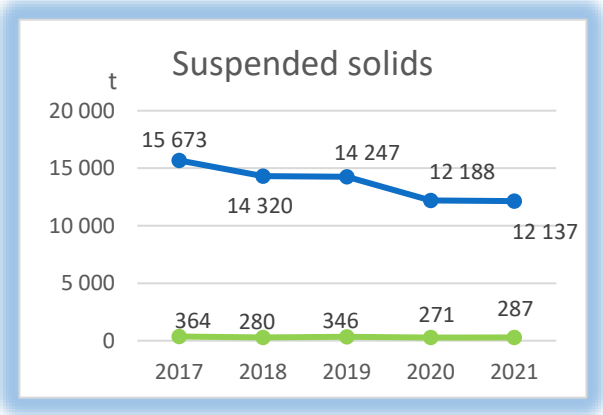
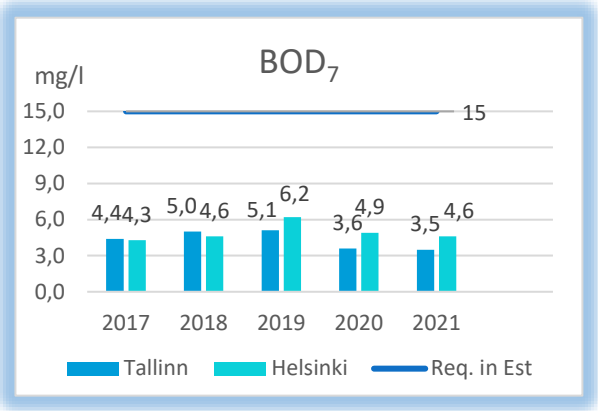
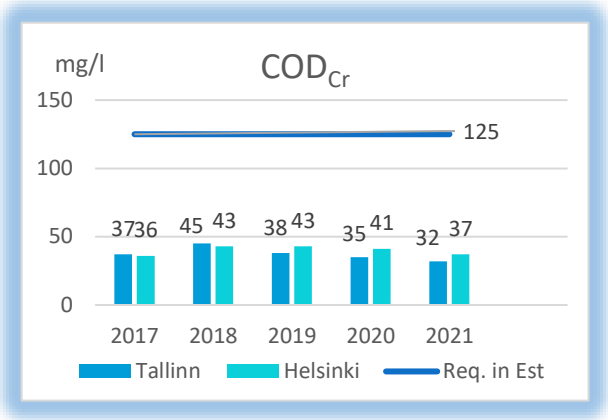
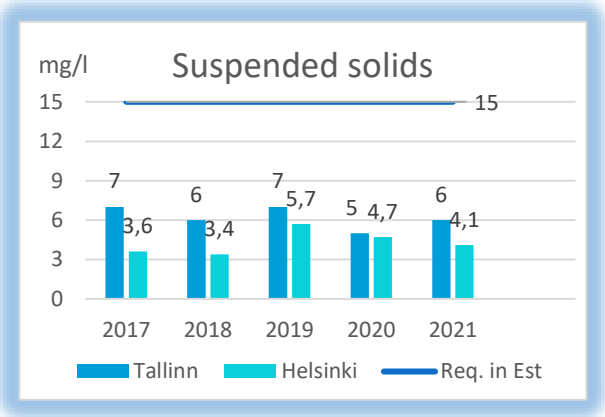
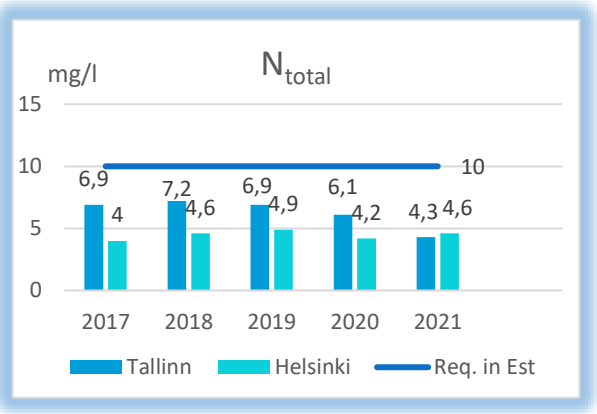


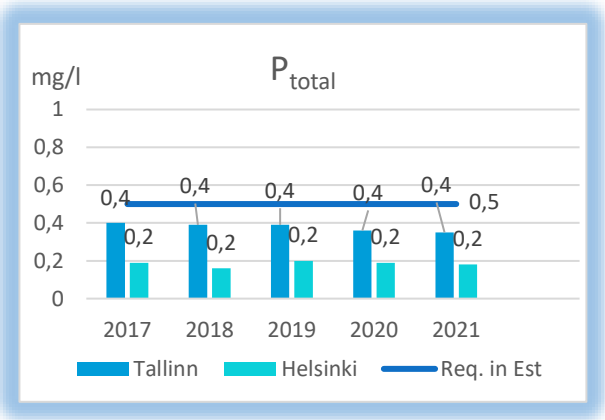
Chart 3: Average pollution concentrations in treated effluent in 2017-2021, compared to regulatory maximum allowable limits and results of Helsinki HSY, mg/l











