1 Report with a robust analysis of the state of play

Guided by a questionnaire drafted by the OECD Secretariat, Estonian authorities collected data and information on the state of play for water supply and sanitation in the country. That background information provides the common knowledge on which to identify pending issues and areas for further work.

1.1. Background and objectives

The Ministry of the Environment of Estonia jointly with other governmental authorities (the Ministry of Finance, the Minister of Public Administration), the European Commission –DG Reform, and the OECD are partnering to enhance the sustainability of water supply and sanitation services in Estonia. The Project will support the preparation of a roadmap for the consolidation of the water utility sector, a requisite for a sustainable and socially acceptable financing strategy and a broader water sector reform in Estonia. See the Detailed Project Description, for more information on background, scope and process.

The specific objectives of this Project are:

- to support the initiatives of national authorities to design their reforms according to their priorities, taking into account initial conditions and expected socioeconomic impacts
- to support the efforts of national authorities to define and implement appropriate processes and methodologies by taking into account good practices of and lessons learned by other countries in addressing similar situations
- to assist the national authorities and water utilities in enhancing the efficiency and effectiveness of human-resource management, inter alia, by strengthening professional knowledge and skills and setting out clear responsibilities.

The report presents background information compiled by Estonian authorities on the state of play, previous attempts to agglomerate water utilities in the country. Data and information were collected on the basis of a questionnaire developed by the OECD Secretariat (see Appendix). The questionnaire covers the following areas:

- Legislation, institutional and regulatory framework
- The organisation of service provision
- The performance of service providers
- Tariff setting
- Inter-agency co-ordination and cooperation for WSS service provision
- Mapping WS service coverage and recent trends in service provision
- WSS strategic policy making and financing water supply and sanitation
- Experience with consolidation of municipalities and/or service providers.

Propositions unfold, on key issues that deserve further analysis in the context of this project. The analyses are meant to document possible courses of action and options to facilitate agglomeration of water utilities in Estonia. They define the proposed programme of work in the context of this project for the next 12 months (in line with the Detailed Project Description). The proposed course of action will be discussed with Estonian stakeholders at the kick-off meeting. The outcome of the discussions will be reflected in an Issue paper.

1.2. The state of play

Estonia has implemented a massive investment programme over the past two decades to catch up with EU standards for water supply and wastewater collection and treatment. Recently built assets now need to be properly operated and maintained, to ensure lasting service provision and performance and avoid costs related to premature decay of existing infrastructures. More than 90% of the population is connected to safe water supply across the country, reflecting a high level of compliance with the Drinking Water Directive (DWD). However, there is room for improvement as regards the Urban Wastewater Treatment Directive (UWWTD).

The institutional and regulatory frameworks are in place (most notably the Water Act, the Public Water Supply and Sewerage Act). They have been recently strengthened (e.g. set up of the Competition Authority, under the Ministry of Justice; extended accountability of local governments for communal infrastructure).

Diverse forms of contractual relations to operate WSS assets, including PSP (e.g. Tallinn) take place. Regionalisation of WSS services have been implemented in selected localities. These developments indicate the sophistication of service provision and the capacity to adapt modalities to local conditions in Estonia.

1.2.1. Access to water supply and sanitation services in Estonia

Estonia has undertaken significant investments to reach compliance with the EU water *acquis* on water supply and sanitation (WSS). As a result of investments made in the last decade, 87.3% of the population in Estonia is connected to the public water supply and 83% to the public sewerage system. The constructed public water supply and sewerage systems require consistent maintenance and new investments. Unfortunately, the present fragmentation of water companies, where the majority are micro-companies, prevents access to the funds required for investments and the qualified workforce for maintenance of equipment while offering water services at affordable tariffs.

One of the most important strategic documents of the Estonian environmental policy is the *Environmental Protection and Use Programme for 2020-2023*. The important goal set in this programme as regards water use is sustainable access of the residents to a safe drinking water, collection and treatment of wastewater, and provision to the service at an affordable water tariff. The following performance indicators, among others, are set in the programme:

Table 1.1. WSS services in Estonia

Indicator	Initial level (2018)	2020	2021	2022	2023
Population connected to public sewerage system	82.9	83.8	84.1	84.4	84.7
Share of consumers receiving safe drinking water from public water supply system, %	99 (2017)	100	100	100	100
The average tariff of the water service and its share in the average income of a household does not exceed 2.5%	Yes	yes	Yes	yes	yes
Share of wastewater collection areas of over 2000 p.e. that comply with wastewater collection and treatment requirements, %	94.7	95	98	100	100

Source: Environmental Protection and Use Programme for 2020-2023.

1.2.2. Institutions in charge of policies that affect water supply and wastewater management

The Ministry of Social Affairs develops policies and legislation in issues related to public health, incl. about the quality of safe drinking water. The Health Board, which is an institution of the Ministry of Social Affairs, performs oversight of the quality requirements for drinking water and the obligations of drinking water operators. You can read about the goals of the Ministry of Social Affairs and about public health in English here: https://www.sm.ee/en/environmental-health and about the Health Board and the safety of drinking water here: https://www.terviseamet.ee/et/keskkonnatervis/inimesele/joogivee-ohutus .

The Ministry of the Environment is developing the water economy and public water supply and sewerage policy. The Environmental Inspectorate, which is an institution of the Ministry of the Environment, also performs oversight of the compliance with the regulations of local governments concerning on-site treatment and removal of wastewater and checks the compliance of the activities of water companies and the clients of water companies with the requirements for handling hazardous substances. The activities of the Environmental Inspectorate can be found here: https://www.kki.ee/et/eesmargid-tegevused/keskkonnakaitse .

The Environmental Board is an institution of the Ministry of the Environment which, in addition to issuing environmental permits and registering activities that pose a risk to the water environment, approves public water supply and sewerage development plans and the formation and alteration of wastewater collection areas. The activities of the Environmental Board can be found here: https://www.keskkonnaamet.ee/en/activities/water .

