Tallinna Vesi
Loome puhta veega parema elu!

AS Tallinna Vesi

Environmental report 2018

CONTENTS

Chairman's Statement

2018 was an exceptional year for both Tallinna Vesi and Estonia in general. The summer of 2018 was one of the warmest in the past 50 years, with the rainfall being only 50% of the usual level. These conditions are especially challenging for Tallinna Vesi, as the main source of water is from surface reservoirs, but thankfully there were no water shortage issues, with the catchment area continuing to supply sufficient volumes of water.

Our wider operational perfomance was also excelent in 2018. Once again, we managed to achieve further improvements with respect to our results, in both water and wastewater treatment, as well as providing reliable supply of services to our customers, with improved levels of satisfaction.

In a globaal context, Estonia is fortunate as we have plenty of natural fresh water for production of drinking water. Nevertheless, we must constantly make sure we are using the resource wisely. Environmental awareness is fundamentaal in everything we do, which ensures the appropriate management and conservation of our wider catchment area and our wastewater treatment plant at Paljassaare. Throughout 2018, our finaal treated effluent was fully compliant with all legal requirements.

The quality of drinking water also remained very high in our service area during 2018. In the annual customer survey, as many as 86% of the customers sätted that they drink tap water in preference to bottled water. People's environmental awareness has been gradually increasing over the years and continues to be topical in the wider community and meedia. Our contribution to improving environmental awareness is signifiant, and we continue to organise bespoke campaigns, and working closely with kindergartens, schools and the local communities.

For several years, we have proudly observed reduced leakage levels in oour water network. This is not easy to achieve and is directly attributable to the investments made in the wider network, and swift repairs when emergencies arise.

In order to ensure the reliability of service for our consumers, we made several large targeted investments in the water and wastewater networks during 2018, the best examples of which are the reconstruction of water and wastewater network in Gonsiori and Tondi strelets, in the vicinity of Tallinn Airport and at the crossings of Tammsaare-Rahumäe streets and Põhja-Kalasadama streets.

Our most important taski s to proovide a reliable and secure service to our customers and this is something we will never compromise. During 2019, we will continue to work closely with our various stakeholders and the wider community. Challenging objectives have been set for the year ahead, too ensure we continue to deliver an exceptional serivce to our water and wastewater customers.

Finally, I would like to thank my colleagues in AS Tallinna Vesi, Watercom OÜ and United Utilities, and all our suppliers and business partners for their continued support and helping the company to deliver such exceptional perfomance during 2018.

Karl Heino Brookes

Chairman of the Management Board

AS TALLINNA VESI IN BRIEF

AS Tallinna Vesi is the largest water utility company providing water and sewerage services to almost a third of the Estonian population. We serve more than 23 000 home and business customers and we have got 460 000 final consumers in Tallinn and its surrounding municipalities: in Maardu, Saue, Harku (Tiskre, Harkujärv villages and Harku countryside. As at 31 December 2018, the company employed 310 employees.

The company has two treatment plants: Ülemiste Water Treatment Plant and Paljassaare Wastewater Treatment Plant. Also included in the composition of Tallinna Vesi are accredited water and wastewater laboratories.

AS Tallinna Vesi was privatized in 2001. Following privatization with the Service Agreement concluded with the city of Tallinn, the company is committed to ensuring the quality of service at 97 service levels. The current Service Agreement is valid until 2020, but in the Tallinn area of service, the company has the exclusive right to proovide water and sewerage services until 2025.

The public water supply system comprises about 1 150 km of water pipelines, 18 water pumps and 64 underground water wells with a total of 93 wells. The surface water body in Harju and Järva county is about 1 800 km^2. The common sewerage system includes 1 130 km of sewerage network, 490 km of offshore water supply Network and 178 km sewage and sewage pumping stations throughout the service area.

MAIN PRODUCTS AND SERVICES

Collection, treatment and supply of water

Collection, treatment and disposal of sewage and storm water

Design works

Owner supervision and project management

Water and wastewater services

Laboratory services

Pipe construction works

Transportation services and road construction

OPERATIONAL SITES

- Head Office, customer service and support sevices are located in Ädala 10, Tallinn.
- Ülemiste water treatment plant, water and microbiological laboratory are located in Järvevana road 3, Tallinn.
- Paljassaare wastewater treatment plant, composting fields and wastewater laboratory are located in Paljassaare cross 14, Tallinn.
- The catchment area of ca 1,800 square kilometres 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 guiding principles

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

- 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 continuously try to reduce and avoid pollution.
- We use natural resources, including energy and water, sparingly. We continuously seek for new ways to make the processes more environmentally friendly and efficient.
- We act environmentally conscious, Tegutseme keskkonnateadlikult, taking our knowledge and mindset to the community and partners.
- We continuously improve our environmntal management system.

Environmental Management System

We have implemented an integrated management system that meets the relevant quality, environment and safety standards. Our Company`s environmental activity is in compliance with the requirements of the international environmental management standard ISO 14001 and EU Eco Management and Audit Scheme (EMAS) Regulation.

The environmental management system covers all the activities of AS Tallinna Vesi: the extraction and treatment ground water and surface water, drinking water supply to the service areas in Tallinn and surrounding municipalities, collection and treatment of wastewater and storm water, 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, significant environmental aspects and potential environmental impacts, which form the basis for determining the Company`s environmental objectives and tasks for improving the performance. Significant environmental aspects are such activities which, directly or indirectly, influence the nature, quality of services, co-operation between stakeholders, health and quality of life of the 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 accordance with the Company´s 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 employees. We measure, monitor and evaluate environmental performance indicators at least quarterly and, on the basis of these results we make an annual environmental report.

Environmental Aspects and Objects

Table 1: SIGNIFICANT ENVIRONMENTAL ASPECTS 2018

Environmental aspect	Environmental impact from the aspect	Direction of the impact	Further actions
Use of heat energy	Heat energy is generated from natural gas, which is non-renewable resource and a fossil fuel. Causes air emissions, CO2	-	Insulation of buildings, energy savings, use of residual heat
Use of biogas to produce heat	Heat energy is produced on site from biogas, which is a residue of the sludge digestion process. Reduces ecological footprint and dependence on non-renewable sources of energy	+	Maximise the use of produced biogas
Construction waste	Construction waste has low potential of being reused, large quantities of waste damage the soil etc	-	Wider use of no-dig methods in pipeline reconstruction
Use of electricity	CO2 emissions, air pollution, environmental damage, exhaustion of fossil fuels	-	Analysis of electricity consumption, introduction of more energy efficient equipment and energy saving modes
Water extraction	Has an impact on energy and chemical consumption and the resulting environment impacts	-	Reducing the water leakages and process water consumption, applying of new technologies
Compliant drinking water supply to consumers	Consumer can prefer tap water instead of bottled water, thus reducing the impact from the use of disposable plastic bottles. Impact on population's health	+	Constant work in all the stages of water treatment, publishing the information about water quality, maintaining of sanitary protection areas.
Sludge handling	Large quantities make the sludge handling complicated. If the sludge is not recycled back to the environment, the amount of waste that needs to be handled increases		Aspect cannot be assessed, further actions awaiting the court decision.
Discharge of untreated sewage into the environment	Causes pollution, negative impact on marine life and -environment. Impairment of living environment and smell problem.	-	Reconstruction of the treatment process, The construction of separate sewerage system in cooperation with Tallinn City Engineering Department, monitoring of systems.

Table 2: ENVIRONMENTAL OBJECTIVES AND RESULTS IN 2018

Objective	Indicator	Result by the end of 2018
Comply with all legal standards, environmental permits and requirements of the Services Agreement.	0 non-compliances	0 non-compliances
Reduced percentage of clean water leakages.	≤ 14.5 %	13.71%
Compliant effluent parameters at the Wastewater Treatment Plant outlet (averaged quarterly result)	0 non-compliances	0 non-compliances
Minimize the evitable sudden discharge of untreated wastewater to the sea.	Amount of untreated wastewater discharged to the sea in 2018 (th m3/y) <125 th m3/y	Adjustments made to the project desing, new procurement and designing phase is being finalised, extension of the project deadline
Improve the effluent quality to reduce the pollution load to the Baltic Sea	P_{tot} annual average ≤0.45 mg P/l	P_{tot} average is 0.39 mg P/l
Reduce the use of natural gas bought externally at the Wastewater Treatment Plant	Biogas production >7000 m^3/d	Biogas production 9990 m^3/d, no natural gas was used.
Reduce energy use at pumping stations	Air heat pumps installed and in operation.	Air heat pumps are installed and in operation.
Prepare sustainable solution for handling the sludge	Studies completed, solution for the reuse of sludge identified and implemented, in accordance with current legislation.	Based on current legislation, stabilized sewage sludge is handed over to waste operators for reuse. Search for any new alternatives is currently stopped because suitable alternatives cannot be used under the current legislation.
Re-organising the waste management system	Volume of mixed municipal waste in 2018 < 2015-2016 average.	In 2018 the amount of mixed municipal waste was 72.09 t. (in 2015-2016 the amount was 78,5 t).
Improve the stakeholders' (employees, young generation, consumers and community) environmental awareness and knowledge of the Company's activity, in order to increase and maintain Company's good reputation (image).	≥ 1100 children have participated in water classes	1243 last children participated
	≥ 65 guided tours /yr	81 guided tours held
	≥ 2 open doors day	2 open doors day held
	≥ 1 water- and environment related campaign or participation in an outdoor event	1 campaign focusing on tap water is carried out

Table 3: ENVIRONMENTAL OBJECTIVES IN 2019

Objective	Indicator	Due date
Reduce the percentage of clean water losses.	≤ 14.0 %	2019
Increase the efficiency of raw water treatment by choosing raw water based on its qualitative characteristics and thereby reducing the water consumption.	Alternative water intake is designed, constructed and taken into use.	2020
Operations comply with the terms set out in the water permits issued by the Environmental Board.	0 non-compliances	2019
Stabilized sewage sludge recycling	0 tons of stabilized sewage sludge landfilled	2019
Minimize the evitable sudden discharge of untreated wastewater to the sea.	Reconstruction works completed, amount of untreated wastewater discharged to the sea without dilution (at least 1:4) = 0 m^3	2021
Reduce energy consumption in the sewage pumping stations by improving existing ventilation systems. Estimated heat and electricity savings are approximately 50 MWh/yr.	Ventilation systems have been improved and are in use in all 7 (Harku, Laagri, Raba, Linnahall, Airport, Tartu mnt, Mõigu) sewage pumping stations.	2019
Reduce the use of electricity and chemicals as well as the discharge of untreated wastewater into the environment.	The separate sewers scheme for the city centre is completed.	2019
Reduce the amount of waste generated during construction and reparing of water and wastewater piplines by extending the use of no-dig construction techniques.	10 % of all sewerage-related reconstruction works have been carried out using no-dig construction techniques.	2019
Reducing the amount of waste generated and raise the awareness of our employees.	By the end on 2019, no more disposable plastic containers are used. During the year sustainable alternatives to disposable plastic containers have been found (biodegradable, reusable etc.)	2019
Improve the stakeholders' environmental awareness and knowledge of the Company's activity (employees, young genetration, consumers and community).	≥ 2000 people/yr have participated in classes/excursions ≥ 65 guided tours/yr ≥ 2 water- and environment related campaign or participation in an outdoor event	2019
Reduce the amount of paper used for printing by employing digital alternatives.	Reduce the amount of paper purchased and used by 5%. At least one „public" computer available for use each in unit. All unnecessary printers are identified and removed.	2019

Complicance of the Activities 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 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, Ambient Air Protection Act, and subordinate acts based on these acts must be ensured. Pursuant to the Water Act, we must ensure that effluent discharged from a wastewater treatment plant complies with established limits and adhere to the requirements of the Public Water Supply and Sewerage Act in our service and connection process. Under the Waste Act, we organize the recycling of sewage sludge. Under the Chemicals Act, we are a Category B major-accident company and are subject to specific requirements. The Atmospheric Air Protection Act establishes air emission limit values and reporting obligations.

At the local level, we are obliged to comply with different rules and requirements applicable in Tallinn and its surrounding municipalities.