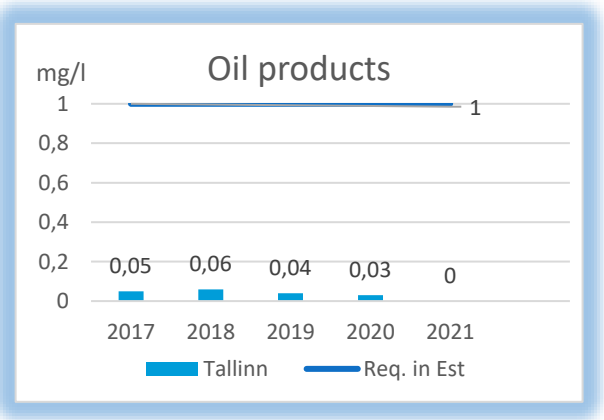
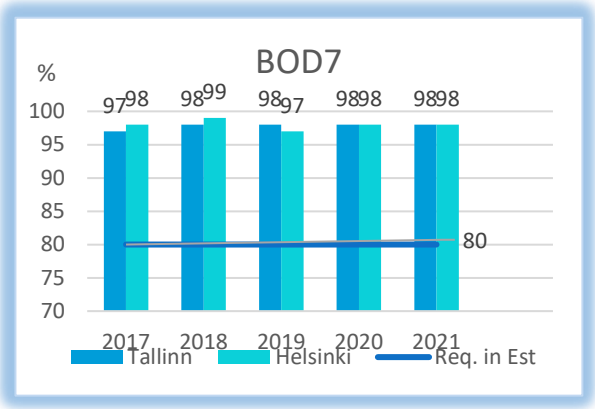
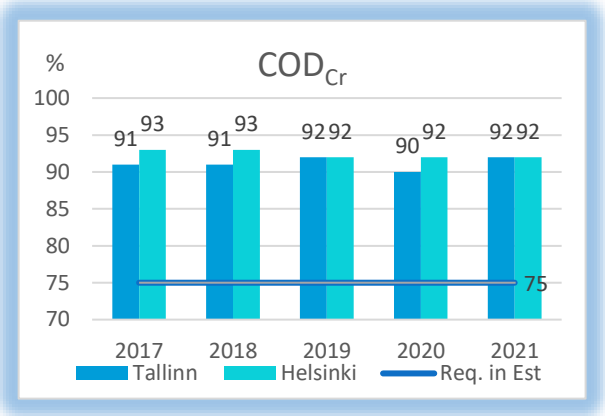
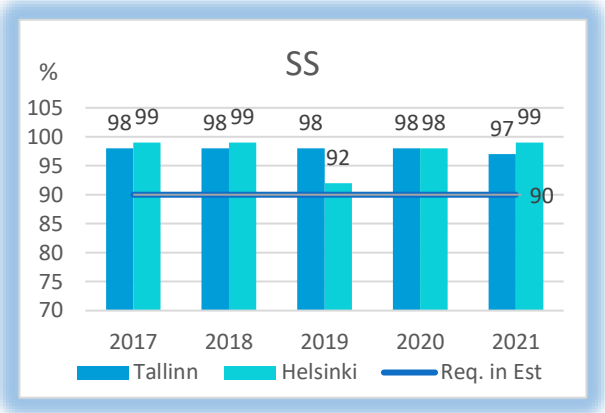
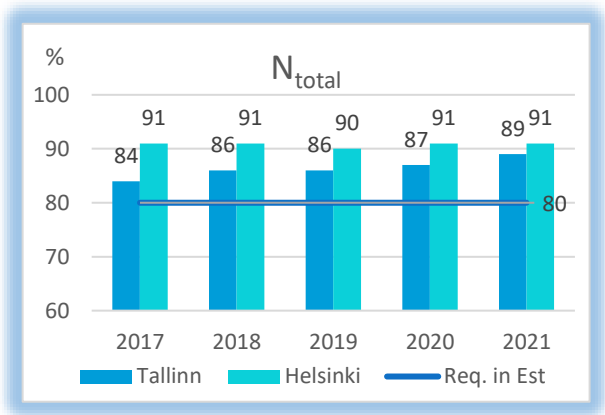


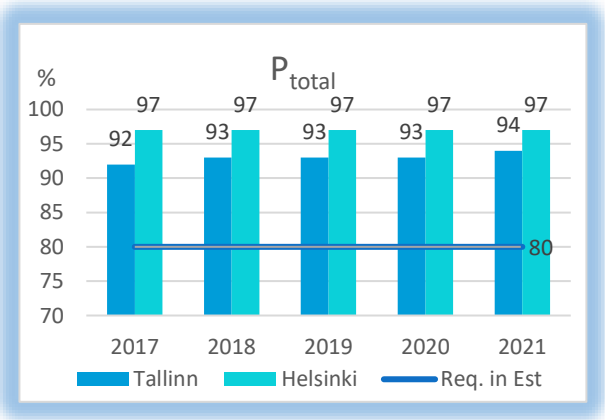
Chart 4: Wastewater treatment plant's treatment efficiency in 2017-2021, compared to minimum regulatory requirements and results of Helsinki HSY, %

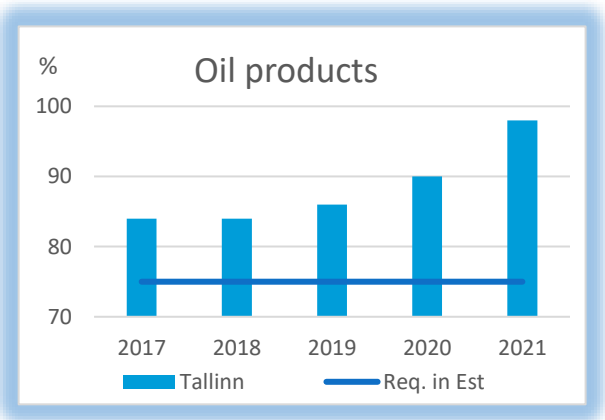












WASTEWATER DISCHARGED TO THE SEA

During 2021, a total of 288,231 m^3 of wastewater diluted by stormwater (minimum dilution 1:4) was conducted directly into the sea due to exceptional weather conditions. Due to the shock loads which exceeded the biological treatment capacity, we led a total of 933,691 m^3 of highly diluted wastewater, which had undergone mechanical treatment, into the sea through the deep-sea outlet in 2021.

Table 14: WASTEWATER TREATMENT PLANT OVERFLOWS IN 2017-2021, th m^3/year

	2017	2018	2019	2020	2021
Untreated wastewater discharged to the sea	111.3	154.7	80.1	234.1	288.2
Partly treated wastewater discharged to the sea	897	590	928	1236	934

POLLUTION CHARGES

As a water company we are required to act in line with the environmental permits and pay pollution charges, the purpose of which is to prevent and reduce the potential damage caused by pollutants or waste released into the environment.

The calculation of pollution charge is established in the permit for special use of water and the Environmental Charges Act, which apply to the pollutants contained in the effluent and stormwater at the particular outlets. Pollution charge calculations take into account both the receiving water coefficient of the specific outlet as well as compliance with the pollutant limit values. In 2021, the pollution charge paid for discharging pollutants into receiving waters formed 2.7% of the cost of services sold (2020: 3.4%).