The Ministry of the Environment also develops support measures for the development of the public water supply and sewerage service. The Environmental Investment Centre is an institution of the Ministry of the Environment, which is the central financier of environmental projects in Estonia as the implementing agency of support policy. You can read about the Environmental Investment Centre here: https://kik.ee/en/kik .

The Competition Authority is an institution of the Ministry of Justice, which is responsible for the regulation of the tariffs of public water supply and sewerage services. You can read about the Competition Authority here: https://www.konkurentsiamet.ee/en/water-district-heating/water/overview .

1.2.3. Legislation and regulatory framework

Legislation is developed in cooperation of the institutions above. The drafts of legislation must be officially approved by the parties concerned. The Health Board and the Environmental Board also approve the public water supply and sewerage development plans, which must be prepared by each local government. Communication about other issues takes place as necessary.

Training and meetings for water companies and local government employees are also organised in cooperation. For example, the Ministry of the Environment organises training for wastewater treatment plant operators, the Partner Day (where we introduce our priorities, answer the questions of partners and organise discussions on WSS in a workshop), quarterly meetings with the Environmental Investment Centre (an overview is given of how to apply for support, the problems that have emerged in the grant or application for support), etc. At the start of every year, the Ministry of the Environment also sends an overview of its annual work plan, incl. planned legislative amendments etc., to its partners (NGOs).

The main pillars of the legislative and regulatory framework are the following.

The Water Act

This Act provides for:

- grounds for planning and organising the use and protection of water, the implementation of which will promote sustainable water use;
- water protection requirements which will ensure protection of water resources in the long term;
- rights, obligations and liability of persons in water use;
- state supervision over compliance with the requirements for the use and protection of water;
- liability for an infringement of the requirements provided for in this Act.

The English version is available here: https://www.riigiteataja.ee/en/eli/511052020001/consolide .

The Public Water Supply and Sewerage Act

The Act regulates the organisation of supply of registered immovables with water and the collection and treatment of wastewater of the registered immovables, rain water, drainage water and other soil and surface water through the public water supply and sewerage system. It provides for the rights and obligations of the state, local governments, water undertakings and client. The Ministry of the Environment started developing the new Public Water Supply and Sewerage Act in 2015 in order to remove vague definitions and harmonise the text.

Pursuant to the Public Water Supply and Sewerage Act, a local government establishes the rules for use of public water supply and sewerage, which must include:

- the procedure for measuring the water taken and the wastewater to be discharged
- the limit values of the wastewater and rainwater discharged into the public sewerage system based on the consideration that the wastewater flowing out of the public sewerage system must comply with the requirements established on the basis of the Water Act and the wastewater discharged into the public sewerage system must not disrupt the functioning of the system
- the procedure for checking the pollutant content
- the procedure for payment for the public water supply and sewerage service
- the definition of unauthorised extraction of water and unauthorised leading off of wastewater, rainwater and drainage water, and other soil and surface water, and the procedure for determining their volume and value.

The English version is available here: https://www.riigiteataja.ee/en/eli/529082019006/consolide .

Regulation of Minister of Environment (08.11.2019) No 61

The regulation sets the requirements for discharging treated effluent, storm water, mining water, quarry water and cooling water into recipient bodies. It sets the methods for assessment of the compliance of discharged water and limit values for pollutant concentration in discharged water.

Regulation is only available in Estonian, here: https://www.riigiteataja.ee/akt/112112019006.

Regulation of Minister of Social Affairs (24.09.2019) No 61

The regulation sets the quality standards and inspection requirements and the methods for analysis for drinking water. It is only available in Estonian, here: https://www.riigiteataja.ee/akt/126092019002 .

Local Government Organisation Act § 6 (1).

The Article stipulates that the functions of a local authority - in the rural or urban environments - include the organisation of the provision of a range of social and cultural services, housing and utilities, including the supply of water and sewerage. The functions also include waste management, spatial planning, and the construction and maintenance of roads or city streets unless such functions are assigned by law to other persons.

1.3. The organisation of WSS services

Local governments are mandated to organise the collection and treatment of urban wastewater before it is discharged into the receiving water body as effluent (industrial or other production wastewater, which is treated in an industrial wastewater treatment plant, is not included in urban wastewater). Local governments make proposals to the Ministry of the Environment for the formation or alteration of a

wastewater collection area. A wastewater collection area is an area that has enough residents or economic activities for the collection of wastewater via a sewerage system and for discharging wastewater to a wastewater treatment plant or effluent receiving water body pursuant to the Urban Waste Water Treatment Directive 91/271/EEC. Pursuant to the requirements established in Estonia, wastewater collection areas in Estonia are formed on the basis of the level of protection of the groundwater layer and the load of the wastewater collection areas, considering socioeconomic criteria, the status of surface water and water protection goals. The size of a wastewater collection area must be at least five hectares.

Households' capacity to pay for public water supply and sewerage service must be taken into account when a wastewater collection area is formed. The money spent by a household member on the water supply and sewerage service may not exceed four per cent of average annual net income in the country of residence according to the data of Statistics Estonia. If the establishment of a public sewerage system in a wastewater collection area brings about unreasonably high costs, leakage-proof collection tanks may be used for wastewater collection in wastewater collection areas where the load is 2,000 p.e. or more.

Building a public sewerage system in a wastewater collection area whose load is less than 2,000 p.e. is not mandatory, but any existing public sewerage system and wastewater treatment plant must be kept in good technical order to guarantee that wastewater is collected and treated according to requirements. The local government establishes the regulations for on-site treatment and removal of wastewater in their administrative territory.

Pursuant to the Public Water Supply and Sewerage Act, the public water supply and sewerage system may be in public or private ownership. The provisions of § 158 of the Law of Property Act are applied to public water supply and sewerage[1]. In practice, assets belong to water companies, but the majority of water companies belong to local governments. In a few cases, the assets belong to private persons (there are four private companies in WWCAs of over 2,000 p.e.). Non-profit co-operatives, which serve small settlements of up to 200 people, also operate as water companies here.