Amendments to the requirements and legislation are being constantly monitored. In case changes are made to the legislation that concerns the Company, those are communicated to the managers and specialists responsible for the relevant matters, allowing them to assess the impact of the amendments on the Company and amend our processes accordingly if necessary.

In cooperation with the Estonian Waterworks Association we participate in the rounds of approvals of legal acts pertaining to the water sector and environmental matters by presenting our opinions and making amendment proposals to the draft legal acts under discussion. Our participation, via the Estonian Waterworks Association, in the work groups, which draft water and environmental legislation, has provided us with the opportunity to communicate our positions directly to the relevant ministries.

In 2018, it continued to be important for us to participate in the drafting of the new Public Water Supply and Sewerage Act, which will continue to be active in 2019. In addition, through 2018, EVEL participated in the creation of a new Drinking Water Directive.

The most important drafts, in which the specialists of AS Tallinna Vesi actively participated in the procedure and in proposing amendments, were the new Public Water Supply and Sewerage Act and the new Law on Amendments to the Water Act but which is likely to be submitted to the new composition of the Riigikogu for further consideration. In addition, work was done on many other drafts of importance to us.

Environmental permits

We act in accordance with the terms and conditions set out in the environmental permits issued to the Company. Environmental Board's department has issued the following environmental permits to us:

- 4 permits for a special use of water (details on page 14);
- 2 waste permits (details on page 30);
- 2 ambient air pollution permits (details on page 34).

Requirements of the Services Agreement

On 12 January 2001 we concluded a tripartite Services Agreement with the City of Tallinn and investors, which, among other things, obliges us to comply with 97 Levels of Service. This makes us the most regulated water undertaking in Estonia. Our activities and levels of services are assessed once a year by an impartial inspection

body – Supervisory Foundation for the Water Companies in Tallinn – to whom the Company annually, i.e. by the end of the first quarter, submits a report on compliance with the levels of service.

In 2018, we were in compliance with and in many cases outperformed all of the contractual levels of service. For example, in 2018 water quality at the customers' taps was 99.93% compliant with the standards, which is the best ever result outperforming the quality level specified in the Services Agreement by 4.93%. Also, the level of leakage continues to be belowe the target of 26%. In 2018 the leakage rate was 13,71%. This is the best result in the history of the Company and has been achieved through forward-looking efforts and consistent work. The best result in years was also achieved in reducing drainage discharges. Thanks to the preventive maintenance and upgrading the sewerage network, we managed to reduce the number of blockages to 650 in 2018.

Requirements to contractual partners

As strict requirements apply to our activities, we consider it to be very important that our suppliers and contractors meet the environmental and occupational safety requirements, too. Among other things, the providers of construction works must confirm that they comply with occupational safety and environmental protection requirements at our repair and construction sites. In 2018, all of our contractors were reminded of an informative letter regarding current occupational safety requirements for repair and construction sites. We plan to continue informing such contractors in the coming years.

We have established several criteria in our procedures which enable us to make sure that our partners meet our expectations. Our specialists monitor the activity of suppliers/contractors with regard to the safety and environment at sites on a daily basis.

Management system control and audit

In spring 2018, an external audit was carried out in the Company by an accredited certifier AS Metrosert in order to evaluate the compliance of the management system with the requirements of ISO 9001:2015, ISO 14001:2015, OHSAS 18001:2017 standards and with the Regulation (EC) No 1221/2009 (EMAS). As a result of the external audit, certifier confirmed the continuous compliance of the Company's integrated management system with the aforementioned standards and EMAS regulation. The auditors also verified that the 2016 environmental report complied with the requirements of EMAS. In their report, the auditors highlighted many positive observations about company's services. Among other things, the audit stated that the applied management system complies with the requirements set by the standard and is effective and contributes to the company's policy and objectives.

In addition to external audits, internal audits were carried out to assess the perfomance of the management system, in accordance with the inetrnal audit plan. As a result of internal audits carried out in 2018, our internal auditors put forward a total of 24 improvement proposals. The improvement proposals were analysed by the responsible managers and the corrective actions were performed.

The compliance of the activity and management system of Company's laboratories against the requirements of ISO 17025 standard were audited by the Estonian Accreditation Centre in 2018. The auditor did not find any non-conformities.

Environmental Education and Consumer Awareness

We keep on working hard to promote the environmental thinking amongst our population. We encourage people to drink tap water and make explanations on the prevention of sewage discharges. With our message "Tap water is drinking water" we draw people's attention to the very good quality of tap water. We also continued our co-operation with restaurants so that the customers would have the courage and awareness to ask for tap water when they dine out in restaurants. In addition, we participated in several public events and set up new public water taps to increase the availability of tap water. While only few years ago, in 2011, 48% of people trusted to drink tap water, the number of people trusting tap water quality had grown to 86% by the end of 2018.

- We continue contributing to environmental awareness of young people who would value the nature and environment. Each year, our employees organize water lessons in kindergartens and schools discussing water circulation, how to save water and avoid blockages. 1,243 children participated in these lessons in 2018.
- In order to promote the environmental awareness of our employees, we went on a tour in 2018 at the AS Ragn-Sells waste station. There was an opportunity to get acquainted with the daily work of sorting waste and for which it is important to do it already at the place of waste generation. Surely this tour raised the awareness of our employees, which in 2018 increased the volume of waste sorting.

- Over the years, we have prepared many educational study materials related to water and environment issues 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. The games and puzzle book for kindergartens and primary schools got new great sequels in the form of Tilgu's playing cards and a puzzle book „Puzzle with Tilgu".
- Tallinna Vesi in cooperation with Kiek in de Kök organized the exhibition "Pure water. Tallinn Water Supply Story ". In addition, a family day was organized in Kiek in de Kök, where participants from Tallinn Water spoke about the connection between tap water and the environment. In addition, exciting water experiments were conducted.
- n 2018, we launched an information campaign called "Water, Tap Water!", Which encouraged people to prefer tap water in every situation. The campaign clip was shown in cinemas, on digital screens in the streets, and on social media. There were also posters promoting tap water in Tallinn's city busses. The effectiveness of such outreach work is evidenced from year to year by the very high level of constant tap water drinkers. Based on the results of a customer satisfaction survey, in 2018, 86% preferred tap water, while many who do not drink tap water simply prefer other drinks.
- In addition to our core tasks – driking water and wastewater treatment – our treatment plants also play an important role in raising awareness among the general public. Every year we introduce the work of the stations toa n increasing number on interested people During the year we conducted over 81 excursions in the stations. In addition, in the spring of 2018, we organized an open day for residents of the city at a wastewater treatment plant and in the autumn we opened the doors for everyone interested in the Ülemiste water treatment plant.

Quality and Use of Water Resources

Permits for special use of water

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

All requirements established in the permits for a special use of water were met in 2017. Fee for a special use of water is paid for the amount of water taken from Ülemiste lake into the water treatment plant and for the ground water pumped from the aquifers. In 2018, the fee for a special use of water amounted to 4.1% of the costs of the sold products/services (2017: 4,5%).

Table 4: VALID PERMITS FOR SPECIAL USE OF WATER OF AS TALLINNA VESI

Permit for special use of water no.	Valid until	Description of special use of water
L.VV/331954	31.12.2030	**Saue City public water and sewerage service area.** Extraction of ground water from boreholes, over 5 m^3/day. Collection of wastewater and directing wastewater to Paljassaare Wastewater Treatment Plant owned by AS Tallinna Vesi.
L.VV/322982	30.09.2019	**Tallinn public water suply and sewerage system main operating area, Tallinn surface water catchment system facilities area in Harju and Järva Counties.** Regulating surface water resources in water bodies of Ülemiste-Pirita-Jägala surface water system, water extraction from Lake Ülemiste, extracting ground water from Ordivician-Cambrian and Cambrian-Vendi aquifers through Tallinn public water supply and sewerage system boreholes, for discharging biologically treated effluent through a deep-sea outlet pipe into Tallinn Bay and for discharging mechanically treated storm water into the sea, Mustjõe Stream and Pääsküla Wetland.
L.VV/328381	31.12.2042	**Harku Municipality.** Extraction of ground water from boreholes, over 5 m^3/day.
L.VV/328349	01.07.2039	**Maardu City public water supply and sewerage system operating area.** Extracion of industrial and drinking water from Cambrian-Vendi aquifers in order to supply water to Maardu City, Kallasvere and Muuga area. From november 2012 all Kallasvere and Maardu public sewerage system is discharged to Tallinna public sewerage system..

Water catchment

Nearly 90% of our consumers in Tallinn and Maardu get their drinking water from the surface water resources. Even though Lake Ülemiste is the main drinking water source for the people of Tallinn, the natural catchment of the lake itself is small. To increase the water volume and ensure that the needs of the 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 the total area of ca 1,800 km^2. The most important water reservoir is Lake Ülemiste with a net volume of 15.8 million m^3. Additional water reserves, can also be to improve Ülemiste lake's poor water quality, have been accumulated to Paunküla water reservoir on the headwaters of the Pirita River (9.9 million m^3) and to Soodla water reservoir on the Soodla River (7.4 million m^3).

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 resource in the most efficient manner. To regulate the water resources in an optimum and accurate manner we have established water metering points at all hydropoints, which enable us to meter the flows conducted to the channels and the sanitary flows in the rivers. We perform metering regularly, as per the requirements of the permit for a special use of water.

The year 2018 is characterized by low water levels and modest ice conditions. For the fourth year in a row, the water regime of the first quater of the year can be described in quite similat terms: the winter was warm and unstable temperature, snowless, ice short-termed, unstable or not at all, fluctuating conditions with winter flood and waterless high water period. Lake's water temperatuure was in April already 9.5°C. The summer season is characterized by above average temperatures and low rainfall. The dry summer affected the runoff of the rivers belonging to the catchment system and the water levels of the reservoirs, which were the lowest in the last 10 years. The climate remained low precipitation level until the end of 2018

In order to protect the water resources and the water body used for the drinking water extraction, a sanitary protection zone around Lake Ülemiste has been formed. The sanitary protection zone, which comprises Lake Ülemiste, water catchment facilities, bank reinforcements and the land in the immediate vicinity of the lake, needs to be kept in its natural condition. In addition, sanitary protection zones have been formed in the catchment area to protect the facilities of Soodla, Kaunissaare, Paunküla and Aavoja water reservoirs.

Use and quality of surface water

According to the permit for a special use of water no L.VV/322982, the Company is allowed to extract 47.60 million m^3 of surface water per year from Lake Ülemiste. The actual surface water extraction in 2018 was 24.31 million m^3.

Table 5: USE OF SURFACE WATER FROM LAKE ÜLEMISTE AND COMPLIANCE WITH THE PERMIT FOR A SPECIAL USE OF WATER No. L.VV/322982, million m3

	2014	2015	2016	2017	2018
Use of surface water from lake Ülemiste	22.61	22.76	23.73	23.72	24.31

Maximum amount allowed 47,6 million m^3/y

The water quality in surface water sources is monitored in line with the program determined by the permit for a special use of water. In 2017, the quality of raw water extracted from the water catchment system was compliant with the Decree No 1 issued by the Minister of Social Affairs. We have been taking raw water samples from the intake of our water treatment plant on a daily basis to ensure the 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 line 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.

Table 6: ÜLEMISTE LAKE'S WATER QUALITY IN 2014-2018

Parameter	Unit	Average results				
		2014	2015	2016	2017	2018
Colour	mg/L Pt	33	36	34	38	39
Turbidity	NTU	8.2	12.0	10.5	10.5	9.6
pH		8.30	8.90	8.32	8.27	8.23
Permanganate index (COD_{Mn})	mg O_2/l	8.9	11.2	9.9	11.1	11.8
Total organic carbon (TOC)	mg C/l	9.5	11.0	10.0	10.7	11.2
Total phosphorus	mg/l	0.036	0.030	0.028	0.038	0.047
Total nitrogen	mg/l	1.17	1.45	1.58	1.60	1.5
Ammonium, NH_4^+	mg/l	0.019	0.038	0..085	0.112	0.085
Phytoplankton abundance	objects/ml	17298	100004	5771	7168	7500

At the beginning of 2018, the water quality of Lake Ülemiste remained similar to that of 2017. The oxidation of raw water was above average and plankton levels were also high. Water quality improved in the second half of the year. Due to the dry summer, water was drawn from the catchment area of Lake Ülemiste

Use and quality of ground water

Approximately 10% of consumers in Tallinn are supplied with water extracted from the Cambrian-Vendian and Cambrian-Ordovician aquifers. Ground water is supplied in the districts of Nõmme, Laagri, Merivälja, Pirita and Tiskre in Tallinn, Tiskre village in Harku Rural Municipality and City of Saue. Total of 2,655,821 m^3 of ground water was extracted in 2018.