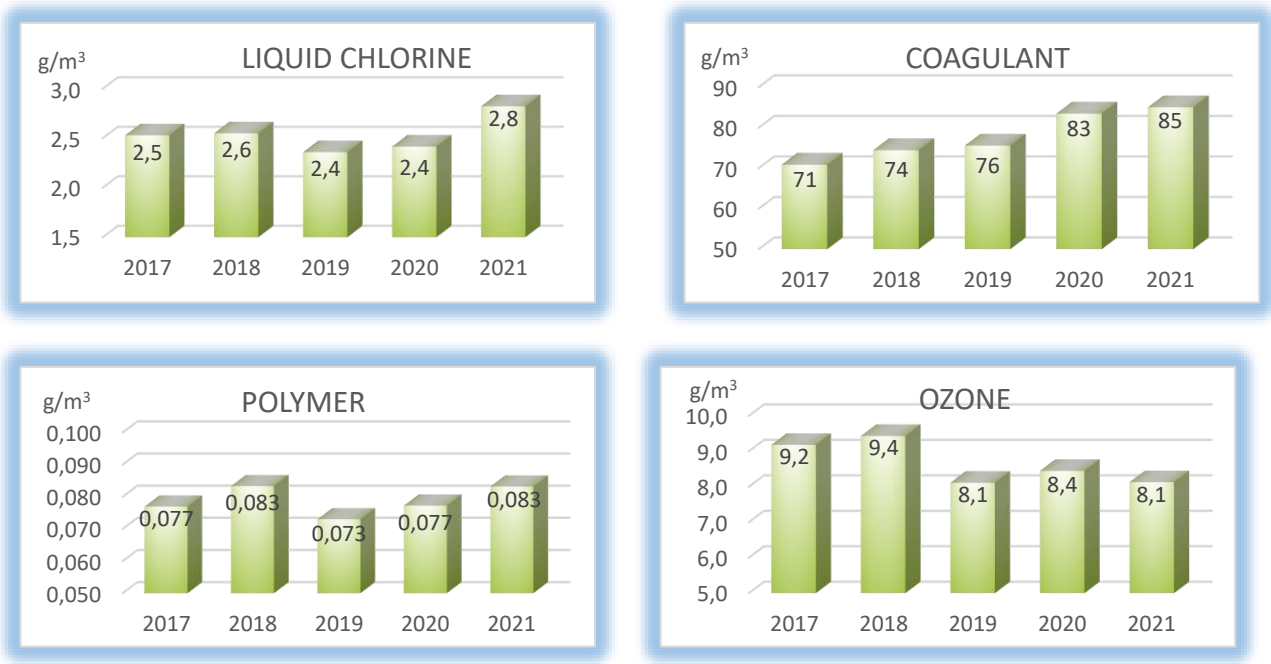
Use of Chemicals

With regard to the health and wellbeing of our employees, safe handling of chemicals at the work site is extremely important for us. Consequently, we have created the conditions necessary for safe storage and use of all chemicals. In 2021, we used a total of 5,981 tons of various chemicals (2020: 5,812 tons) in our operations, whereas no reported accidents with chemicals occurred, which could have caused harm to people or the environment.

USE OF WATER TREATMENT CHEMICALS

- Chlorine is an effective disinfecting chemical with a long-term aftereffect. The Regulation No 61 ("Drinking Water Quality and Testing Requirements and Analysis Methods"), issued by the Minister of Social Affairs on 24 September 2019, specifies that the content of free chlorine added to the drinking water, produced out of surface water, can be up to 1.0 mg/l leaving the plant and up to 0.5 mg/l at consumer taps. We add chlorine in the final stage of the water treatment process to ensure the microbiological purity of the water and to help maintain water quality in the city's water distribution network. Chlorine has a strong oxidising effect and is extremely poisonous for aquatic microorganisms. Due to the chlorine stored and used, AS Tallinna Vesi classifies as a company with the risk of category B major accident in Estonia. Applying the necessary safety measures, we have minimised the likelihood of chlorine accidents.
- Ozone is a good and quick oxidiser, which effectively breaks down organic matter and microorganisms in raw water and improves the colour of water. Ozone is produced locally on site from ambient air and only in necessary quantities. With a closed process and absence of stock reserve, the environmental risk is taken to minimum.
- Coagulants and polymers are chemicals we use in the treatment process in significant amounts in liquid form. These chemicals are added within treatment to remove smaller particles (e.g. suspended solids and organic substance) from water. The coagulation process significantly reduces the concentration of organic matter in water.
- Sodium hypochlorite (NaOCl) is an effective chemical with a longer-term aftereffect, used by the Company mainly during summer to further disinfect drinking water in water pumping stations. NaOCl is added to drinking water to ensure microbiological purity of the water and to help maintain water quality in the city's water distribution network. Chlorine is added to the water before the water pumping station's reservoir to allow adequate contact time for chlorine in the reservoir.

Chart 5: Average use of water treatment chemicals per unit of production in 2017-2021, g/m³



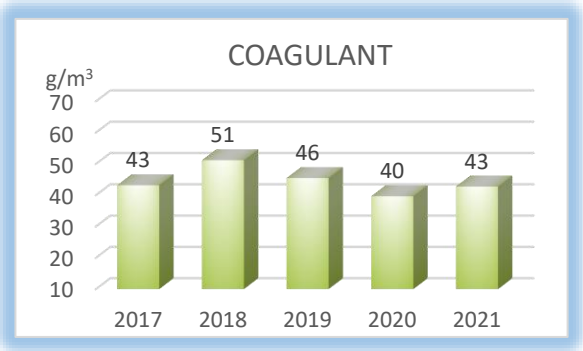
Water quality in Lake Ülemiste is strongly dependent on the weather. However, long-term observations have also indicated periodic changes in water quality over the years. In 2021, the quality of raw water was affected by a warm summer and low levels of precipitation. Due to the warm summer, the evaporation from the water bodies was high, and as the precipitation was also low, Lake Ülemiste was supplied with additional water from the catchment system from spring to autumn. A warm summer and a higher ammonium content in autumn also resulted in chlorine being used in above-average quantities, which increased by 20% compared to 2020. The Company has deliberately chosen to apply higher doses of coagulant to minimise permanganate index and organic carbon levels in drinking water.

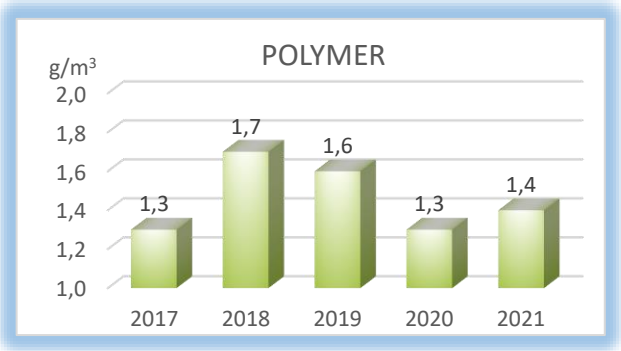
USE OF WASTEWATER TREATMENT CHEMICALS

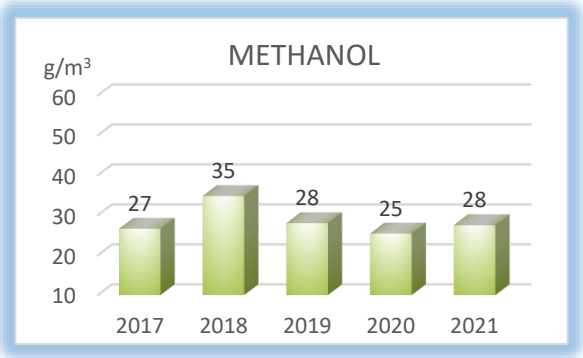
- Methanol is used at the wastewater treatment plant to increase the nitrogen removal efficiency of the bacteria participating in the biological treatment process. Due to the extremely explosive methanol used in the wastewater treatment, AS Tallinna Vesi classifies as a hazardous company in Estonia.
- Coagulants and polymers are chemicals used in the wastewater treatment process in large amounts. Coagulants are used for the chemical processing of wastewater to remove phosphorus. Polymers are used to change the qualities of sludge by accelerating the dewatering process.

The amount of chemicals used in the wastewater treatment process is dependent on the pollution levels of incoming wastewater, which in turn are affected by the weather. The higher the concentration of pollutants in incoming wastewater and the lower the regulatory limits for pollutants in the treated effluent, the higher is the amount of chemicals used in the wastewater treatment process.

Chart 6: Average use of wastewater treatment chemicals per unit of production in 2017-2021, g/m³







The use of polymer depends on the quantities of dry matter and the sludge to be treated. In 2021, the amount of polymer used was similar to 2020, however, more sludge (39,601 tons) was removed from the wastewater than in 2020 (37,884 tons).

Waste Management

WASTE GENERATION

A total of 50,704 tons of waste was generated in the Company in 2021. Sludge being the by-product of the wastewater treatment process constitutes the largest part of waste.