WSS is a fragmented industry in Estonia. The 2018 annual reports on water use indicate that there are 177 water companies in Estonia and 44 local governments have more than one water company (local governments that have more than one water company are listed in Annex 6). These 177 water companies have declared themselves as water companies, but the number of water companies that comply with the definition of water company given in the Public Water Supply and Sewerage Act is actually bigger. There are companies among said undertakings for whom the provision of water services is not the principal activity (e.g. peat mining and processing company Peat Mill OÜ), but that still provide water services by giving water to some settlements from their drill wells or treating wastewater in their treatment plants.

Changes in the water business occurred after the administrative reform when local governments merged and water companies were merged as well. For example, Alutaguse Haldus OÜ was formed in Alutaguse Municipality after the administrative reform, which provides other utility services in addition to the water service. Regional water companies have also been formed to increase the probability of receiving support from the national environmental programme of the Environmental Investment Centre (KIK).

An example of a water company is Emajõe Veevärk AS, which characterises itself as a company established by local governments on the initiative of the Ministry of the Environment in 2004. The company provides water services in 106 settlements located in five counties. The shareholders of the public limited company are 12 local governments:

Elva	Luunja	Põltsamaa
Jõgeva	Mustvee	Räpina
Kambja	Nõo	Tartu
Kastre	Peipsiääre	Vinni.

Regional water companies are established in cooperation. If the assets are operated by regional water companies, then each local government owns assets proportionally to the local government. Water companies are mostly commercial undertakings, which means that they are free to use their assets as they see fit.

1.4. Concerns about the sustainability of the state of play

While the quality of WSS services markedly improved over the last couple of decades, stakeholders share concerns about the sustainability of the current level of performance.

First, demographic trends affect the financing needs and capacities of water utilities. On the one hand, urbanisation drives investment needs in urban settlements. On the other hand, a decreasing population can affect the revenues of utilities and lead to oversized infrastructures, which will be costly to operate. These contrasted trends need to be properly reflected in infrastructure and service development.

Second, the economic and fiscal situation deteriorates. It is unlikely that public funds, which account for a lion's share of investment finance in the country, can be sustained in the long run. This calls for a revision of financing models, which need to harness other sources of finance, including (but not limited to) revenues from tariffs.

Another source of concern is the complex devolution of responsibilities across institutions involved in setting policies, monitoring performance and providing support to the sector. Blurred responsibilities or lack of accountability can undermine performance of the sector.

Finally, cause and consequence of the concerns above, the performance of water utilities seems to be very fragile. Financing sustainability, in particular is an issue Other potential weaknesses reflect the lack of technical and financial capacities to cope with a range of operational and strategic issues (such as efficient use of water resources, or energy efficiency).

As a result, there is a risk that performance of the service to the population (or selected settlements) deteriorates in the coming years/decades. As an early signal, it is noteworthy that compliance with the EU acquis on water is lagging, in particular as regards the Urban Wastewater Treatment Directive.

1.4.1. Demographic trends

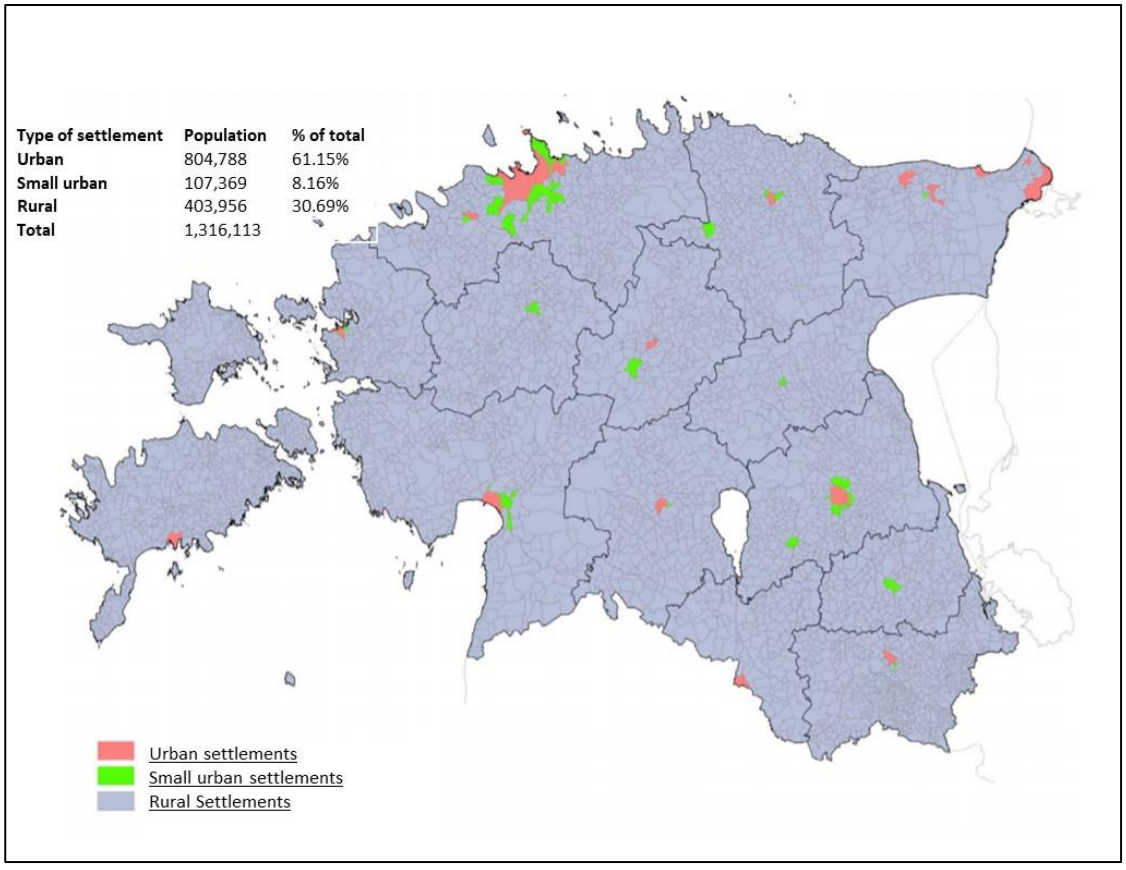
The country has 1.3 million inhabitants. Approximately 1.2 million people will be living in Estonia in 2080 according to the population forecast of Statistics Estonia made in 2019. The population will decrease by 11% in the next 60 years, by 35,800 people in the next 25 years and by 145,200 people by 2080. The demographic trends affect the revenues of water utilities. They also drive investment needs (where population grows) or lead to some infrastructures being oversized and costly to operate (where population decreases).