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

Parameter	Maximum volume permitted	Average results				
		2014	2015	2016	2017	2018
Tallinn (Permit no. L.VV/322982)	7150,7	2076,3	2 146,1	2437,4	2384,2	2323,8
Saue (Permit no. L.VV/323855)	511	230,7	265,5	278,7	283,9	290,5
Harku (Permit no. L.VV/328381)	110	57,9	58,6	46,7	42,3	41,1
Maardu (Permit no. L.VV/328349)	720	0	0,1	0,3	0,48	0,28

According to the EU Water Framework Directive (2000/60/EC), the qualitative or chemical condition of ground water is regarded to be good if the concentration of pollutants does not indicate an inflow of salty water or other water, nor does it exceed the respective quality standards. In 2018, the quality of drinking water at the borehole pumping stations complied with the requirements of the Regulation No 82, issued by the Minister of Social Affairs. There were no ground water pollution incidents or potential pollution incidents demanding the notification of the City of Tallinn and the Health Board.

We monitor the ground water quality parameters in accordance with the permits for a special use of water and the drinking water source quality monitoring programme, and if necessary, the ground water will undergo a

treatment process. On a monthly basis we monitor the treated ground water quality (content of iron, manganese, and ammonia) in 20 ground water pumping stations, which constantly provide water to the public network. All the bore-wells that are currently in use are equipped with automatic hydrostatic pressure sensors, which enable to measure the static and dynamic level of ground water. The results of this measuring enables us to assess the recovery of ground water resources.

Ground water in Northern Estonia (Cambrian-Vendian aquifer) contains natural radionuclides. The natural radioactivity of Estonian ground water has been thoroughly studied by the Geological Survey of Estonia, as well as the 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 this risk assessment, any random health damage resulting from the content of radionuclides in the water of Cambrian-Vendian bore-wells is unlikely. Repeated radiological analyses in all the bore-wells are carried out in every ten years, in accordance with the requirements.

Drinking Water Production and Quality

Last year we supplied 25 million m^3 of pure drinking water to our consumers. Drinking water quality is required to comply with the Regulation No 82 "Quality and Control Requirements and Analysis Methods for Drinking Water", issued by the Minister of Social Affairs on 31 July 2001 (hereinafter referred to as the Regulation No 82), originating from the Estonian Water Act and the European Union Drinking Water Directive 98/83/EC. The water quality is monitored following the monitoring programmes approved by the Health Board. Samples are taken from the raw water (Lake Ülemiste, its catchment area, and ground water), treatment process, water tanks at the groundwater pumping stations, as well as the customer taps.The quality indicators for drinking and groundwater in Ülemiste Water Treatment Plant in 2017 are added at the end of the report.

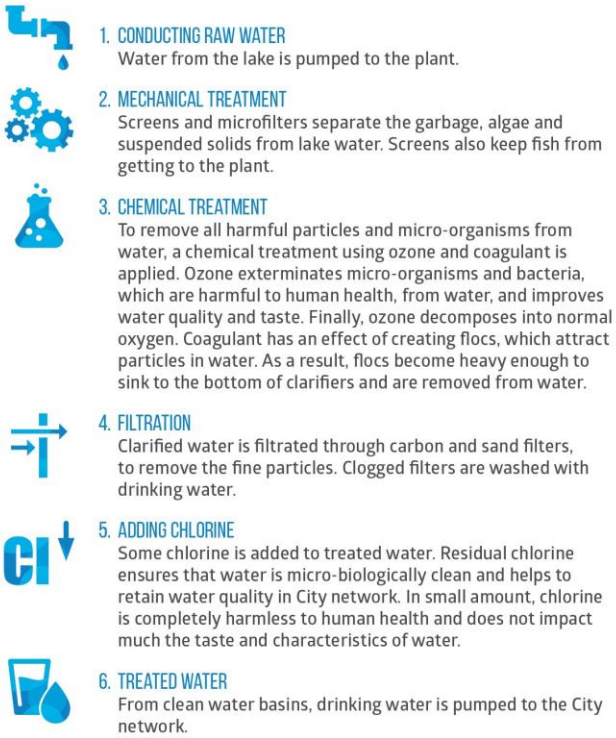
Water analyses are carried out by the Company's water and microbiology laboratory, which is one of the largest water laboratories in Estonia. The quality of the analyses is guaranteed by the certified samplers and laboratories accredited by the quality management system (EVS-EN ISO/EC 17025 standard), using modern equipment and professional staff. In 2017, our water and microbiology laboratory performed a total of 100 000 analyses.

Veeanalüüse teostatakse meie vee ja mikrobioloogia laboris, mis on ühtlasi üks Eesti suurimaid veelaboreid. Analüüsitulemuste kvaliteedi tagavad nii atesteeritud proovivõtjad kui akrediteeritud kvaliteedijuhtimissüsteemi (EVS-EN ISO/IEC 17025), kaasaegse aparatuuri ja professionaalse personaliga laborid. 2017. aastal teostasid meie vee- ja mikrobioloogialabor kokku 100 000 analüüsi.

Thanks to the high quality of water and improved awarenesss of consumers, the number of people drinking tap water in our service area has shown a steady increasing trend over the last years.

Surface water treatment process

Figure 1: Water treatment process at Ülemiste water treatment plant



Ülemiste Water Treatment Plant treats water extracted from the lake applying a treatment scheme which is used world-wide. 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 treatment – preliminary ozonation, coagulation, clarification, filtration, and disinfection.

In 2018 the Water Treatment Plant was invested in several major projects.

From the environmental point of view, one of the most important projects was the installation of a frequency converter on the clarifier purge pump, which saves a considerable amount of water. In addition, 6 tanks were reconstructed in 2018, which is an important investment for the sustainability of the cleaning process

Ground water treatment

Ground water used for producing drinking water usually falls under the quality class I-III. Ground water from Ordovician-Cambrian aquifer usually falls under the quality class I and does not need any treatment. However, ground water from Cambrian-Vendian aquifer, which is the main drinking water source, qualifies as class II or III and requires treatment. The main reason is mostly a natural excess content of iron, manganese, or ammonium, resulting in higher turbidity of water than usual.

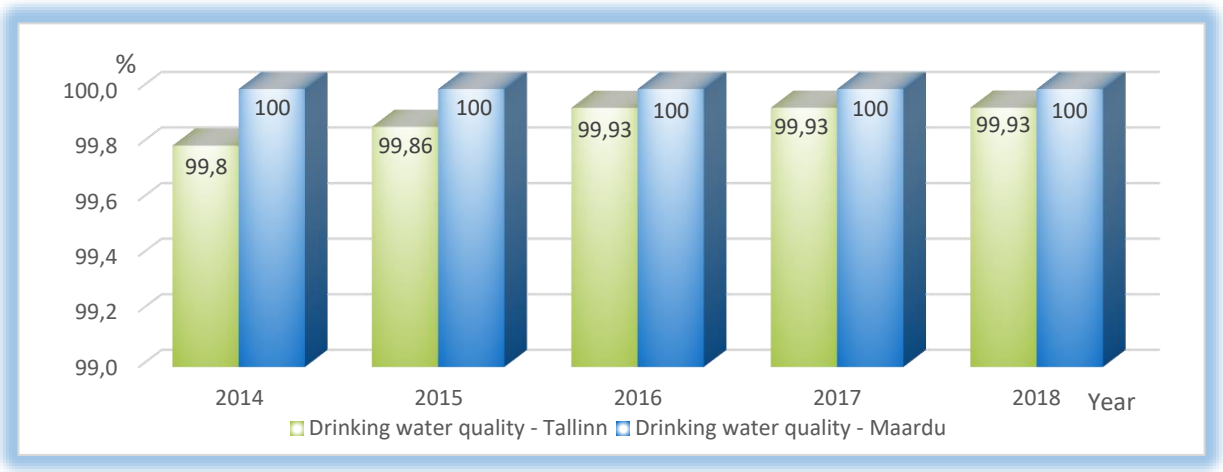
The Water Act implies the preservation of ground water as similar to its natural conditions as possible, therefore, no chemicals are used. In order to supply compliant drinking water, we treat ground water by using filtration and aeration to remove excess iron, manganese and ammonium from the water. The samples taken after the ground water treatment process indicate a significant decrease in turbidity as well as in the content of iron, manganese and ammonium, an improvement of colour and stability index and an increase in oxygen content.

Drinking water quality in the network and at customer premises

Tap water in Tallinn and Maardu is of a very good quality and safe to drink. In terms of quality, the year 2017 did not differ from the previous periods. During the year, we took samples twice a month at the sampling points (at customer premises) agreed with the Health Board.

99.93% of all water samples complied with the standards, which means that in 2018 we detected non-compliances only in 2 samples of the total of 2,977 samples taken from the customer taps. Non-compliances are mainly related to higher iron and turbidity parameters caused by the conditions of the water network. We always react immediately to a non-compliance.

100% of the 144 water samples taken in Maardu in 2018 complied with the requirements. Before connecting with Tallinn water network, the quality compliance of drinking water in Maardu was only 33%.



Ghart 1: Compliace of the quality of drinking water with the requirements set out by the Minister of Social Affairs decree no. 82 in 2014-2018, %

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 high drinking water quality for our consumers we regularly clean and flush the water network. During the cleaning process the sediment build-up is removed from the network, serving as one of the important methods for improving water quality in distribution networks. In 2018, air-scouring pipe cleaning method was carried out on 135 km of water network.

Table 8: CLEANED WATER NETWORK 2014-2018, km

	2014	2015	2016	2017	2018
Cleaned water network	146	140	137	137	135

Investments in replacing 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 sewerage network and 5 km of water network, pursuant to the Services Agreement signed with the City of Tallinn.

Leakages and interruptions to water supply

One of our key objectives is to keep the losses of water in the water network at a minimum level. The Services Agreement covering the service area in Tallinn sets the obligation to the Company to reduce the level of leakages to 26%. We have managed to keep the leakage at a considerably lower level than that for several consequtive years already, achieving 13.71% in 2018. About ten years ago the level of leakages exceeded 32%, which means that we are currently saving over 27,000 m^3 of treated water a day compared to ten years ago. The reduction in the level of leakages has been facilitated by our consistent efforts to use the water resource sustainably and with lower losses.

Table 9: LEAKAGE LEVEL IN 2014-2018, %

	2014	2015	2016	2017	2018
Leakage level	16.14	14.68	15.07	13.82	13,71

Daily water loss monitoring helps to find as fast as possible and to reduce the level of leakages. Our specialists have special equipment for finding leakages and, along with zoning the network and remote reading devices, it allows us to detect the leakages faster.

In order to mitigate the inconveniences resulting from an interruption to the service, we notified the customers in advance of unplanned interruptions nearly 95% of the events. In case of interruptions to water supply we provide customers with a temporary water supply with the water tanks.

Water metering

The water meters we use are of high quality. All new water meters comply with the currently applicable European standards and European Measuring Instruments Directive along with the relevant accuracy requirements established therein. The expert studies and calibration of water meters is performed by the national Central Office of Metrology, AS Metrosert.

24 765 water meters in total have been installed to customers' connection points. Water meters enable a more accurate accounting for the usage of water resources. Under the current Metrology Act, we are required to calibrate the water meters, based on which the transaction between the water company and its customer is based, every five years.

Wastewater Collection

Wastewater Network and collection of wastewater

Wastewater is directed to the wastewater treatment plant by using the combined sewer system, which collects both sewerage and storm water. Some parts of our service area are also covered with a separate storm water system with storm water outlets. However, most of the storm water is collected with a combined sewer system and ends up at the wastewater treatment plant in Paljassaare.