Table 15: MAIN TYPES AND AMOUNTS OF WASTE IN 2017-2021, t

Type of waste	2017	2018	2019	2020	2021
Mixed municipal waste	110.0	72.0	45.1	62.0	81.5
Paper and cardboard *	3.3	5.7	4.7	7.3	6.1
Packages *	0.9	0.9	1.2	1.5	1.5
Biodegradable waste*	6.5	6.4	6.0	7.8	7.1
Waste from screens	960.5	904.4	893.8	882.2	900.7
Wastewater sludge*	35,481.0	40,732.0	38,940.3	37,883.8	39,600.5
Sediments from grit traps	141.0	129.0	139.3	178.7	471.0
Excavated stones and soil	10,630.0	4,767.0	6,148.3	8,127.4	9,366.7
Asphalt waste	812.0	518.0	294.9	179.9	130.8
Mixed building waste*	0.0	25.6	6.8	2.3	7.0
Concrete and bricks	35.2	6.5	1.8	0.0	11.7
Metal scrap*	60.6	55.3	29.9	32.7	97.0
Hazardous waste	4.5	9.3	2.9	3.9	5.8
Other waste	2.2	146.0	6.4	6.3	17.0
TOTAL	***48,248***	***47,378***	***46,521***	***47,376***	***50,704***

* - possible to reuse

Since the sludge generated in the wastewater treatment process forms large part of our waste, we continued to recycle it through our sludge treatment process in 2021. Sludge stabilisation process (anaerobic digestion of sludge in digesters) produces biogas which is used to produce heat for the technological process and for heating the facilities. We analyse the samples of greening soil made from our sludge at least four times a year according to the requirements established in the Regulation No 29, issued by the Minister of Environment on 31 July 2019. All the results of the treated sludge analyses were publicly available on the Company's website during the period of issue of the greening soil. Out of the five sludge samples taken, four samples met all the requirements, with one sample exceeding the *E. coli* limit.

In addition to sludge, the wastewater treatment process produces significant amounts of other types of waste, such as waste from screens, which we hand over to our waste handling partner. The volume of waste generated within the wastewater treatment process is directly affected by the incoming wastewater flows, the weather, and the efficiency of cleaning the streets and land areas in the city. However, people also have an important role to play here as they can avoid throwing waste and hazardous substances into the sewerage system. The amount of sediments collected from sand traps has increased, firstly due to the introduction of the modernized mechanical treatment stage, and secondly, the changes in the measurement methodology according to which the amount of sediments collected from sand traps is calculated.

Excavated soil, stones, and asphalt waste account for the majority of waste resulting from the networks maintenance and repair works. The volume of waste from construction and excavation works is again dependent on the amount of works. However, since 2013, we have been performing most of the network reconstruction works using the so-called no-dig methods, which allows carrying the works out faster and reduces the inconvenience caused by traffic jams during the road works. 48.9% of reconstructions were performed using no-dig methods in 2021.

We collect and sort the other types of waste, which have a smaller share in the total waste volume, and hand them over to waste handlers. We separate paper and cardboard, biodegradable and packaging waste, hazardous waste, metal, and mixed municipal waste. In 2021, more mixed municipal waste was collected than in 2020 due to major clean-up works carried out at both the water and the wastewater treatment plants.

SEWAGE SLUDGE

The Company has an integrated environmental permit (KKL-509326), issued in 2020, for managing the sewage sludge produced in the wastewater treatment process. The permit establishes technical and environmental requirements for the waste handling process.

Table 16: INTEGRATED ENVIRONMENTAL PERMIT ISSUED TO AS TALLINNA VESI

Number of integrated environmental permit	Valid until	Description
KKL-509326	indefinite term	Issued for recycling waste at Paljassaare composting fields, procedure code R12o - biological treatment preceding the recycling of waste

In 2021, 39,395 tons of stabilised sewage sludge and 2,205 tons of non-stabilised sludge were removed from the wastewater treatment process and composted to produce the greening soil (by mixing with milled peat and implementing aerobic digestion in windrows). In 2021, we gave away 42,402 tons of sewage sludge that had been stabilised and had undergone aerobic digestion in composting windrows (hereinafter referred to as „greening soil"). The main users of greening soil were agricultural companies OÜ Tubren Agro and OÜ Oru Agro.

Table 17: AMOUNTS OF SEWAGE SLUDGE AND GREENING SOIL IN 2017-2021, t/y

Type of sludge	Quantities				
	2017	2018	2019	2020	2021
Stabilised and dewatered sewage sludge taken out of the wastewater treatment process	35,481	40,732	36,789	35,200	39,395
Greening soil given away (reuse of sewage sludge)	32,645	26,944	41,261	45,796	42,402

Energy Consumption

ELECTRICITY CONSUMPTION

The majority of electricity is used to run the Company's core processes: operating the water treatment plant, wastewater treatment plant and pumping stations on the network.

Although we have been making significant investments aimed at reducing electricity consumption, the energy consumption is still inevitably and closely connected to the operation of our core processes. Those are in turn affected by changes in consumption and service areas as well as by the natural conditions.

From the second half of 2021, we only use electricity produced from renewable sources at our facilities and in the treatment process.

Table 18: ELECTRICITY CONSUMPTION IN 2017-2021, MWh

Unit	2017	2018	2019	2020	2021
Water Treatment	10,755	11,782	10,599	10,988	11,181
Wastewater Treatment	23,000	21,949	22,539	22,224	21,865
Networks pumping stations, incl. Maardu	7,094	6,709	7,286	7,554	7,602
Other	693	962	839	613	710
TOTAL	***41,543***	***41,402***	***41,262***	***41,379***	***41,357***

The total consumption of electricity remained fairly stable in comparison with 2020. The electricity consumption of the water treatment plant is significantly affected by the ozone production. In 2021, the water quality in Lake Ülemiste was better than in 2020, which also led to lower ozone doses (especially towards the end of the year) and reduced amounts of electricity used to produce the ozone. At the same time, electricity consumption is most affected by the production of drinking water (pumping), which continued to grow also in 2021, causing us to use more electricity than in the years before.

Chart 7: ELECTRICITY CONSUMPTION PER UNIT PRODUCTED AT THE WATER TREATMENT PLANT IN 2017-2021, kWh/m³

As mentioned above, in 2021 the quality of surface water was better compared to the previous year, the levels of plankton and organic matter were lower than in previous years. However, the Company did not use less chemicals than in the previous year, mainly due to the extremely hot summer.

Chart 8: ELECTRICITY CONSUMPTION PER UNIT PRODUCTED AT THE WASTEWATER TREATMENT PLANT IN 2017-2021, kWh/m³

Consumption of electricity in the wastewater treatment process depends largely on the weather, as the main areas of consumption are pumping wastewater and producing air i.e. to aerate the activated sludge in the biological treatment stage.

HEAT ENERGY CONSUMPTION

In addition to heating the premises we need heat energy to run the core processes. The water treatment plant produces heat out of outsourced natural gas in its boiler house. Ädala site uses central heating also produced out of natural gas in our area. The wastewater treatment plant's needs for heat energy are mostly covered by biogas.