Urbanisation is increasing. Young people tend to live in cities while aged people mostly stay in rural areas. The population of rural areas also changes seasonally, because more people move to the countryside for summer. More people moved to the countryside during COVID-19 as well.

The type of settlements has been the basis for the definition of rural and urban population in Statistics Estonia until 2018. This classification was recently adjusted, to better monitor increasing suburbanisation. The population of settlements around cities was growing, while being still classified as rural population. The working group on regional statistics under the Ministry of Finance decided to start defining rural and urban population in line with an internationally recognised methodology. However, the internationally used criteria do not meet the needs of Estonia for the determination of rural and urban areas, as the thresholds are too high. This is why the working group developed the following thresholds fort Estonia: urban (type 1), small urban (type 2) and rural (type 3).

On the map below, one can see urban regions are red, small urban regions (i.e. the transition territories of rural and urban settlements) are green and grey marks rural areas.

Figure 1.1. Urban, small urban and rural settlements in Estonia



The population of Estonian cities, towns, small towns and villages as at 1 January 2019 was published in the map application of Statistics Estonia on 28 May 2019. There are 4,712 settlements in Estonia. They include 73 villages without permanent residents. The map is accessible here: https://estat.stat.ee/StatistikaKaart/VKR

Number of residents in settlements:

- up to five residents in 344 settlements
- 6–10 residents in 349 settlements
- over 1,000 residents in 102 settlements

These figures have not changed much in two years. For example, the number of villages not populated all year round was 71 at the same time last year.

The number of unpopulated villages was the biggest in Võru County with 23. There are 16 of them in Saaremaa and eight in Hiiu, Harju and Pärnu counties. Unpopulated villages are usually small with an area of less than 2 km2, and only consist of a couple of farms. These villages are often located far from important roads. There were no unpopulated villages in Lääne, Rapla, Jõgeva, Viljandi, Valga and Põlva counties.

From 2017–2019, population increased the most in Harju and Tartu counties, more specifically in Tallinn and Tartu with their neighbouring settlements. Among these, the increase in population was the biggest in Tallinn City Centre. The population of Haabersti and Lasnamäe districts also increased by more than 1,000

people. There are other green areas on the map as well, but they are mostly close to county centres and larger roads.

Narva City was the biggest settlement with a decreasing population – it lost 1,881 people in two years. The population of Järve and Ahtme, the largest districts of Kohtla-Järve, and of Sillamäe also decreased by more than 500 people.

In general, population decreased the most in county centres and other small towns, and settlements in the peripheral regions of counties. However, the change in population was small in most settlements, ranging between -4 to +4 in 66% of them.

Table 1.2. Population by type of settlement

	Number of dwellers	% of total population
Urban settlement region	804,788	61.15%
Small urban settlement region	107,369	8.16%
Rural settlement region	403,956	30.69%
Total people:	1,316,113	100.00%

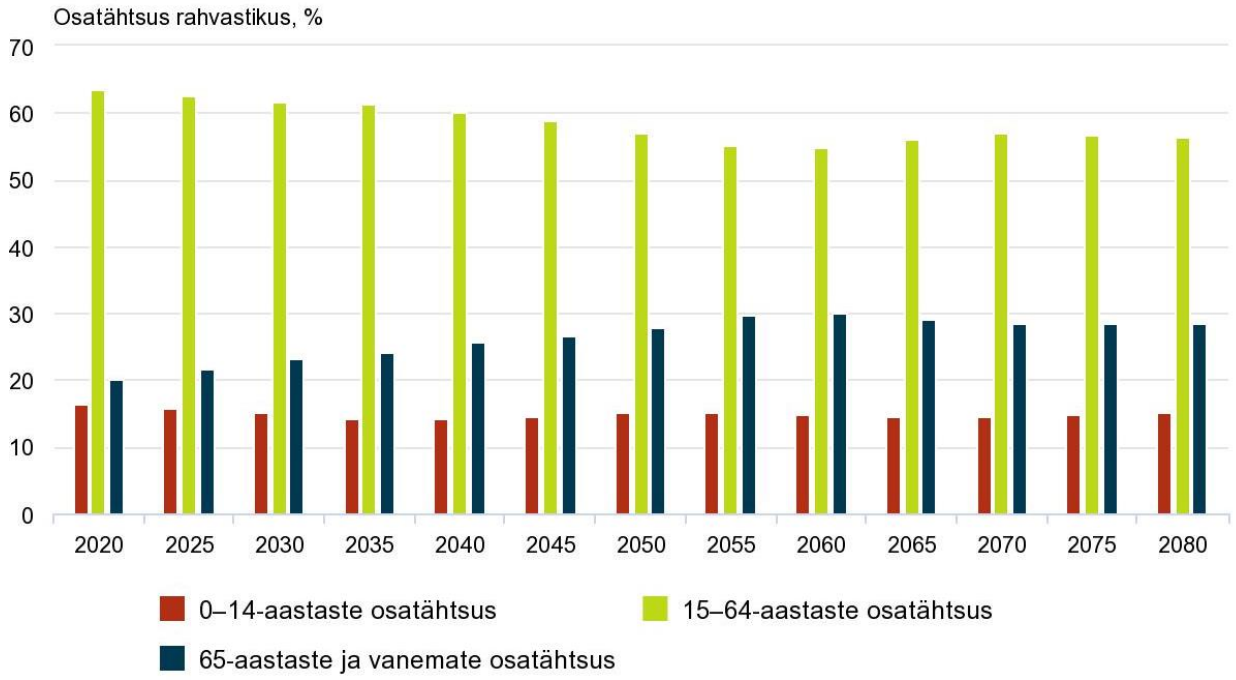
Projected trends

Birth rate is an important component through which population increases. The current trends suggest that the birth rates will continue growing. According to the baseline scenario of the forecast, we assume that by 2080, the birth rate will increase to the level of 1.86 children per woman on average.