The number of blockages is a good indicator for reflecting the condition of the wastewater network. Blockages are mainly caused by the sediments build-up in the wastewater network or the misuse of the wastewater network by consumers. Initially, the pipelines were dimensioned for larger flow volumes, so today's smaller water consumption results in the reduction of flow volumes and flow speeds, which in turn increases the risk of blockages. Additionally, continuous extension of sewerage network is affecting the total number of blockages.

Table 10: NUMBER OF BLOKAGES IN 2014-2018, pcs

	2014	2015	2016	2017	2018
Number of blockages	771	759	707	699	650

We have been able to achieve steadily good level of blockages in the recent years due to many preventive actions, such as arranging preventive flushing on the pipelines. For flushing a pipe, first, a flow speed is generated with high pressure carrying sediment into the nearest cesspool. Sediment is then collected with pressure washing trucks and transported to Paljassaare Wastewater Treatment Plant.

In addition, each year the Company rehabilitates at least 5 km of problematic wastewater pipelines, which also contributes to the effective wastewater collection.

Discharging

To serve the inhabitants whose properties have not been connected to the sewerage system, the Company has provided two dicharge places in Tallinn, where sewage suction trucks bring sewage from septic tanks. The availability of discharge places contributes to ensuring that the sewage from septic tanks finally ends up in the wastewater treatment plant and gets treated to a required degree. Consequently, it diminishes the risk of environmental pollution caused by discharging sewage in a manner and place not intended for the specific purpose.

The discharge services that help to make sure that sewage from septic tanks is delivered to Paljassaare Wastewater Treatment Plant through the discharge places are provided by our partners in Tallinn. Although the number of inhabitants, who are not connected to the sewerage system, is below 1%, the volume of sewage transported from the septic tanks in Tallinn and neighbouring municipalities to our discharge places last year amounted to approximately 85,000 m^3. Therefore, we continue to cooperate with various local governments in Harju County to find the best solutions for discharge services outside Tallinn as well.

Pollution load in wastewater and storm water

In order to ensure acceptable pollution load in wastewater reaching the Paljassaare wastewater treatment plant we regularly monitor the wastewater discharged in Tallinn and Maardu and in the surrounding areas and check the compliance of pollution parameters with legal requirements.

In 2018, our Wastewater Inspectorate performed 453 inspections to identify inspection wells, to check local treatment facilities and boundary drawings. 1,000 wastewater samples, in addition to 487 monitoring samples were taken for determining the wastewater pollution load at sites. Over-pollution instances were identified and over-pollution fees were applied on 514 occasions.

In 2018 the level of precipitation in Tallinn was 538.4 mm per area unit, which is significantly less than in 2017. Consequently, the amount of storm water discharged to the environment through storm water outlets also decreased in 2018.

2018. aastal langes Tallinnas ühele pindalaühikule keskmiselt 538,4 mm sademeid, mis on oluliselt vähem kui möödunud 2017. aastal (865 mm). Sellest tulenevalt langes ka 2018. aastal sademevee väljalaskude kaudu looduskeskkonda juhitud sademevee ja reostusainete kogused.

Table 11: STORM WATER VOLUME 2014-2018, miljlion m3

	2014	2015	2016	2017	2018
Storm water volume	4,08	4,2	5,8	6,6	3,8

According to the requirements set by the permits for a special use of water we monitor 24 storm water outlets, the largest among them being the Lasnamäe, Harku and Mustoja outlets. In orde to prevent any potential pollution, some of our storm water outlets (in Olevi, Kaare, Raba and Vabaduse Streets) have been equipped with sand and oil traps, which are regularly maintained.

Table 12: POLLUTANTS FROM THE MAIN OUTLETS IN 2014-2018, t

	2014	2015	2016	2017	2018
Suspended solids	109,4	84	87	130	84,3
Oil products	0,8	0,2	0,4	0,6	0,2

Wastewater Treatment

We treat the wastewater collected in Tallinn and nearest surrounding areas at Paljassaare Wastewater Treatment Plant. We are committed to maintaining the high standards and achieving the results that would outperform the standards that have been set for the treated effluent discharged into the Baltic Sea. Almost 43.9 million m^3 of wastewater was treated at Paljassaare wastewater treatment plant in 2018.

Figure 2: Description of the wastewater treatment process at Paljassaare Treatment Plant

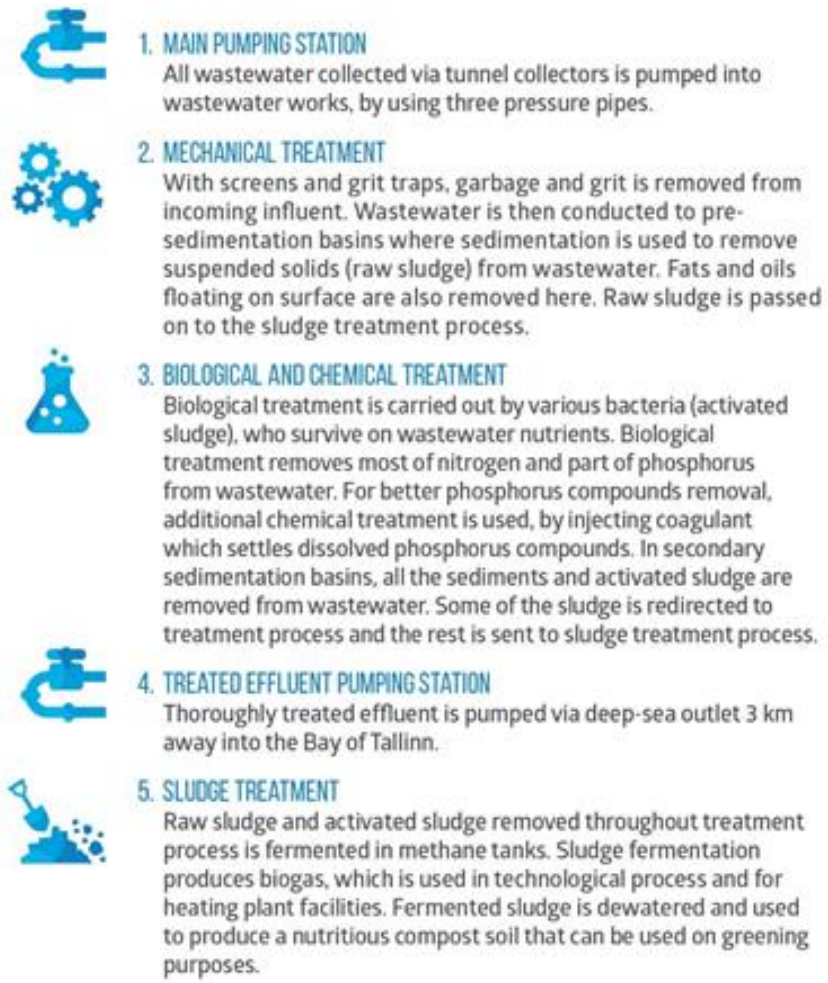


Table 13: TREATED WASTEWATER VOLUME IN 2014-2018, milj m3

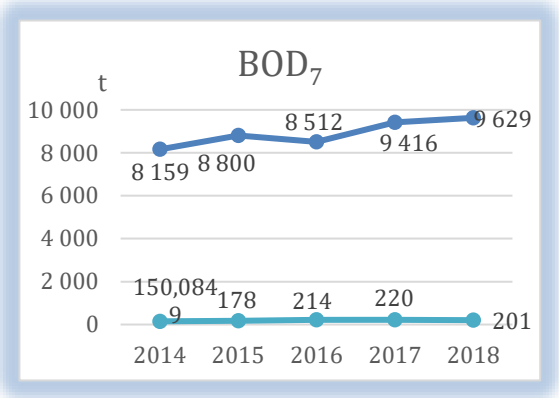
	2014	2015	2016	2017	2018
Treated wastewater volume	42.99	45.07	50.22	51.49	43.92

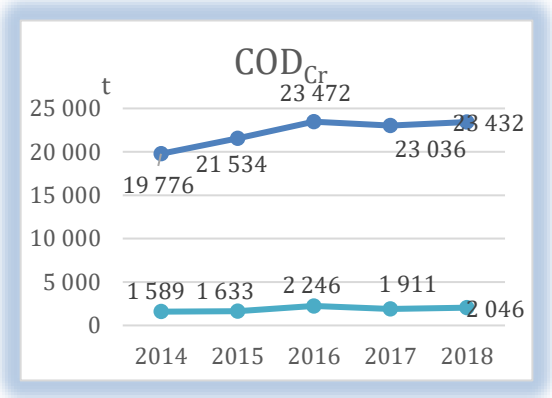
The requirements for the quality of effluent discharged into the sea are determined by the legal acts and the water extraction permit no L.VV/322982. The concentration of pollutants in inlet and in the outlet are monitored in order to assess the efficiency of the treatment process and the quality of effluent. In 2018, the wastewater laboratory carried out about 51,000 analyses at different wastewater treatment stages, storm water discharged and wastewater collected.

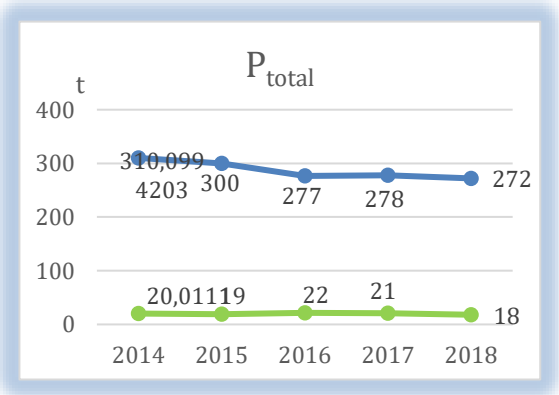
The important pollution parameters for us are the following:

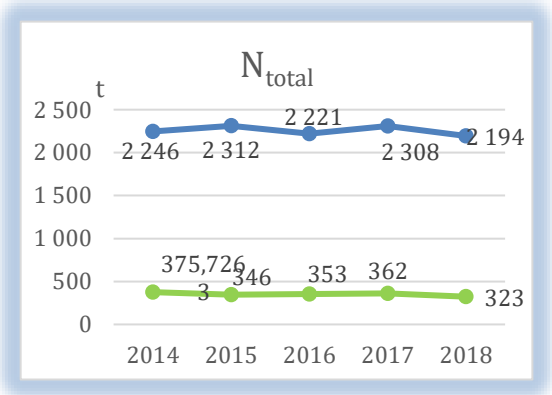
- BOD_7 - biological oxygen demand shows the amount of oxygen, it takes to decompose the organic matter in the course of 7 days;
- COD_{Cr} - chemical oxygen demand is an indicator for the decomposition of organic matter, measured as the consumption of oxygen in chemical oxidation of the organic matter in water;
- SS - suspended solids shows 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- and phosphorus compounds serve as nutrients, which in high quantities lead to the eutrophication of water bodies.
- Oil products - shows the amount of non-volatile oil products in water.