Biogas is a by-product from the digestion of sewage sludge in digesters and is used to produce on-site thermal energy, with which we heat the premises at the wastewater treatment plant and keep the processes in operation. Due to the nature of biogas production, we are sometimes bound to burn some of the biogas or use some small volumes of natural gas. In 2021, we used 63% of the total biogas generated (66% in 2020) to produce heat.

Table 19: HEAT ENERGY CONSUMPTION IN 2017-2021, MWh

Unit	2017	2018	2019	2020	2021
Water Treatment	3,022	2,922	2,877	2,685	3,206
Wastewater Treatment	7,299	12,421	13,887	14,311	12,092
incl. heat energy from biogas	7,225	12,400	13,886	14,217	11,991
Ädala Offices	1,044	1,148	1,189	1,215	1,398
TOTAL	***11,365***	***16,491***	***17,953***	***18,211***	***16,696***

As of January 2018, the methodology for calculating the volume of heat generated from biogas was changed. In order to calculate the historical amount of thermal energy from biogas used for wastewater treatment as per the updated methodology, the previous amount consumed shall be divided by the coefficient of 0.61.

Chart 9: BIOGAS PRODUCTION IN 2017-2021, th m³

TRANSPORTATION AND FUEL CONSUMPTION

Road transport accounts for the largest part of our need for transportation. The Company has 100 vehicles for carrying out various operational tasks as well as for driving between the company sites and numerous service sites. The largest group of vehicles is cars and operating vehicles, including minivans and team vans. The Company has a total of 85 cars and operating vehicles, and 15 special purpose vehicles (such as tractors, loaders, excavators, etc).

Table 20: NUMBER OF VEHICLES AND FUEL CONSUMPTION IN 2017-2021

	2017	2018	2019	2020	2021
Total number of vehicles, pcs.	88	92	93	96	100
Petrol, l	56,759	41,265	37,775	36,168	35,405
Diesel, l	104,719	101,377	108,179	123,656	137,864
Total fuel, l	**161,478**	**142,642**	**145,954**	**159,824**	**173,269**

We continue to try and keep the fuel consumption under control by the fuel limits set for the car users and the GPS-tracking devices. Some of the cars are being shared by employees, i.e. all employees with specific authorisation are allowed to use the cars for working purposes. This enables the Company to cut down the costs and contribute to the saving of natural resources. Furthermore, all new cars we purchase meet current emission standard requirements. The number of business trips made by our staff inside and outside Estonia is relatively small.

Air Emissions

AS Tallinna Vesi has been issued one air pollution permit, which sets limits to the pollution sources of Ülemiste water treatment plant and regulates emissions of ozone produced for the treatment of drinking water. An integrated environmental permit No KKL-509326, valid from the second half of 2020, applies to the sources of pollution of Paljassaare wastewater treatment plant, regulating the air emissions from grit traps, primary clarifiers, aeration tanks, secondary clarifiers, as well as from the sludge and composting fields. The company pays a pollution charge for the pollutants discharged into ambient air.

Table 21: PERMITS ISSUED TO AS TALLINNA VESI, REGULATING THE AMBIENT AIR POLLUTION

Number of permit	Valid until	Description
Air pollution permit No L.ÕV/319438	indefinite term	Applies to the pollution sources at Ülemiste water treatment plant - the chimney of the boiler house, ozonation, diesel generator. Establishes the list of pollutants emitted into ambient air and the annual permitted emissions thereof.
Integrated environmental permit No KKL-509326	indefinite term	Applies to the pollution sources at Paljassaare wastewater treatment plant, e.g. the chimneys, ventilation pipes, composting fields, clarifiers, etc. Establishes the list of pollutants emitted into ambient air and the annual permitted emissions thereof.

Table 22: AMBIENT AIR POLLUTION FROM WATER TREATMENT PLANT'S POLLUTION SOURCES IN 2017-2021, t

Pollutant	Limit	2017	2018	2019	2020	2021
Nitrogen dioxide	1.954	0.78	0.713	0.763	0,656	0.855
Carbon monoxide	1.846	0.712	0.686	0.688	0,602	0.801
Volatile organic compounds	0.125	0.049	0.046	0.047	0,041	0.054
Carbon dioxide	1688	647	634	623	548	736.28
Sulphur dioxide	0	0.001	0.001	0	0*	0
Total solid particles	0.004	0.003	0.001	0.003	0,006	0.002

* Sulphur dioxide pollution remained below the threshold limit

Table 23: AMBIENT AIR POLLUTION FROM WASTEWATER TREATMENT PLANT'S POLLUTION SOURCES IN 2017-2021, t

Pollutant	Limit[1]	2017	2018	2019	2020	2021
Nitrogen dioxide	4.487	4.7	5.23	6.37	6.57	4.02
Carbon monoxide	3.146	4.7	5.23	6.37	6.21	2.82
Volatile organic compounds	14.503	0.3	0.33	0.39	3.96	14.45
Carbon dioxide	5,789.49	4,045	3,186	5,293	5,715	5,262
Hydrogen sulphide	3.82	17.5	16.9	17.3	14.1	3.7
Ammonia	79.341				19.9	79.3
Sulphur dioxide	11.982				3.3	11.2
Total solid particles	4.348				0.87	4.0

[1] Limits set in the integrated environmental permit No KKL-509326

The limits and calculation formulae for the quantities of pollutants were changed in the integrated environmental permit issued in the second half of 2020.

Environmental Performance

In line with the EMAS (Regulation (EU) 2018/2026) requirements, we have outlined below the key indicators characterizing our environmental performance regarding energy efficiency, material efficiency, water, waste, biological diversity and emissions. At least three elements have been presented for each key indicator:

- Figure A stands for the total annual input/impact in the respective field of activity.

- Figure B represents the total volume of pure water sold and wastewater and stormwater treated at the wastewater treatment plant throughout the year (million m^3).

- Figure R stands for the ratio A/B.

Table 24: ENVIRONMENTAL PERFORMANCE IN 2019-2021

Key indicators of environmental performance	Year	Consumption (rounded), i.e. annual input (Figure A)	Annual output of the Company (Figure B)	Ratio R (A/B)
Electricity				
Electricity used, MWh	2021	82,726	65.7	1,260
	2020	82,776	70.0	1,183
	2019	82,558	68.0	1,215
Heat				
Heat produced from natural gas, MWh	2021	4,605	65.7	70
	2020	3,900	70.0	56
	2019	4,034	68.0	59
Thermal energy produced from biogas, MWh	2021	14,224	65.7	217
	2020	14,224	70.0	203
	2019	13,885	68.0	204
Handling of chemicals				
Liquid chlorine, t	2021	73	65.7	1.1
	2020	61	70.0	0.9
	2019	59	68.0	0.9
Coagulant, t	2021	4,259	65.7	65
	2020	4,187	70.0	60
	2019	4,147	68.0	61
Polymer, t	2021	70	65.7	1.1
	2020	69	70.0	1.0
	2019	82	68.0	1.2
Ozone, t	2021	210	65.7	3.2
	2020	213	70.0	3.0
	2019	203	68.0	3.0
Methanol, t	2021	1,326	65.7	20
	2020	1,330	70.0	19
	2019	1,389	68.0	20
Water				
Water for own consumption, th m^3	2021	2,400	65.7	37
	2020	2,411	70.0	34
	2019	1,958	68.0	29