The life expectancy at present is 74 years for men and 82 years for women. These indicators have increased year over year and will continue growing according to forecasts – life expectancy will increase to 83.5 years for men and 89.0 years for women by 2080. The increase in the case of men is slightly faster than in the case of women, as a result of which the gender gap in life expectancy, which is extraordinarily large in Estonia in comparison with other European countries, will decrease to 5.5 years.

The forecast indicates that natural growth is the main factor that will shape the population. There will be fewer births and the number of deaths will start growing after some time. The way the age structure of Estonian residents changes is important in terms of the changes in population. The forecast indicates that working-age population (aged 15–64) will decrease by 8.6 percentage points by the 2060s, which will be followed by a small increase. The share of people aged 65 and over in the population will increase evenly from 20% to 30% by 2060. The share of children (aged 0–14) in the population will decrease from 16% to 14% in 20 years and will be followed by a small increase. The natural growth will remain negative, as the birth rate is below the recovery level.

Figure 1.2. Age structure of forecast populations, 2020–2080 (proportion of people aged 0-14, 15-64, over 64)



Source: Statistics Estonia

The forecast was also prepared about counties until 2045. Changes in rural areas are occurring differently: whilst the total population of Estonia decreased 2.7% by 2045, the population of Ida-Viru, Järva, Valga and Jõgeva counties decreased by a third. The people living in counties with decreasing populations are older on average and the population in them is mainly shaped by the number of deaths. The population is growing the most in Harju County, including Tallinn. The population of Tartu County is also growing to a small extent.

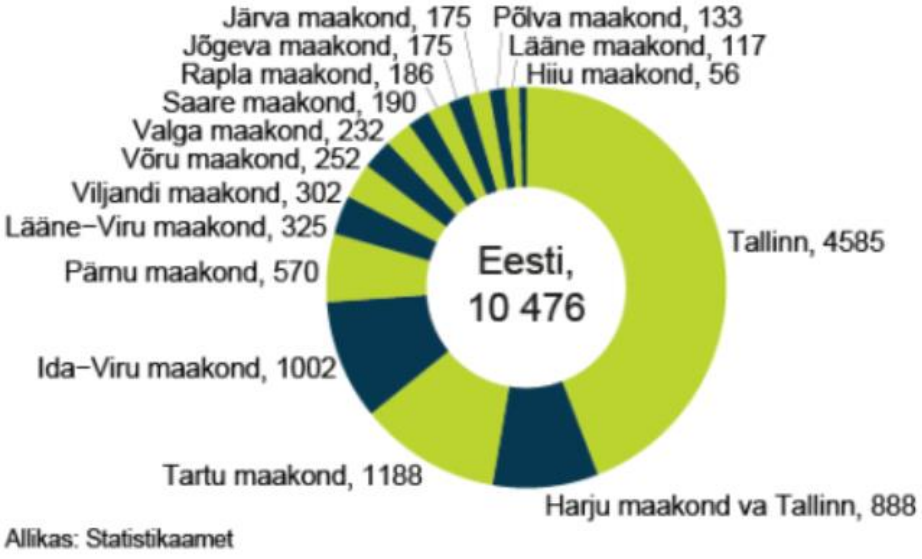
Population forecasts are prepared according to the existing trends by extending them into the future. However, the future is actually difficult to predict. Even stable progression always entails alternative possibilities of how trends will change, not to speak of unexpected turns.

Statistics Estonia completed four population forecasts by 2080. In its press release, Statistics Estonia introduced the baseline scenario. In addition to the baseline scenario, there is a scenario where the birth rate and migration are bigger, a second one where the birth rate is lower, mortality higher and migration balanced, and a third one where the birth rate has risen to the recovery level by the end of the period.

On 12 September 2019, Statistics Estonia wrote that thousands of people leave Tallinn every year. We're used to thinking of the capital as a strong magnet. However, when we look at the movement of the people living in Tallinn from another angle, it's also the local government with the biggest number of emigrants in Estonia.

21,185 have moved abroad from Tallinn in the last four years, which is considerably more than the number of residents in Pirita at the start of this year. 33% of the population of Estonia lives in Tallinn. People leaving the capital comprise 44% of the total emigration from Estonia.

Figure 1.3. Emigration of residents of Estonian counties and Tallinn to foreign countries, 2018



Allikas: Statistikaamet

2,571 men and 2,014 women, i.e. 4,585 people in total, moved abroad from Tallinn in 2018. There were more emigrants than Tallinn residents who passed away. 4,474 residents of Tallinn died in 2018.

Most of the people who leave Estonia are young: the biggest group of emigrants are 20–39 years old. Thus, every person who leaves affects the size of the working population and the subsistence of households. This can mean babies not born, jobs not filled and companies not established in Estonia. [https://blog.stat.ee/2019/09/12/igal-aastal-lahkub-tallinnast-tuhandeid-inimesi/]

These trends are consequential for WSS service provision. The changes in the population of densely populated areas (increase or decrease) change the provision and development of the water supply and sewerage service significantly (it affects the productivity of infrastructures and the efficiency of work). Population ageing does not change the water supply service. However, legislative changes in the maximum levels and requirements concerning drinking water and/or wastewater change the service considerably.

The introduction of stricter drinking water and/or wastewater provisions in legislation of any level bring about additional work and resources, We have to start thinking about changing, updating, reconstructing and financing the existing technologies. It’s particularly bad if the changes are significant and require massive changes in technologies and cannot be solved with simpler changes in the operation of drinking water processing/wastewater treatment plants.