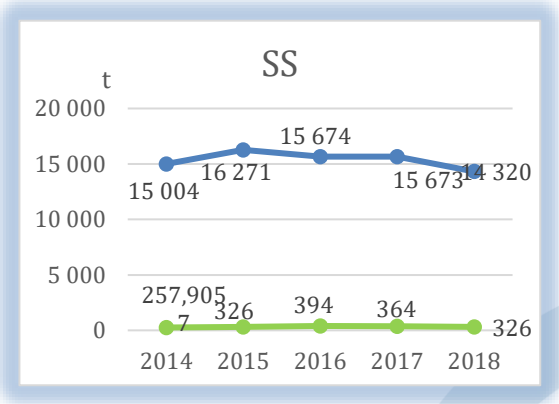
Ghart 2: Amount of pollutants coming to the wastewater treatment plant and discharged into the sea in 2014-2018, t/y

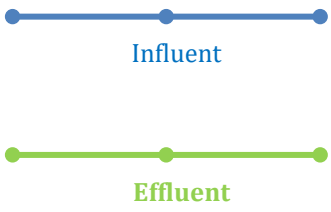




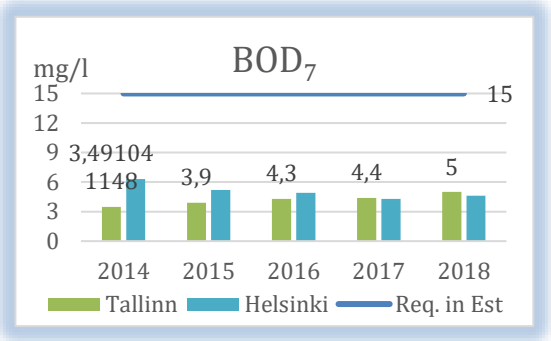


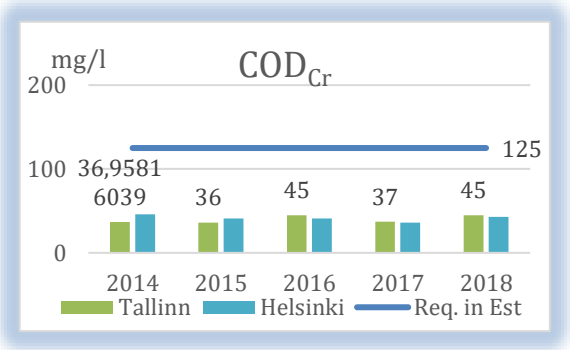


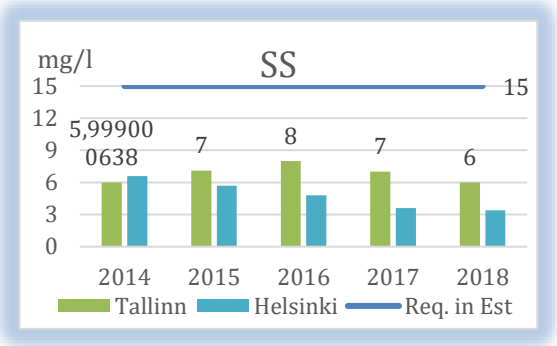


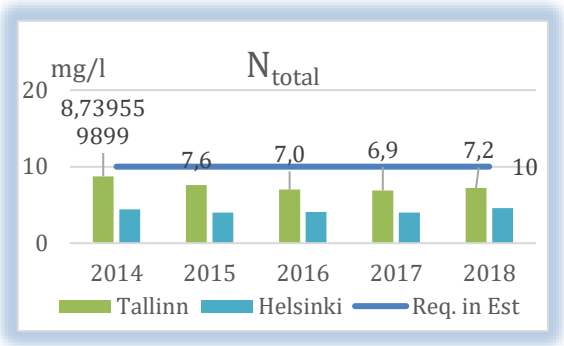


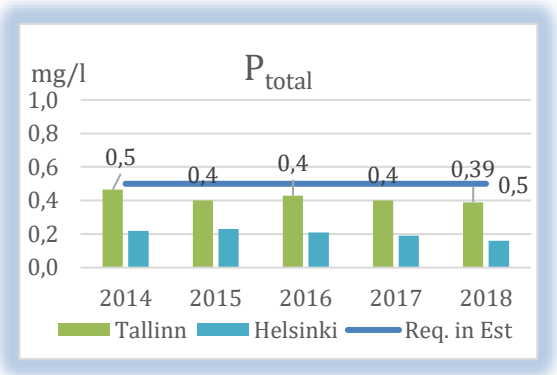
Ghart 3: Average pollution concentration in treated effluent in 2014-2018, compared to regulatory maximum allowable limit and results of Helsinki HSY, mg/l

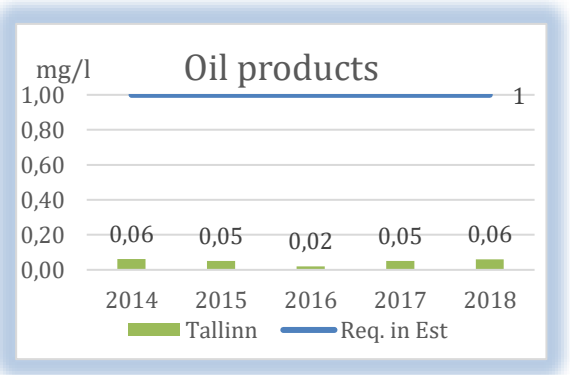






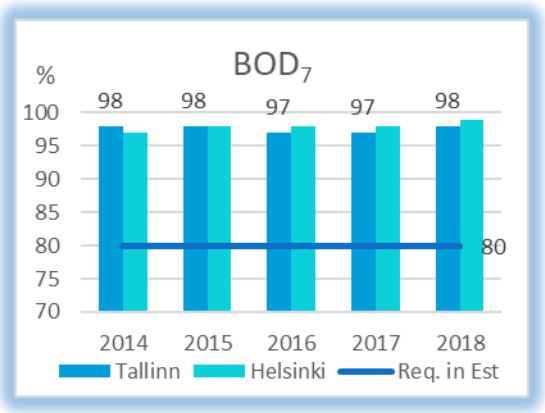


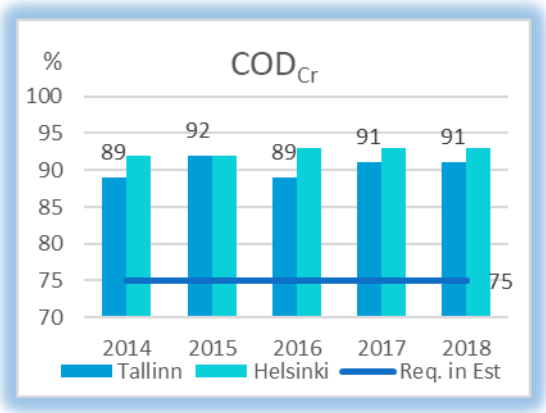


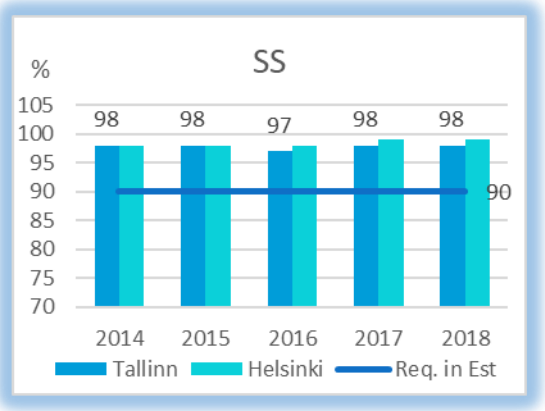


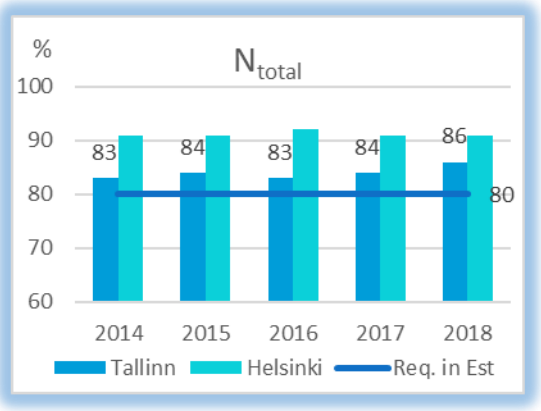
In 2018, the outgoing sewage water from wastewater treatment plant parameters for all wastewater treatment plants were met, as well as purification efficiency and, in summary, the wastewater treatment results were largely in the same magnitude compared to the previous year.

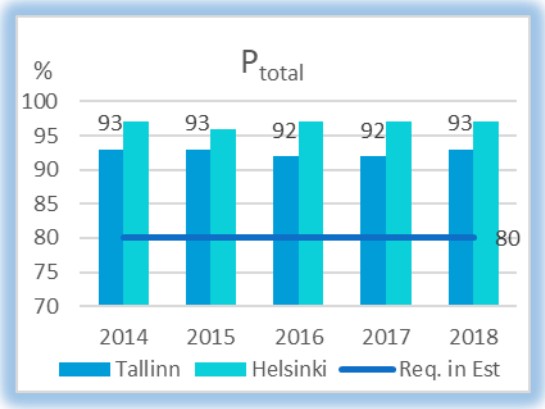
Ghart 4: Wastewater treatment plant's treatment efficiency in 2014-2018, compared to regulatory minimum requirements and results of Helsinki HSY, %

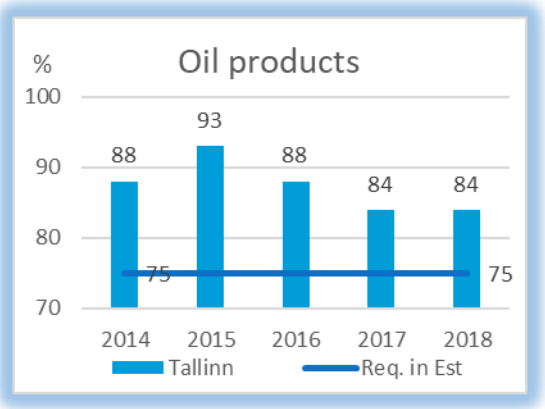












Wastewater outlets to the sea

During 2018, we were bound to open the emergency outlets in the wastewater treatment plant two times for a short period of time during heavy showers, in order to avoid any major damages. Total of 154,673 m^3 of wastewater diluted by storm water (dilution ¼) was conducted to the sea.

Due to the shock loads which exceeded the biological treatment capacity, 589,822 m^3 of highly diluted wastewater that had undergone mechanical treatment was discharged into the sea through the deep-sea outlet in 2018.

Table 14: WASTEWATER TREATMENT PLANT OVERFLOWS IN 2014-2018, th. m3/year

	2014	2015	2016	2017	2018
Untreated wastewater discharged to the sea	1.3	45.0	122.7	111.3	154.7
Partly ytrated wastewater discharged to the sea	225	317	584	897	590

Pollution charges

As a water company we are required to act in line with the environmental permits and pay pollution charge with the aim to prevent and reduce the potential damage caused by pollutants or waste discharged to the environment.

The calculation of pollution charge is established in the permit for a special use of water and the Environmental Charges Act, and is applied to the pollutants contained in the effluent and storm water at the particular outlets. Both the receiving water coefficient of the specific outlet, as well as compliance with the pollutant limit value in effluent are taken into account in pollution charge calculations. In 2018, the pollution charge paid for discharging pollutants into receiving waters formed 3.4% of the cost of services sold (2017: 4.3%).

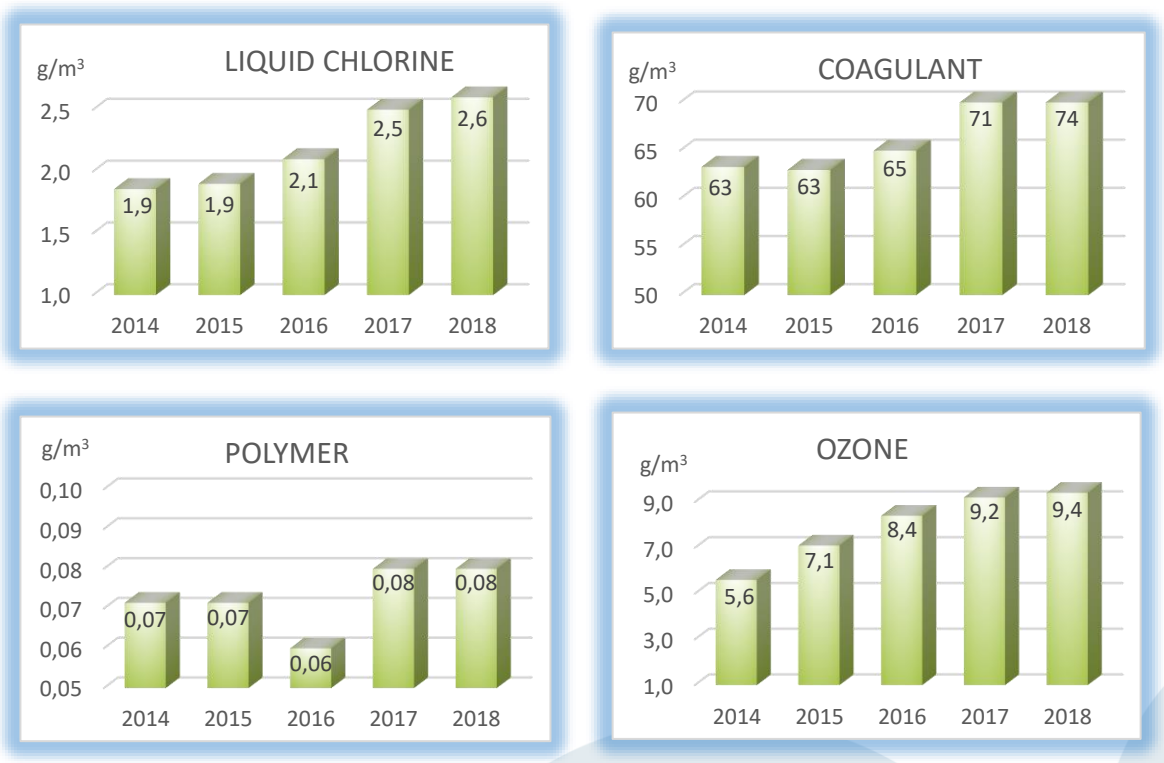
Use of Chemicals

With regard to the health and wellbeing of our employees we deem a safe handling of chemicals at the work site extremely important For this purpose, we have created necessary conditions for a safe storage and use of all chemicals. In 2018, we used about 5,983 tons of vairous chemicals (2017: 5,620 tons), but no reported accidents with chemicals occurred, which could have caused damage to people or the environment.