Surface water extraction, th m^3	2021	25,850	65.7	394
	2020	25,242	70.0	361
	2019	25,000	68.0	368
Ground water extraction, th m^3	2021	2,954	65.7	45
	2020	2,735	70.0	39
	2019	2,680	68.0	39
Waste				
Mixed municipal waste, t	2021	81.5	65.7	1.2
	2020	62.0	70.0	0.9
	2019	45.1	68.0	0.7
Recycled paper and cardboard, t	2021	6.1	65.7	0.1
	2020	5.6	70.0	0.1
	2019	5.7	68.0	0.1
Recycled packages, t	2021	1.5	65.7	0.02
	2020	1.5	70.0	0.02
	2019	0.9	68.0	0.01
Recycled biodegradable waste, t	2021	7.1	65.7	0.1
	2020	7.8	70.0	0.1
	2019	5.2	68.0	0.1
Waste from screens, t	2021	901	65.7	14
	2020	882	70.0	13
	2019	894	68.0	13
Recycled sludge, t	2021	39,601	65.7	603
	2020	37,884	70.0	541
	2019	38,940	68.0	573
Sediments from grit traps, t	2021	471	65.7	7.2
	2020	179	70.0	2.6
	2019	139	68.0	2.0
Recycled excavated stones and soil, t	2021	9,367	65.7	143
	2020	8,013	70.0	114
	2019	6,148	68.0	90
Asphalt waste, t	2021	131	65.7	2
	2020	180	70.0	3
	2019	295	68.0	4
Mixed building waste, t	2021	7.0	65.7	0.1
	2020	2.3	70.0	0.0
	2019	6.8	68.0	0.1
Concrete and bricks, t	2021	11.7	65.7	0.2
	2020	0.0	70.0	0.0
	2019	1.8	68.0	0.0
Recycled metal, t	2021	97.0	65.7	1.5
	2020	32.7	70.0	0.5
	2019	29.9	68.0	0.4
Hazardous waste, t	2021	5.8	65.7	0.1
	2020	3.9	70.0	0.1
	2019	2.9	68.0	0.0
Other waste, t	2021	17.0	65.7	0.3
	2020	6.3	70.0	0.1
	2019	6.4	68.0	0.1
Biological diversity				
Land use as a total size of the land owned by the company, ha	2021	355.3	65.7	5
	2020	355.3	70.0	5
	2019	350.0	68.0	5

Non-permeable surface area, ha	2021	118.0	65.7	2
	2020	118.0	70.0	2
	2019	117.9	68.0	2
Air emissions				
Nitrogen dioxide, t	2021	4.9	65.7	0.1
	2020	7.2	70.0	0.1
	2019	7.1	68.0	0.1
Carbon monoxide, t	2021	3.6	65.7	0.1
	2020	6.8	70.0	0.1
	2019	7.1	68.0	0.1
Volatile organic compounds, t	2021	14.5	65.7	0.221
	2020	4.0	70.0	0.057
	2019	0.4	68.0	0.006
Carbon dioxide, t	2021	5,998	65.7	91
	2020	6,263	70.0	89
	2019	5,916	68.0	87
Sulphur dioxide, t	2021	11.153	65.7	0.16988
	2020	3.300	70.0	0.04715
	2019	0.000	68.0	0.00000
Total solid particles, t	2021	3.981	65.7	0.0606
	2020	0.873	70.0	0.0125
	2019	0.003	68.0	0.0000
Hydrogen sulphide, t	2021	4	65.7	0.1
	2020	14	70.0	0.2
	2019	17	68.0	0.3
Ammonia, t	2021	79	65.7	1.2
	2020	20	70.0	0.0
	2019	-	68.0	0.0
Environmental education				
Number of children participated in group discussions	2021	0	65.7	0
	2020	240	70.0	3
	2019	969	68.0	14

Best Environmental Management Practices and Environmental Performance Indicators

The Environmental Report 2021 takes into account the Commission Decision (EU) 2019/61, which sets out the best environmental management practices and environmental performance indicators for water metering, water leakages, energy-efficient wastewater treatment and the recovery of energy from wastewater treatment that are related to significant environmental aspects.

Deploying water metering

Water meters are installed for all consumers who have signed a relevant contract. The water supply network is constantly monitored to allow quick reaction to the changes in the network. Consumers are invoiced on the basis of water meter readings.

Table 25: ENVIRONMENTAL PERFORMANCE INDICATORS IN DEPLOYING WATER METERING

Environmental performance indicators[1]	Benchmarks of excellence[2]	AS Tallinna Vesi's environmental performance indicators
Level of metered water (% of consumers, % of water consumption that is metered)	The use of water meters at household or end consumer level is 99% or higher	All consumers with a valid contract have water meters installed
Reduction in water use by end consumers after installation of water meters and/or smart meters (l/user)	All new buildings are equipped with water meters (smart meters in water-scarce areas)	All buildings have water meters

Minimising water leakages

In order to minimise water leakages, the water distribution system is constantly monitored:

1) carrying out a detailed water balance monitoring of the water distribution system and managing water pressure, by avoiding high pressure levels: pumping stations are equipped with SCADA control system;

2) analysing the water distribution network and dividing it into adequate district metering areas to detect water leakages: sensors for water zones are being used, which measure pressure, flow rates and noise;

3) responding promptly and adequately to the identified faults and leakages on the network: after detecting and locating a leakage the information is immediately provided to the unit that plans the repairs;

4) establishing a database to list all technical installations, the age and type of pipes, hydraulic data, previous interventions, etc.: Tekla geo-reference system, which collects that data, is being used.

Table 26: ENVIRONMENTAL PERFORMANCE INDICATORS IN MINIMISING WATER LEAKAGES

Environmental performance indicators[3]	AS Tallinna Vesi's environmental performance indicators
Percentage of water loss out of the system input volume (%)	Water loss in the network was 15% in 2021

[1] Commission Decision (EU) 2019/61, published ELT L 17, 18.1.2019, page 35, i97); i99)

[2] Commission Decision (EU) 2019/61, published ELT L 17, 18.1.2019, page 35, b31); b33)

[3] Commission Decision (EU) 2019/61, published ELT L 17, 18.1.2019, page 35, i100)

Energy efficient wastewater treatment

According to the best environmental management practices:

1) the average dry weather wastewater flow is 5,000 m^3/t, biological treatment capacity is up to 14,000 m^3/t, which is twice the average dry weather wastewater flow;

2) the biological treatment is performed with nitrification and denitrification processes, chemical phosphorus removal is also used;

3) the incoming wastewater and treated effluent discharged are monitored on a daily basis;

6) the primary and excess sludge are stabilised in anaerobic digesters;

7) the anaerobically stabilised sludge is dewatered;

8) the energy efficient fine bubble aeration systems in the biological treatment stage and energy-efficient pumps are used.