1.4.2. Economic and fiscal situation

Four times a year, Eesti Pank publishes an overview that summarises the most important developments in the economy of the world and Estonia. The overview also includes an economic forecast for Estonia. The last overview was published on 10 June 2020. Two tables are reproduced below. The first table shows the economic forecast according to key indicators. The second table presents a comparison with the forecasts prepared by other institutions.

Table 1.3. Economic forecast by key indicators

	2019	2020	2021	2022
GDP at current prices in billion euros	28.04	25.41	27.95	29.34
GDP at constant prices**	4.3	-10.0	8.5	2.3
Private consumption***	3.2	-7.9	9.5	3.7
Consumption by government sector	2.8	3.4	-1.7	-0.5
Total capital investment in fixed assets	13.3	-18.8	13.5	4.1
Export	5.2	-13.9	9.3	5.9
Import	3.9	-15.6	8.7	7.2
GDP gap (% of potential GDP)	4.5	-6.9	0.6	1.2
Consumer price index	2.3	-1.1	0.0	2.1
Harmonised consumer price index	2.3	-0.9	-0.1	2.1
GDP deflator	3.2	0.7	1.4	2.6
Unemployment rate (% of workforce)	4.5	9.5	8.8	7.3
Employment****	1.3	-4.4	0.7	1.4
Average gross monthly wages (euros)	1,407	1,393	1,395	1,478
Average gross monthly wages	7.5	-1.0	0.1	5.9
GDP per worker at constant prices	3.0	-5.8	7.8	0.9
Current account balance (% of GDP)	2.2	2.6	2.9	2.7
Balance of the government sector budget (% of GDP)	-0.3	-10.3	-4.3	-2.2

* The indicators are presented as annual change in percentages, unless otherwise noted, ** The GDP and its components are presented as chained values. *** Includes non-profit institutions serving households. **** Covers resident production units. ***** The forecast of the revenue and expenditure of the government sector considers the impact of the measures known to sufficient detail by the time the forecast was prepared.
Sources: Statistics Estonia, Eesti Pank.

Table 1.4. Comparison with forecasts of other institutions

	Actual GDP growth, %				Change in consumer prices, %			
	2019	2020	2021	2022	2019	2020	2021	2022
Eesti Pank	4.3	-10.0	8.5	2.3	2.3 (2.3*)	-1.1 (-0.9*)	0.0 (-0.1*)	2.1 (2.1*)
Ministry of Finance	4.3	-8.0	8.0		2.3	0.6	2.1	
European Commission	4.3	-6.9	5.9		2.3*	0.7*	1.7*	
IMF	4.3	-7.5	7.9		2.3*	1.5*	2.0*	
Consensus Economics	4.3	-7.1	5.7		2.3	0.7	1.7	
SEB	4.3	-9.8	6.5		2.3	0.4	2.8	
Swedbank	4.4	-7.0	5.0		2.3	0.4	1.3	

* Harmonised consumer price index.
Sources: June Forecast of Eesti Pank, 10.06.2020; Spring Economic Forecast of the Ministry of Finance, 09.04.2020; European Commission. Economic Forecast. Spring 2020. 07.05.2020; IMF, WEO, April 2020, 14.04.2020; Eastern Europe Consensus Forecasts, May 2020; SEB, Nordic Outlook, May 2020, 06.05.2020; Economic Overview of Swedbank 13.05.2020.

In 2020, Estonia is going through a health crisis with far-reaching economic effects, because of which the total annual production is projected to decrease by 10%. Unemployment is expected to rise to over 13% by the end of 2020. The average wage is falling. As this crisis is more acute for population with lower incomes, the government ensures adequate social protection measures. As a consequence, COVID-19 created further stress on public budget expenditures.

The budget deficit of previous years has made it more difficult for the government to help the economic sectors. This affects provision of public budget guarantees and/ or direct financing of new investments in infrastructure.

Over the last decades, investment in WSS infrastructure and household connection has been largely financed with EU support. Infrastructure development was essentially financed through international support (70% of funds came through the EU Cohesion and Structural funds or grants). New financing capacities are required to operate and maintain existing assets, adapting services to changing needs, driven by more stringent environment and health regulations, or a changing climate.

1.4.3. Accountability of local governments for local infrastructure

Decentralised ownership for local infrastructure creates issues with accountability for service provision. The allocation of tasks and responsibilities across institutions is blurred, on some issues. Water companies and local governments are responsible for the provision of water services in cities and settlements; the Ministry of the Environment is responsible for sustainable access to WSS services in the state as a whole. The situation raises a few questions:

- Are these responsibilities equally clear and understandable to each party?
- Do all of the parties agree to the performance of the functions and obligations assigned to them?
- How are some obligations and functions financed? Is this allocation fair from the viewpoint of all parties and does it treat all of them equally?

There may be disputes and misunderstandings between the Ministry of the Environment, the local governments and water companies about who should be responsible if a policy goal is not achieved. For example:

- Who should guarantee the WSS access in areas of over 2,000 p.e. to the sewerage system?
- Who should pay the fine for non-compliance with the EU directives, should it occur?

Questions also arise when major disruptions and problems occur in the provision of the water service in a densely populated settlement. For example, if a major problem occurs, and drinking water no longer complies with requirements, so that an advanced water treatment is to be put in place; or if treated wastewater does not comply with norms, and a solution requires major investments, and minor operational improvements cannot solve the problem. Who bears responsibility to the citizens and/or the Ministry of Environment – the local government or the water company?

In that context, the utilities boards' roles, responsibilities and capacity to deliver on the tasks devolved to them seem uneven across the country.

1.4.4. The performance of utilities

As 70% of the infrastructure of the water sector has been built with the help of grants, the challenge is to guarantee the sustainability of the systems as well as the quality and consistency of the service in the future and, by achieving all this, eliminate the dependence on grants, but by guaranteeing affordable tariffs to consumers at the same time.