Use of water treatment chemicals

- Chlorine is an effective disinfecting chemical with a long-term aftereffect. The Regulation No 82 issued by the Minister of Social Affairs "Drinking Water Quality and Testing Requirements, and Analysis Methods" (dated 31.07.2001) specifies the content of chlorine added to the drinking water produced out of surface water to be in the range 0.2 – 0.5 mg/l. We add chlorine in the final stage of the water treatment process to ensure the microbiological purity of water and to help to maintain the water quality in the city's water distribution network. Chlorine has a strong oxidising effect and is extremely poisonous for aquatic microorganisms. In Estonia, we have been classified as a category B company with risk of a major accident due to the chlorine stored at the plant and used in the water treatment process. By applying the necessary safety measures we have minimized 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 coulour of the water. Ozone is produced locally in the plants from the ambient air and only in necessary quanities. Thanks to the closed process and the absence of stock reserve the environmental risk is taken to minimum.
- Coagulants and polymers are chemicals that are used in significant amounts in liquid form. These chemicals are added in the treatment to remove the particular matter (e.g. suspended solids and organic substance) from water.

Ghart 5: Average use of water treatment chemicals per unit of production in 2014-2018, g/m3



Water quality in Ülemiste Lake is strongly dependent on the weather. However, long-term observations have also shown a periodic change in quality over the years. Continuation of 2017 was also marked by poor raw water performance in early 2018 and higher chemicals costs than in the second half of the year.

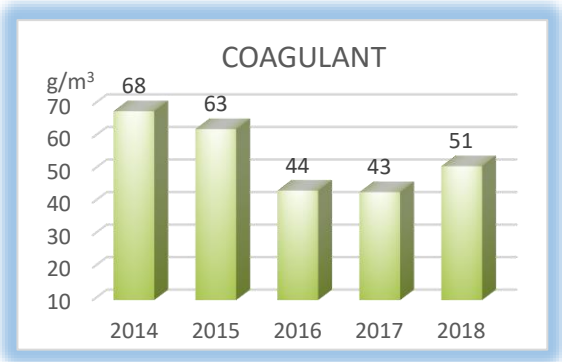
Use of wastewater treatment chemicals

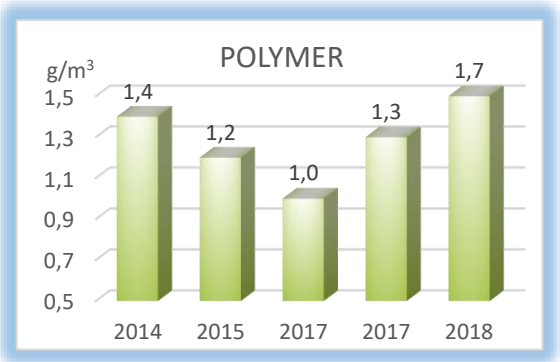
- Methanol - We use methanol at the wastewater treatment plant to increase the nitrogen removal efficiency of the bacteria participating in the biological treatment process. Due to the extremely explosive methanol used in the wastewater treatment, we have been classified as one of the most hazardous companies in Estonia.
- Coagulants and polymers are used in large amounts in the wastewater treatment process. 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.

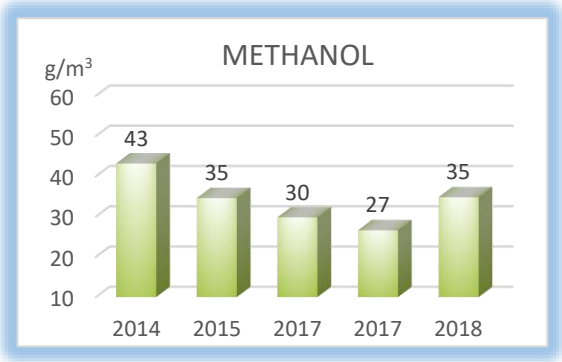
The amount of chemicals used in the wastewater treatment process is dependent on the pollution levels of incoming wastewater, which in turn is affected by the weather. The higher the concentration of pollutants in incoming wastewater and the lower the regulatory limits for pollutants in the treated effluent,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

In 2018 the use of chemicals for wastewater treatment (methanol and coagulants) was slightly bigger than in 2017. Thanks to this a bigger cleaning efficiency was achieved and small amounts of nitrogen and phosphorus were lead into environment.

Ghart 6: Average use of wastewater treatment chemicals per unit of production in 2014-2018, g/m3







The use of polymer depends on the quantities of dry solids and sludge to be treated. In 2018 slightly more polymer was used compared to 2017. More polymer was needed because in 2018 wastewater amounts were bigger and thus the amount of sludge was bigger (2018: 40,732 tons, 2017: 35,481 tons).

Waste Management

Waste generation

A total of 47,378 tons of waste was generated in the Company in 2018. The majority of waste is made up by the sludge, which is a by-product of the wastewater treatment process.

Table 15: TYPES AND AMOUNTS OF MAIN WASTE IN 2014-2018, t

Type of waste	2014	2015	2016	2017	2018
Mixed municipal waste	93	67	90	110,0	72,0
Paper and cardboard *	6	5	5	3,3	5,7
PackagesPaper and cardboard *	0,5	0,6	0,7	0,9	0,9
Biodegradable waste*	7	7	7	6,5	6,4
Waste from screens	1085	615	651	960,5	904,4
Wastewater sludge*	32 109	31 974	31 741	35481,0	40732,0
Sandtraps grid	142	0	161	141,0	129,0
Excavated stones and soil*	10 882	11 235	11 354	10630,0	4767,0
Asphalt waste	1 190	1 548	1 181	812,0	518,0
Mixed building waste	84	40	81	0,0	25,6
Concrete and bricks	62	274	77	35,2	6,5
Metal scrap*	44,8	68	34	60,6	55,3
Hazardous waste	3	2,4	3,6	4,5	9,3
Other waste	2	9	15	2,2	146,0
TOTAL	***45 711***	***45 844***	***45 401***	***48 248***	***47 378***

* - possible to reuse

Since the sludge generated in the wastewater treatment process forms large part of our waste, in 2018 we recycle all the sludge through our sludge treatment process. Sludge stabilization process (anaerobic fermentation of sludge in methane tanks) produces biogas used for heat generation both for heating and for technological process. We analyse planting soil from war sludge at least four times a year according to the requirements set in the Decree No 78, issued by the Minister of Environment on 30.12.2002. All the results of the sludge analyses were public and displayed on the Company's webpage during the period of issuing landscaping soil.

In addition to sludge, the wastewater treatment process produces significant amount of other types of waste, such as waste from screens, which is disposed to our waste handling partner. The volume of waste generated within the wastewater treatment process is directly affected by the volume of incoming wastewater, the weather and the efficiency of the City cleaning services. However, people also have an important role to play here as they can avoid throwing waste and hazardous substances into the wastewater system.

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 volume of works. However, since 2013, we have been performing most of the network reconstruction works using the so-called no-dig closed method, which allows carrying the works out faster and reduces the inconveniences caused by traffic jams during the road works.

We collect and sort the other types of waste, which have a smaller share in the total waste volume, and hand them over to the waste handling company. We separate paper and cardboard, biodegradable waste, hazardous waste, metal and mixed municipal waste.

Waste permits and sludge

The Company has two waste permits, issued to manage the sludge produced in the wastewater treatment process. The permits establish technical and environmental requirements for the waste handling process.

Table 16: VALID WASTE PERMITS ISSUED TO AS TALLINNA VESI 31.12.2018

Permits	Valid until	Description of waste permit
Waste permit No. L.JÄ/325362	27.10.2019	Issued for recycling waste at Paljassaare, procedure code R12o - biological treatment preceding the recycling of waste
Waste permit No. L.JÄ/325737	18.06.2020	Issued for recycling waste in Liikva, procedure code R12o – biological treatment preceding the recycling of waste

In 2018, 40,732 tons of stabilized sewage sludge was removed from the wastewater technological treatment process, which was transferred to the composting field to the purpose of producing so-called landscaping soil (mixing with milling peat and aerobic fermentation. In 2018, 26,944 tons of sewage sludge that was stabilized and aerobically fermente by composting (hereinafter reffered to as „green soil"). The main users of green soil were agricultural companies Tubren Agro and Oru Agro.

Although a waste permit was issued also for Liikva composting field, since 2014, no sludge has been recycled in Liikva because the new permit does not allow recycling.

Table 17: AMOUNTS OF SEWAGE SLUDGE AND LANDSCAPING SOIL IN 2014-2018, t/y

Type of waste	Quantities				
	2014	2015	2016	2017	2018
Stabilised sewage sludge separated from the wastewater treatment process	32 109	31 974	31 741	35 481	40 732
Issued landscaping soil (reuse of sewage sludge)	25 744	38 285	39 073	32 645	26 944

Energy Consumption

Electricity consumpiton

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

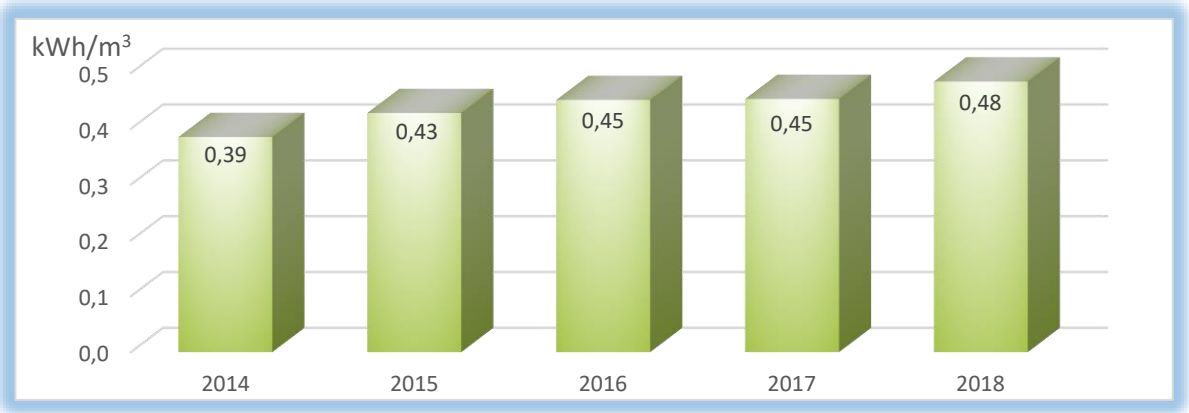
Although we have been making significant investments aimed at decreasing electricity consumption, the energy consumption is still inevitably and closely connected to the operation of our core processes. Those are in turn affected by changes in consumption and in service areas, also by the weather conditions.