Table 27: ENVIRONMENTAL PERFORMANCE INDICATORS IN WASTEWATER TREATMENT

Environmental performance indicators[4]	Benchmarks of excellence[5]	AS Tallinna Vesi's environmental performance indicators
Concentrations in the discharged final effluent or removal efficiencies of COD. BOD_5, ammonia, total nitrogen and total phosphorus (mg/l, %)	The removal efficiencies achieved are: at least 98% for BOD_5, at least 90% for COD, at least 90% for ammonia, at least 80% for total organic nitrogen compounds and at least 90% for total phosphorus	Removal efficiencies achieved in 2021: BOD_5 – 98% COD – 92% Total nitrogen – 87% Total phosphorus – 94%
Electricity use of the wastewater treatment plant per mass of BOD_5 removed (kWh/kg per BOD_5 removed)	-	2.67 kWh/kg*
Electricity use of the wastewater treatment plant per volume treated (kWh/m^3 per wastewater treated)	-	0.47 kWh/m^3
Annual electricity use of the wastewater treatment plant per population equivalent (kWh/PE/year)	Electricity use of the wastewater treatment plant is: 1) less than 18 kWh/PE/year for large municipal wastewater treatment plants (with a size of more than 10,000 PE) 2) less than 25 kWh/PE/year for small municipal wastewater treatment plants (with a size of less than 10,000 PE)	41.5 kWh/PE

* This indicator per BOD_5 is calculated as per removed BOD_7 (2.3 kWh/kg)

[4] Commission Decision (EU) 2019/61, published ELT L 17, 18.1.2019, page 36, i102); i103); i104); i105)

[5] Commission Decision (EU) 2019/61, published ELT L 17, 18.1.2019, page 36, b35); b36)

Anaerobic digestion of sludge and optimal energy recovery

The primary and excess sludge are stabilised in anaerobic digesters and the biogas produced from sludge is used for heating the facilities and the treatment process.

In 2022, a plan is to set up a combined heat and power (CHP) unit at the waste water treatment plant. The cogeneration plant will use the biogas produced as a fuel and will be able, under the best conditions, to cover the entire heat demand and at least one third of the electricity demand of the whole plant. In the future, the capacity to produce electricity will be further enhanced by the installation of solar panels.

Table 28: ENVIRONMENTAL PERFORMANCE INDICATORS IN ENERGY RECOVERY

Environmental performance indicators[6]	Benchmarks of excellence[7]	AS Tallinna Vesi's environmental performance indicators
Percentage of electricity and heat demand of the wastewater treatment plant met by own-generated electricity and heat from biogas on an annual basis (%)	Own-generated electricity and heat from biogas cover 100% of the energy demand at municipal wastewater treatment plants with a size of more than 100,000 PE without on-site thermal sludge drying and 50% of the energy demand in the case of plants with on-site thermal sludge drying	100% of heat
Electrical efficiency of the generator fuelled with biogas (%)	-	No generator
Specific biogas production (Nℓ (1)/kg per organic dry matter input)	-	No biogas valorisation

[6] Commission Decision (EU) 2019/61, published ELT L 17, 18.1.2019, page 37, i108); i109); i110)

[7] Commission Decision (EU) 2019/61, published ELT L 17, 18.1.2019, page 37, b39)

Significant Changes in the Environmental Report

There are no major substantive changes in this report compared to the Environmental Report 2020.

Validation of the Environmental Report

AS Metrosert, an accredited verifier EE-V-0001, having inspected the environmental management system and the Environmental Report 2021 of AS Tallinna Vesi, confirms that the information and data in the organisation's environmental report are reliable, credible and correct and meet the requirements of the Regulation (EC) No 1221/2009 of the European Parliament and of the Council of 25 November 2009 on the voluntary participation by organisations in a Community eco-management and audit scheme. The Commission Regulation (EU) 2017/1505 of 28 August 2017 and the Commission Regulation (EU) 2018/2026 of 19 December 2018 amending the annexes I, II, III and IV to the Regulation (EC) No 1221/2009 of the European Parliament and of the Council, have been applied to this report.

The Environmental Report has been validated on 07/06/2022

Evelin Kurmiste

EMAS Verifier

AS Metrosert

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Verified environmental management
REG.NO. EE-000001

Appendix 1: Drinking Water Quality at Ülemiste Water Treatment Plant in 2021

Parameter	Unit	Min	Max	Average	Regulation No 61 of 24 Sept 2019	EU Directive 98/83/EC
Temperature	°C	2.0	25.0	10.5		
Odour	dilution ratio	1	1	1	Acceptable to consumer	Acceptable to consumer
Taste	dilution ratio	1	1	1	Acceptable to consumer	Acceptable to consumer
Turbidity	NTU	< 0.1	0.20	0.1	1	1
Colour	mg/l Pt	< 3	3	< 3	Acceptable to consumer	Acceptable to consumer
Dry residue	mg/l	260	290	272		
pH		7.09	7.42	7.25	≥ 6.5 and ≤ 9.5	≥ 6.5 and ≤ 9.5
Conductivity, 20 °C	µS/cm	379	428	398	2,500	2,500
Alkalinity	mmol/l	2.67	3.13	2.89		
Total hardness	mmol/l	1.88	2.15	2.00		
Permanganate index	mg O_2/l	2.44	3.39	2.90	5	5
Total organic carbon, TOC	mg/l	4.9	6.1	5.5	Without unusual changes	Without unusual changes
Dissolved Oxygen	O_2 mg/l	4.1	14.5	10.2		
Dissolved Oxygen	saturation %	52	106	88		
Free CO_2	mg/l	12	24	17		
Carbonates, CO_3^{2-}	mg/l	0	0	0		
Bicarbonates, HCO_3^-	mg/l	170	186	178		
Chlorides, Cl^-	mg/l	33	37	34	250	250
Sulphates, SO_4^{2-}	mg/l	19	27	23	250	250
Orthophosphates, PO_4^{3-}	mg/l	< 0.02	< 0.02	< 0.02		
Fluoride, F^-	mg/l	0.07	0.13	0.10	1.5	1.5
Nitrates, NO_3^-	mg/l	< 1	4.2	1.9	50	50
Nitrites, NO_2^-	mg/l	< 0.003	< 0.003	< 0.003	0.5	0.5
Ammonium, NH_4^+	mg/l	< 0.006	0.006	< 0.006	0.5	0.5
Cyanide, CN^-	µg/l	< 2	< 2	< 2	50	50
Calcium, Ca^{2+}	mg/l	59.8	78	67.6		
Magnesium, Mg^{2+}	mg/l	7.75	8.91	8.25		
Aluminium, Al	µg/l	29	117	55	200	200
Boron, B	µg/l	12.7	18.3	14.2	1 000	1 000
Beryllium, Be	µg/l	< 0.2	< 0.2	< 0.2		
Sodium, Na	mg/l	7.85	9.92	8.77	200	200
Potassium, K	mg/l	2.15	2.87	2.47		
Vanadium, V	µg/l	0.23	0.53	0.32		
Chromium, Cr	µg/l	< 0.1	< 0.1	< 0.1	50	50
Iron, Fe	µg/l	< 10	< 10	< 10	200	200