The constructed public water supply and sewerage systems require consistent maintenance and new investments. Unfortunately, the present fragmentation of water companies, where the majority of them are micro-companies, is unable to guarantee the funds required for investments and the qualified workforce for maintenance of automated equipment when offering water services at reasonable tariffs. It is estimated that only three or four water companies in Estonia that service larger cities are able to operate sustainably today, but there are more than 150 water companies in Estonia in total. The Environmental Protection and

Use Programme for 2020-2023 states that a vision for the policy regarding the provision of public water supply and sewerage services will be developed in order to guarantee the sustainability of the public water supply and sewerage service and ensure the continuity of the service in all regions.

Financial sustainability is not the only challenge water utilities face in Estonia. The efficiency of using water resources is an issue. This means that water leakages from the pipeline must be reduced and various water saving and reuse technologies must be implemented in regions where wastewater must be redirected to reduce flood risks, extract natural resources or for other economic activities. Nature-based solutions could be further deployed, together with incentives for people to use rainwater more efficiently; they include green areas, ponds, drenches and other solutions, which make it possible to manage rainwater via landscaping at the place where it occurs, thereby avoiding the pollution of rainwater.

The adequacy of the groundwater resources is a problem in some regions, which is why the use of groundwater must be managed in a manner that would primarily cover the water needs of people. It is also important to guarantee that water suitable for drinking is used expediently and the resources of clean water are preserved for the future as much as possible.

Another challenge is to make urban wastewater treatment plans work as required by making the necessary investments or improving the competencies of operators. Five treatment plants in wastewater collection areas whose load exceeds 2,000 p.e. do not meet the maximum limits and 90 treatment plans in areas where the load is smaller than 2,000 p.e. do not meet said requirements.

Energy efficiency is also a challenge. The Study of Resource Efficiency of water companies was completed in 2019, to support action in this domain. The objective of the study was to analyse the resource efficiency of Estonian water companies.

1.4.5. Compliance with the EU acquis on water

Coherent implementation of the EU *acquis* on water would help to enhance cost effectiveness of new water investments. A comprehensive monitoring of water quality and setting treatment standards based on expected environmental impacts can better inform investment decisions by features of the receiving water body. A robust cost-benefit analysis (particularly, in case of diffuse pollution) can support agri-environmental actions to improve the ecological status of rivers.

Compliance with UWWTD, in particular, needs to be analysed in more details. Distance to compliance may depend in the size of the settlements and the status of receiving water bodies. In this context, prioritisation of new investment, taking into account the total cost for O&M costs over the lifetime of the investment, is to be done.

1.5. Pending issues

This section sketches issues that need to be analysed to address the concerns listed above on the sustainability of water supply and sanitations services in Estonia.

The institutional and legal framework is one. In particular, Estonia is completing a major reform of its administrative structure, which lead to a significant diminution of local governments. The consequences on water services remain to be seen.

Second, a robust and effective framework to drive performance improvements of water utilities is missing. While some utilities report on selected indicators, a systematic list of performance targets, indicators, and a performance monitoring and benchmarking capacity are lacking.

Third, tariffs for water supply and sanitation services have a critical role to play to generate the revenues needed to enhance the financial sustainability of water utilities, and to drive operational and resource

efficiency. It is not clear how prevailing tariff setting process and tariff levels combine cost recovery and affordability. This enhances financial challenges of current and future development plans for water services.

Ultimately, previous attempts to urge utilities to agglomerate and benefit from economies of scale have reached limited results. Lessons can be learned, that can inspire further policies and incentives in this domain.

1.5.1. The institutional and legal environment

Legal framework

The existing framework limits the range of arrangements that can be considered for ownership of assets and operation and maintenance of WSS services. More work is needed to characterise the options to combine local ownership with a wider range of arrangements for the operation and maintenance of WSS services.

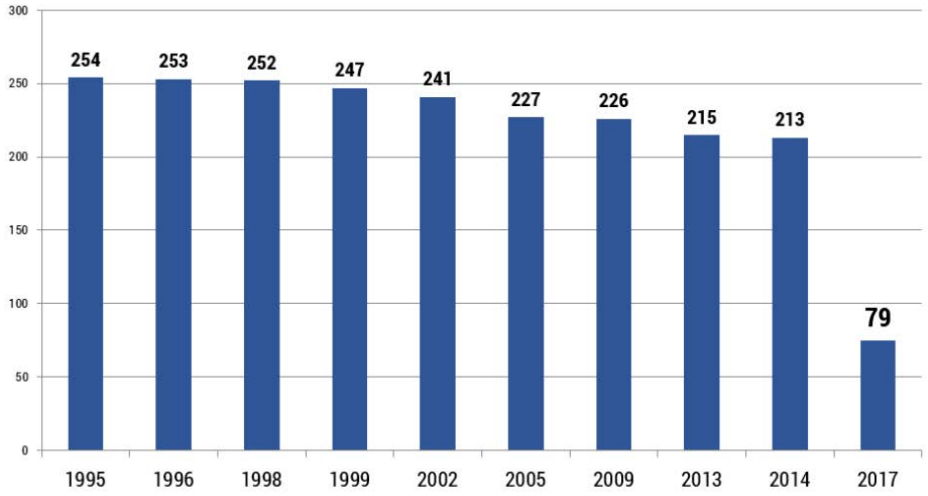
In line with the regional and local government policy reform, the Ministry of the Environment of Estonia jointly with other governmental authorities (the Ministry of Finance, the Minister of Public Administration) is working towards the enhanced sustainability of WSS services in the country. Modalities of the reform implementation, including options for consolidation of the water utility sector, have to be further considered and included into the proposal to the Government. It also relates to further improvement of the Shareholder Agreement framework for regional companies. The agreement could be further strengthened to reflect on responsibility and obligations of the local governments as shareholders.

The context of the administrative reform

In Estonia, municipal and local governments own WSS infrastructure and water companies. They bear most of the cost of providing water supply and sanitation services and operating and maintaining existing systems. They face a severe financial challenge. On the one hand, the small size and low density of population make the unit cost of WSS services provision high. On the other hand, most of the Estonian municipalities lack professional staff to properly operate the existing water supply and sanitation infrastructure. Creating such competences would further increase the operation cost of services.