Table 18: ELECTRICITY CONSUMPTION IN 2014-2018, MWh

Unit	2014	2015	2016	2017	2018
Water Treatment	8 709	9 746	10 721	10 755	11 782
Wastewater Treatment	21 295	21 617	22 516	23 000	21 949
Networks pumping stations, incl. Maardu	6 409	6 346	6 841	7 094	6 709
Other	776	757	710	693	962
Total	***37 188***	***38 465***	***40 787***	***41 543***	***41 402***

Although the total consumption of electricity in 2018 was slightly lower than in 2017, it has been quite stable over the few last years. Increase in the use of electricity in last years was mainly induced by lower raw water quality in Lake Ülemiste.

Ghart 7: Electricity consumption per unit producted at the water treatment plant in 2014-2018, kWh/m³



Electricity consumption in the water treatment plant has been increasing year-on-year along with the growing use of surface water. A significant proportion of the electricity consumption in the water treatment plant is used to produce ozone. Both the higher doses of ozone and increased electricity consumption in 2018 were brought along by lower quality of raw water in Lake Ülemiste.

Ghart 8: Electricity consumption per unit producted at wastewater treatment plant in 2014-2018, kWh/m³

Consumption of electricity in the wastewater treatment process depends largely on the weather, as it is mainly used to pump wastewater and to produce air i.e. to aerate the activated sludge in the biological treatment stage. During the years 2012-2015 the aeration tanks were reconstructed in stages, which resulted in the replacement of the membranes of aerators in all aeration tanks and installation of new dissolved oxygen sensors in the aeration tanks. This allows saving electricity in producing the air.

Consumption of heat energy

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 majority of the wastewater treatment plant's needs for heat energy is covered by biogas.

Table 19: CONSUMPTION OF HEAT ENERGY 2014-2018, MWh

Unit	2014	2015	2016	2017	2018
Water Treatment	3 978	3 540	3 224	3 022	2 922
Wastewater Treatment	8 989	9 446	9 281	7 299	12 421*
Incl. Heat energy from biogas	8 977	9 446	9 272	7 225	12 400*
Ädala office	1 164	920	1 100	1 044	1 148
TOTAL	2014	2015	2016	2017	2018

Biogas is produced as a by-product from the fermentation of sewage sludge in methane tanks. From the resulting biogas we produce on-site thermal energy, which we use to heat the premises of the wastewater treatment plant and to keep it in operation. Due to the nature of biogas production, we are sometimes forced to burn some of the biogas or to a small extent to use natural gas. In 2018, we used 75% of the total biogas generated (48% in 2017) to produce heat. In 2018, 75% of the total heat energy consumed in biogas (63% in 2017) was produced. In the second half of 2017, we replaced the biogas meter.

* As of January 2018, the calculation methodology for calculating the amount of heat from biogas has been changed. Calculating according to the previous methodology, the heat consumption of biogas from sewage treatment in 2018 would have been 7564 MWh, which would make the total heat consumption of wastewater treatment in 2018 7585 MWh. In order to calculate the historical amount of thermal energy from biogas used for

wastewater treatment using an updated methodology, the previous amount consumed shall be divided by a coefficient of 0,61. Heat consumption has remained at the same level.

Chart 9: Biogas production in 2014-2018, tuh m3

The amount of biogas to be measured has increased since 2017, as a new biogas meter was installed in the wastewater treatment plant in 2017 with more accurate measurement results.

Transportation and fuel consumption

Road transport accounts for the biggest part of our need for transportation. The Company has 92 vehicles for carrying out different operating tasks and for driving between the company locations and numerous service sites. The biggest group of vehicles is cars and operating vehicles, including minivans and team vans. We have a total of 77 cars and operating vehicles and a total of 15 special purpose vehicles (such as tractors, loaders, excavators, jet washing trucks etc).

Table 20: NUMBER OF VEHICLES AND FUEL CONSUMPTION IN 2014-2018

	2014	2015	2016	2017	2018
Total number of vehicles, pcs.	93	94	95	88	92
Petrol, l	70 075	65 962	63 289	56 759	41 265
Diesel, l	122 456	115 485	113 622	104 719	101 377
Total fuel, l	**192 531**	**181 447**	**176 911**	**161 478**	**142 642**

Due to the decrease in the number of vechiles in 2018, the cost of the whole fuel has also decreased. We continuously try to keep the fuel consumption Under Control through the fuel liimits set on the car users and through GPS-tracking devices. Some of the cars are being shared between employees, which means that all authorised employees are able to use the cars to deliver their work duties. This enables the Company to cut down the costs and save natural Resources.

The number of business trips made by our staff in and outside Estonia is relatively low. In planning the travel routes we follow the principle of always choosing the most advantageous option. The most frequent destinations of business trips outside Estonia are the United Kingdom and Finland, to where our staff usually travels by plane and by boat respectively. Other means of transport (e.g. bus and train) are used very little.

Air Emission

AS Tallinna Vesi has been issued two ambient air pollution permist. In order to reduce any potential air pollution, the Company focuses on limiting the amount of pollutants emitted from Ülemiste and Paljassaare boiler houses, particularly the pollutants of primary importance, such as nitrogen dioxide, carbon monoxide and volatile organic compounds, as well as CO_2 greenhouse gas emissions. Also the emissions of ozone produced for drinking water treatment are regulated. The Company pays a pollution charge for pollutants emitted into ambient air.

Table 21: VALID AIR POLLUTION PERMITS OF AS TALLINNA VESI

Permit	Valid until	Description of ambient air pollution permit
Pollution permit NO. L.ÕV.HA 48701	termless	Valid for Paljassaare wastewater treatment plant pollution sources - the chimney of the boiler house, exhaust pipes, the chimney of the combined heat plant. Establishes the list of pollutants emitted into ambient air and the annual permitted emission amounts thereof.
Pollution permit NO. L.ÕV/319438	termless	Valid for Ülemiste water treatment plant pollution sources - the chimney of the boiler house, ozonisation, diesel generator. Establishes the list of pollutants emitted into ambient air and the annual permitted emission amounts therof.

Table 22: AMBIENT AIR POLLUTION FROM WATER TREATMENT PLANT POLLUTION SOURCES IN 2014-2018, t

Pollutant	Limit	2014	2015	2016	2017	2018
Nitrogen dioxide	1,954	1,10	1,01	0,829	0,78	0,713
Carbon monoxide	1,846	0,97	0,88	0,761	0,712	0,686
Volatile organic compounds	0,125	0,067	0,06	0,052	0,049	0,046
Carbon dioxide	1688	868	787	692	647	634
Sulphur dioxide	0	0,001*	0,001*	0,001*	0,001	0,001
Total solid particles	0,004	0,004	0,004	0,003	0,003	0,001

* Sulphur dioxide pollution below the limit

Table 23: AMBIENT AIR POLLUTION FROM WASTEWATER TREATMENT PLANT POLLUTIO SOURCES IN 2014-2018, t

Pollutant	Limit	2014	2015	2016	2017	2018
Nitrogen dioxide	29,8	2,7	2,6	2,80	4,7	5,23
Carbon monoxide	210	2,7	2,6	2,80	4,7	5,23
Volatile organic compounds	14	0,2	0,2	0,20	0,3	0,33
Carbon dioxide	4440	2477	2341	2523	4045	3186
Sulphur dioxide	17,8	17	17,2	17,5	17,5	16,9

Emissions from both Ülemiste water treatment plant and Paljassaare wastewater treatment plant have been relatively low and remained stable throughout the years. Biogaasi kogused on seoses kulumõõtja vahetamisega oluliselt suurenenud.

Environmental Performance

In addition to the data on ecological footprint and as set out by the requirements of EMAS, we outline below our main indicators of the environmental performance regarding energy efficiency, material efficiency, water, waste, biological diversity and emissions. Three elements have been presented for each main indicator:

• Figure A, which stands for the total annual input/impact in the respective area.

• Figure B, which represents the total volume of water, wastewater and rainwater sold by the company throughout the year (million m^3). In the 2018 Environmental Report, we revised the benchmark (number B) to better reflect the company's full-year output.

• Figure R, which stands for the ratio A/B.

The increase in R is due to a decline in total output due to low rainfall in 2018.

Table 24: ENVIRONMENTAL PERFORMANCE IN 2016-2018

Main indicators of environmental performance	Year	Consumption (rounded) i.e. annual input (figure A)	Annual output of the Company (figure B)	Ratio R (A/B)
Electrycity				
Electric power produced from oil shale, MWh	2018	82 805	62,2	1331
	2017	83 085	68,7	1209
	2016	81 574	68,2	1196
Heat				
Heat produced from natural gas, MWh	2018	3 942	62,2	63
	2017	3 989	68,7	58
	2016	4 150	68,2	61
Thermal energy produced from biogas, MWh	2018	12 401	62,2	199
	2017	7 223	68,7	105
	2016	9 272	68,2	136
Handling of chemicals				
Liquid chlorine, t	2018	62	62,2	1,0
	2017	60	68,7	0,9
	2016	51	68,2	0,7
Coagulant, t	2018	4 060	62,2	65,3
	2017	3 905	68,7	57
	2016	3 738	68,2	55
Polymer, t	2018	79	62,2	1,3
	2017	68	68,7	1,0
	2016	53	68,2	0,8
Ozone, t	2018	229	62,2	3,7
	2017	218	68,7	3,2
	2016	200	68,2	2,9
Methanol, t	2018	1 528	62,2	25
	2017	1 369	68,7	20
	2016	1 497	68,2	22
Water				
Water for own consumption, th. m^3	2018	1 590	62,2	26
	2017	1 858	68,7	27
	2016	1 878	68,2	28
Surface water, th. m^3	2018	24 306	62,2	391
	2017	23 716	68,7	345
	2016	23 734	68,2	348
Ground water, th. m^3	2018	2 656	62,2	43
	2017	2 711	68,7	39
	2016	2 763	68,2	41
Waste				
Mixed municipal waste, t	2018	72	62,2	1,2
	2 017	110	68,7	1,6
	2 016	90	68,2	1,3
Recycled paper and cardboard, t	2018	6	62,2	0,1
	2 017	3	68,7	0,0
	2 016	5	68,2	0,1
Recycled packages, t	2018	0,9	62,2	0,01
	2 017	0,9	68,7	0,01
	2 016	0,7	68,2	0,01

	2018	6	62,2	0,1
Recycled biodegradable waste, t	2 017	7	68,7	0,1
	2 016	7	68,2	0,1
	2018	904	62,2	15
Waste from screens, t	2 017	961	68,7	14
	2 016	651	68,2	10
	2018	40 732	62,2	655
Recycled sludge, t	2 017	35 481	68,7	516
	2 016	31 741	68,2	465
	2018	129	62,2	2,1
Sandtraps grid, t	2 017	141	68,7	2,1
	2 016	161	68,2	2,4
	2018	4 767	62,2	77
Recycled excavated stones and soil, t	2 017	10 630	68,7	155
	2 016	11 354	68,2	166
	2018	518	62,2	8
Asphalt waste, t	2 017	812	68,7	12
	2 016	1 181	68,2	17
	2018	26	62,2	0,4
Mixed building waste, t	2 017	0	68,7	0,0
	2 016	81	68,2	1,2
	2018	7	62,2	0,1
Concrete and bricks, t	2 017	35	68,7	0,5
	2 016	77	68,2	1,1
	2018	55	62,2	0,9
Recycled metal, t	2 017	61	68,7	0,9
	2 016	34	68,2	0,5
	2018	9	62,2	0,1
Hazardous waste, t	2 017	5	68,7	0,1
	2 016	4	68,2	0,1
	2018	146	62,2	2,3
Other, t	2 017	2	68,7	0,0
	2 016	15	68,2	0,2
Biological diversity*				
	2018	350	62,2	6
Land use expressed as the total area owned by the enterprise, ha	2 017	350	68,7	5
	2 016	350	68,2	5
	2018	118	62	2
Area covered by waterproofing material, ha	2 017	117,8	68,7	2
	2 016	117,8	68,2	2
Emissions				
	2018	5,9	62,2	0,1
Nitrogen dioxide, t	2 017	5,5	68,7	0,1
	2 016	3,6	68,2	0,1
	2018	5,9	62,2	0,1
Carbon monoxide, t	2 017	5,4	68,7	0,1
	2 016	3,6	68,2	0,1
	2018	0,4	62,2	0,006
Volatile organic compounds, t	2 017	0,4	68,7	0,006
	2 016	0,3	68,2	0,004
Carbon dioxide, t	2018	3 820	62,2	61

	2 017	4 692	68,7	68
	2 016	3 215	68,2	47
	2018	0,001	62,2	0,00002
Sulphur dioxide, t	2 017	0,001	68,7	0,00001
	2 016	0,001	68,2	0,00001
	2018	0,001	62,2	0,0000
Total solid particles, t	2 017	0,003	68,7	0,0000
	2 016	0,003	68,2	0,0000
	2018	17	62,2	0,3
Hydrogen sulphide, t	2 017	18	68,7	0,3
	2 016	18	68,2	0,3
Environmental education				
	2018	1 243	62,2	20,0
Number of children in the discussions	2 017	1 371	68,7	20,0
	2 016	1 553	68,2	22,8
	2016	0,3	68,2	0,004

*The size of the land is estimated by a AS Tallinna Vesi's real estate expert

Important changes in the Environmental Report

This chapter outlines the major substantive changes made to the 2018 Environmental Report in comparison with the 2017 Environmental Report.