Manganese, Mn	µg/l	0.73	20.4	5.4	50	50
Cobalt, Co	µg/l	< 0.02	0.04	0.02		
Nickel, Ni	µg/l	< 0.2	0.29	< 0.2	20	20
Copper, Cu	µg/l	<0.5	1.3	0.57	2 000	2 000
Zinc, Zn	µg/l	<0.5	4,1	0.63		
Arsenic, As	µg/l	0.28	0.58	0.38	10	10
Selenium, Se	µg/l	< 0.4	< 0.4	< 0.4	10	10
Strontium, Sr	µg/l	81.0	101	90.2		
Molybdenum, Mo	µg/l	0.23	0.42	0.35		
Cadmium, Cd	µg/l	< 0.02	< 0.02	< 0.02	5	5
Antimony, Sb	µg/l	0.06	0.09	0.07	5	5
Barium, Ba	µg/l	38.3	52.7	44.4		
Mercury, Hg	µg/l	< 0.1	< 0.1	< 0.1	1	1
Thallium, Tl	µg/l	< 0.01	< 0.01	< 0.01		
Lead, Pb	µg/l	< 0.05	0.06	< 0.05		
Uranium, U	µg/l	0.34	0,47	0.42		
Acrylamide	µg/l	0.012	0.020	0.017	0.1	0.1
Chloroform	µg/l	9	55	23		
Bromodichloromethane	µg/l	1.5	9.4	3.9		
Dibromochloromethane	µg/l	0.30	1.1	0.59		
Bromoform	µg/l	< 0.2	< 0.2	< 0.2		
THM	µg/l	11	66	27	100	100
1,2-dichloroetane	µg/l	< 0.2	< 0.2	< 0.2	3	3
Trichloroethene	µg/l	< 0.3	< 0.3	< 0.3		
Tetrachloroethene	µg/l	< 0.2	< 0.2	< 0.2		
Tetrachloroethene and Trichloroethene sum	µg/l	below LOQ	below LOQ	below LOQ	10	10
Benzene	µg/l	< 0.2	< 0.2	< 0.2	1	1
Benzo(a)pyrene	µg/l	< 0.00017	< 0.00017	< 0.00017	0.01	0.01
PAH sum (polycyclic aromatic hydrocarbons)	µg/l	below LOQ	below LOQ	below LOQ	0.1	0.1
Pesticides (sum)	µg/l	below LOQ	below LOQ	below LOQ	0.5	0.5
Enterococci	number/100ml	0	0	0	0	0
No of colony forming units at 22 °C	number/ml	0	7	< 3	Without unusual changes	Without unusual changes
Coliform bacteria	number/100ml	0	0	0	0	0
Escherichia coli	number/100ml	0	0	0	0	0
Clostridium perfringens	number/100ml	0	0	0	0	0
Residual chlorine (free chlorine)	mg/l	0.39	0.97	0.67	≤ 1.0	
Bromate	µg/l	< 2	< 6.6	< 6.6	10	10
UV-abs	AU/cm	0.034	0.078	0.062		

Appendix 2: Quality of Drinking Water Produced from Ground Water in 2021

Parameter	Unit	Average results				Regulation No 61 and Council Directive 98/83/EC
		Nõmme	Merivälja	Tiskre	Saue	
Odour	Points	1	1	1	1	Acceptable to consumer
Taste	Points	1	1	1	1	Acceptable to consumer
Colour	mg/l Pt	< 3	10	< 3	< 3	Acceptable to consumer
Turbidity	NTU	0.22	0.39	0.44	0.30	Acceptable to consumer
Dissolved O_2	mg/l	6.18	7.5	4.95	6.68	
pH	pH unit	8.14	8.0	7.80	8.07	≥ 6.5 and ≤ 9.5
Conductivity	µS/cm	506	498	750	510	2 500
Alkalinity	mmol/l	2.46	3.88	2.02	2.28	
Total hardness	mmol/l	1.61	2.28	2.28	1.43	
Transient hardness	mmol/l	2.45	3.32	2.02	2.27	
Overall hardness	mmol/l	0.39	0.4	1.27	0.31	
Permanganate index (COD_{mn})	mgO_2/l	0.58	2.5	< 0.5	< 0.5	5
Free Carbon dioxide. CO_2	mg/l	2	5	4	3	
Total iron. Fe	µg/l	< 20	68	56	30	200
Fluoride. F^-	mg/l	0.62	0.41	0.83	0.69	1.50
Chloride. Cl^-	mg/l	79	59	168	87	250
Manganese. Mn	µg/l	< 8	18	15	< 8	50
Ammonium. NH_4^+	mg/l	0.097	0.192	0.008	0.120	0.5
Nitrite. NO_2^-	mg/l	0.008	0.016	< 0.003	0.012	0.5
Nitrate. NO_3^-	mg/l	< 1	1.1	< 1	< 1	50
Stability index		0.27	0.52	-0.02	0.11	
Total organic carbon. TOC	mg/l	0.64	3.4	0.3	0.25	Without unusual changes
Sulphide. S^{2-}	mg/l	0.004	< 0.004	< 0.004	< 0.004	
Sulphate. SO_4^{2-}	mg/l	21	5	27	0.3	250
Hydrogen carbonate. HCO_3^-	mg/l	150	236	123	139	
Calcium. Ca^{2+}	mg/l	45	69	68	40	
Magnesium. Mg^{2+}	mg/l	13	15	14	11	
Dry residue	mg/l	304	320	468	300	
Sodium. Na^+	mg/l	44.5	23.4	66.8	52.9	200
Potassium. K^+	mg/l	6.71	5.0	8.44	7.6	

Boron	µg/l	168	67.4	98.1	278	1 000
Aluminium	µg/l	5.21	< 1	< 1	0.7	200
Arsenic	µg/l	< 0.1	< 0.1	< 0.1	< 0.1	10
Cadmium	µg/l	< 0.02	< 0.02	< 0.02	< 0.02	5
Chromium	µg/l	< 0.1	< 0.1	< 0.1	0.25	50
Copper	µg/l	0.81	< 0.5	0.58	0.59	2 000
Mercury	µg/l	< 0.1	< 0.1	< 0.1	< 0.1	1
Nickel	µg/l	< 0.2	< 0.2	< 0.2	< 0.2	20
Lead	µg/l	0.11	0.23	0.27	0.07	10
Antimony	µg/l	< 0.02	< 0.02	< 0.02	< 0.02	5
Selenium	µg/l	< 0.4	< 0.4	< 0.4	< 0.4	10
Beryllium	µg/l	< 0.02	< 0.02	< 0.02	< 0.02	
Barium	µg/l	219	82.8	172	195	
Coliform bacteria	CFU/100ml	0	0	0	0	0
Escherichia coli	CFU/100ml	0	0	0	0	0
Enterococci	CFU/100ml	0	0	0	0	0
Number of colony forming units at 22°C	CFU/ml	5	2	1	3	Without unusual changes
Effective dose	mSv per year	0.32	0.27	0.32	0.25	0.1