- The 2018 Environmental Report excludes the chapter about our ecological footprint. Calculating the ecological footprint is the simplest method that gives a rough idea of the amount of land needed to produce the Resources used per year, however we are convinced that in water and wastewater treatment it does not give a complete Picture. In the report, we have looked at the consumption of all resources separatelt and found that the ecological footprint does not add value to the environmental report. For example, it does not take into account an important parameeter in the wastewater treatment process - sewage sludge.

EMAS Verification

Having examined the environmental management system and the information provided in the 2018 environmental report of AS Tallinna Vesi, AS Metrosert as an accredited verifier EE-V-0001 certified that the information and data presented in the organisation's environmental report was reliable and adequate and complied with the requirements of the Regulation No 1221/2009 (on the voluntary participation of organisations in a Community eco-management and audit scheme (EMAS)) of the European Parliament and of the Council dated 25th November 2009. This report implements European Commission Regulation (EU) 2017/1505 o 28th of August 2017 and European Commission Regulation (EU) 2018/2026 of 19th of December 2018 amending Annexes I to Regulation (EC) NO. 1221/2009 of the European Parliament and of the Council, II, III and IV.

The environmental report was verified on 3rd of June 2019.

Andres Martma

EMAS verifier

Metrosert AS

www.metrosert.ee

Appendix 1: Drinking water quality in Ülemiste water treatment plant in, 2018

Parameter	Unit	Min	Max	Average	Act no. 82, 31.07.2001	EU directive, 98/83/EC
Temperature	°C	1	25	10		
Odour	points	1	1	1	Acceptable to consumer	Acceptable to consumer
Taste	points	1	1	1	Acceptable to consumer	Acceptable to consumer
Turbidity	NTU	<0,10	0,31	0,18	1	1
Color	mg/l Pt	<3	4	<3	Acceptable to consumer	Acceptable to consumer
Dry reisude	mg/l	224	305	259		
pH		7,09	7,36	7,24	≥6,5 ja ≤9,5	≥6,5 ja ≤9,5
Conductivity, 20 °C	µS/cm	337	431	374	2500	2500
Alkanity	mg-ekv/l	2,45	3,53	2,76		
Total hardness	mg-ekv/l	3,38	4,49	3,84		
Permangante index	mg O_2/l	2,91	4,24	3,65	5	5
Total organic carbon, TOC	mg/l	5,6	6,9	6,2	Without unusual changes	Without unusual changes
Dissolved Oxygen	O_2 mg/l	4,9	14,6	10,1		
Dissolved Oxygen	saturation %	59	110	88		
FreeCO_2	mg/l	13	25	19		
Carbonates, CO_3^{2-}	mg/l	0	0	0		
Bicarbonates, HCO_3^-	mg/l	154	200	169		
Chlorides, Cl^-	mg/l	29	32	30	250	250
Sulphates, SO_4^{2-}	mg/l	17	28	23	250	250
Orthophospates, PO_4^{3-}	mg/l	<0,02	<0,02	<0,02		
Fluoride, F^-	mg/l	0,09	0,12	0,1	1,5	1,5
Nitrates, NO_3^-	mg/l	1	5,9	2,8	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	56	76	64		
Magnesium, Mg^{2+}	mg/l	7	9	8		
Aluminium, Al	µg/l	50	199	120	200	200
Boron, B	µg/l	12,3	16,9	14,2	1000	1000
Beryllium, Be	µg/l	< 0,2	< 0,2	< 0,2		
Sodium, Na	mg/l	6,3	8,19	7,13	200	200
Potassium, K	mg/l	2,16	2,85	2,58		
Vanadium, V	µg/l	0,17	0,46	0,27		
Chromium, Cr	µg/l	<0,1	0,62	0,27	50	50
Iron, Fe	µg/l	<10	<20	<10	200	200
Manganese, Mn	µg/l	0,94	19,5	5,7	50	50
Cobalt, Co	µg/l	<0,02	0,06	0,04		
Nickel, Ni	µg/l	<0,2	0,38	0,23	20	20
Copper, Cu	µg/l	0,94	3,8	1,7	2000	2000
Zinc, Zn	µg/l	<0,5	3,5	1,1		
Arsenic, As	µg/l	0,32	0,57	0,43	10	10
Selenium, Se	µg/l	<0,4	<0,7	<0,4	10	10

Strontium, Sr	µg/l	73,9	101	88		
Molybdenum, Mo	µg/l	0,26	0,61	0,44		
Cadmium, Cd	µg/l	<0.02	<0.02	<0.02	5	5
Antimon, Sb	µg/l	0,07	0,11	0,08	5	5
Barium, Ba	µg/l	36,5	51,6	42,2		
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	0,18	0,06		
Uranium, U	µg/l	0,31	0,73	0,53		
Akrylamide	µg/l	0,014	0,024	0,017	0,1	0,1
Chloroform	µg/l	11	40	23		
Bromodichloromethane	µg/l	1,7	10,1	5,1		
Dibromochloromethane	µg/l	0,35	2,3	1,1		
Bromoform	µg/l	<0,2	0,2	<0,2		
THM	µg/l	15	47	29	100	100
1,2-dichloroetane	µg/l	<0,2	<0,2	<0,2	3	3
Trichloroethene	µg/l	<0,3	<0,3	<0,3		
Tetrachloroetene	µg/l	<0,2	<0,2	<0,2		
Tetrachloroetene and Trichloroethene sum	µg/l	0	0	0	10	10
Benzene	µg/l	<0,2	<0,2	<0,2	1	1
Benso(a)pyrene	µg/l	<0,00017	<0,005	<0,005	0,01	0,01
PAH(polycyclic aromatic hydrocarbons) sum	µg/l	0	0	0	0,1	0,1
Pesticides (sum)	µg/l	0	0	0	0,5	0,5
Enterococci	CFU/100ml	0	0	0	0	0
No of colony forming units at 22 °C	CFU/ml	0	3	1	Without unusual changes	Without unusal changes
Coliform bacteria	CFU/100ml	0	0	0	0	0
Escherichia coli	CFU/100ml	0	0	0	0	0
Clostridium perfringens	CFU/100ml	0	0	0	0	0
Reisudal chlorine (free chlorine)	mg/l	0,18	0,49	0,36	≥0,2 ja ≤0,5	
Bromate	µg/l	<5	<10	<5	10	10
UV-abs	AU/cm	0,047	0,085	0,068		

Tallinna Vesi
Loome puhta veega parema elu!

Appendix 2: Ground water quality in 2018

Paramtere	Unit	Average results					Decree no 82 ja EU Directive 98/83/EC
		Nõmme	Merivälja	Tiskre	Saue	Pillado	
Odour	Points	1	1	1	1	1	Acceptable to consumer
Taste	Points	1	1	1	1	1	Acceptable to consumer
Colour	mg/l Pt	<3	8	<3	<3	<3	Acceptable to consumer
Turbidity	NTU	0.42	0.42	0.29	0.58	1.75	Acceptable to consumer
Dissolved O_2	mg/l	5.9	7.5	5.6	6.9	3.55	
pH	pH unit	7.93	7.95	7.87	7.88	8.12	≥6,5 ja ≤9,5
Conductivity	µS/cm	488	537	749	508	371	2500
Alkanity	mg-ekv/l	2.45	3.59	2.01	2.27	1.98	
Total hardness	mg-ekv/l	3.10	4.46	4.50	2.81	2.43	
Transient hardness	mg-ekv/l	2.45	3.56	2.01	2.27	1.96	
Overall hardness	mg-ekv/l	0.65	0.89	2.49	0.58	0.46	
Permanganate index (COD_{mn})	mgO_2/l	0.52	1.9	1.2	<0.5	0.71*	5
Free Carbon dioxide, CO_2	mg/l	3	6	4	3	2	
Total iron, Fe	µg/l	<20	42	50	43	141	200
Fluoride, F^-	mg/l	0.61	0.46	0.79	0.69	0.71*	1.5
Chloride, Cl^-	mg/l	75	78	173	87	45*	250
Manganese, Mn	µg/l	<8	20	14	9	40	50
Ammonium, NH_4^+	mg/l	0.080	0.110	0.02	0.26	0.179	0.5
Nitrite, NO_2^-	mg/l	0.006	0.014	0.004	0.007	<0.003	0.5
Nitrate, NO_3^-	mg/l	<1	1.5	<1	<1	<1	50
Stability index		0.09	0.34	0.03	-0.013	0.05	
Total organic carbon, TOC	mg/l	0.56	2.63	0.29	0.25	0.23*	Without unusual changes
Sulfide, S^{2-}	mg/l	<0.004	<0.004	<0.004	<0.004	<0.004	
Sulfate, SO_4^{2-}	mg/l	22	4.5	26	0.3	31*	250
Hyrocarbonate, HCO_3^-	mg/l	150	219	123	139	121	
Calcium, Ca^{2+}	mg/l	43	66	67	40	31	
Magnesium, Mg^{2+}	mg/l	13	13	14	11	11*	
Dry residue	mg/l	290	330	465	300	218*	
Sodium, Na^+	mg/l	40.8	28.6	65.1	52.9	29.8*	200
Potassium, K^+	mg/l	6.70	5.67	8.43	7.60	7.68*	
Boron	µg/l	168	82.0	114	278	215*	1000
Aluminium	µg/l	2.01	68	<0.5	0.7	<0.5*	200
Arsenis	µg/l	<0.1	<0.1	<0.1	<0.1	<0.1*	10
Cadmium	µg/l	<0.02	<0.02	<0.02	<0.02	<0.02*	5
Chromium	µg/l	0.24	0.82	0.35	0.25	0.44*	50
Copper	µg/l	0.91	1.56	0.3	0.59	0.8*	2000
Mercury	µg/l	<0.1	<0.1	<0.1	<0.1	<0.1*	1
Nickel	µg/l	0.27	0.53	<0.2	<0.2	0.31*	20
Lead	µg/l	0.074	0.153	0.20	0.07	0.16*	10
Antimony	µg/l	<0.02	<0.02	<0.02	<0.02	<0.02*	5
Selenium	µg/l	<0.4	<0.7	<0.7	<0.4	<0.7*	10
Beryllium	µg/l	<0.02	<0.02	<0.02	<0.02	<0.02*	
Barium	µg/l	189	84.0	161	195	44.2*	

Coliform bacteria	CFU/100ml	0	0	0	0	0	0
Escherichia_coli	CFU/100ml	0	0	0	0	0	0
Enterococci	CFU/100ml	0	0	0	0	0	0
No of colony forming units at 22°C	CFU/ml	2	0	5	3	2	Without unusual changes
Effective dose	mSv per year	0.22	0.27	0.32	0.24	0.04*	0.1

*The parameter was analyzed in 2017