The administrative reform took place in Estonia in 2017. The total number of local governments decreased from 213 to 79 as a result of the administrative reform. The average number of population and the average area of a local government almost tripled. After the reform, the share of small local governments with a population of less than 5,000 decreased from 79% (169 local governments before the reform) to just a fifth (15). 47 cases of voluntary merger were approved and 160 local government participated in them. Thus, the majority of the mergers (86%) occurred in the stages initiated by the councils themselves and in the manner that was locally agreed. Pursuant to the Administrative Reform Act, the Government of the Republic initiated merger proceedings in respect of local governments with fewer than 5,000 residents, i.e. the local governments that did not meet the minimal population criteria.

Figure 1.4. Number of local governments in Estonia from 1995-2018



There are 15 counties and 79 local governments in Estonia. Local governments are divided in 15 cities and 64 municipalities, which decide on and organise the matters concerning local life independently. Irrespective of their size, local governments must perform the same functions and offer the same services to residents throughout Estonia. The territory of local governments, i.e. administrative units, divides in settlements: cities, towns, small towns, villages. Local governments decide on and organise all matters concerning local life and act independently. The state may assign obligation to them only on the basis of law or by agreement with the local governments.

Figure 1.5. Changes in counties borders and population (%) after the administrative reform

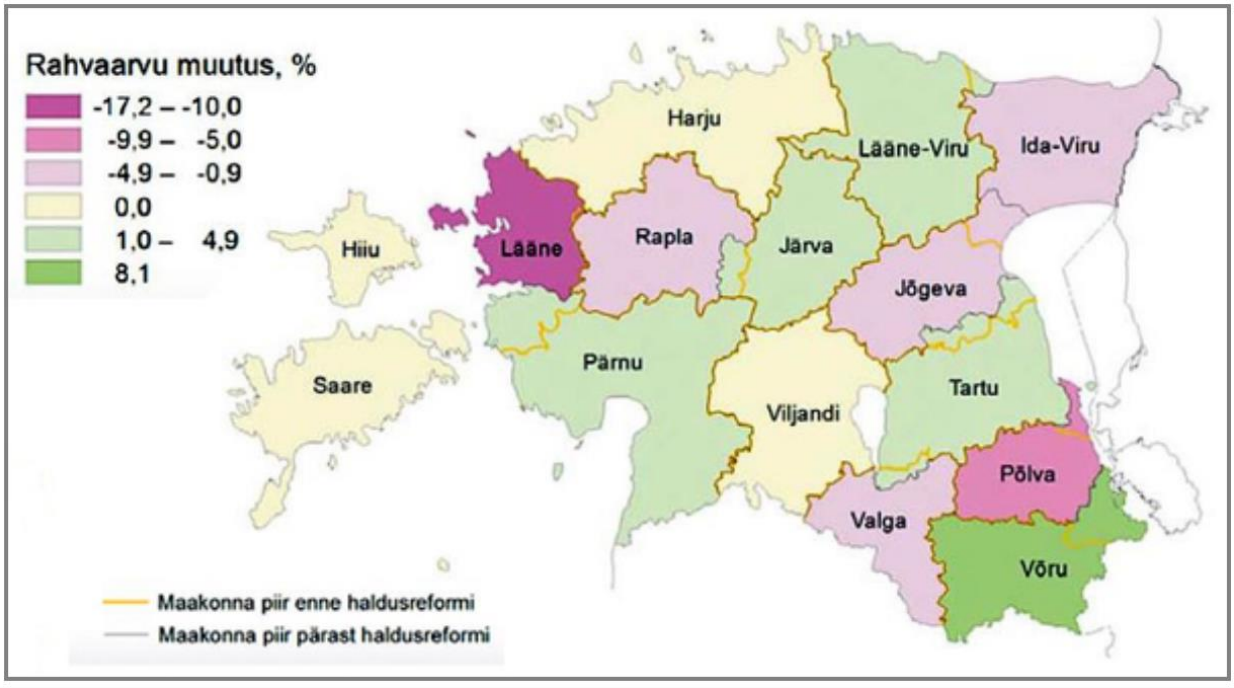


Table 1.5. Local governments before and after the administrative reform

	Before mergers 01.01.2017	After the administrative reform of 1 January 2017	01.01.2018	02.01.2019 (after the Population Register was updated)
Under 5,000 residents	169 local governments	15 local governments	17 local governments	17 local governments
5,000–11,000 residents	28 local governments	36 local governments	34 local governments	36 local governments
Over 11,000 residents	16 local governments	28 local governments	28 local governments	26 local governments
Average number of residents	6,349	17,118	17,152	16,835
Median number of residents	1,887	7,865	7,739	7,558
Average area	204 km^2	550 km^2	550 km^2	550 km^2
Median area	180 km^2	512 km^2	512 km^2	512 km^2

Source: population according to the Population Register.

Completion of a large scale administrative reform is in progress. Further analyses would characterise what is in it for WSS (capacity and financial sustainability of municipalities; synergies with other services). Some utilities can operate sustainably; however, most utilities are unable to secure the technical skills for the operation of existing assets.

After the administrative reform, many of the merged local governments agreed that no structural changes will be made in the local governments until the results of the local elections of autumn 2021 are announced. In particular, they agreed that water companies will not be merged until then.

1.5.2. Performance monitoring

The Health Board supervises the quality requirements for drinking water and the obligations of drinking water operators.

The regulations for on-site treatment and removal of wastewater established by local governments are supervised by the Environmental Inspectorate and the local government. Similarly, compliance of the activities of a water company and the clients of a water company with the requirements for handing hazardous substances is checked, and decisions and precepts are made by the Environmental Inspectorate.

State supervision over compliance with the Public Water Supply and Sewerage Act is carried out according to their competencies by city and municipality governments (i.e. local governments), the Competition Authority and the Environmental Inspectorate.

Oversight of the compliance of the tariff of the water service and connection fee with legislation and the requirements related to their establishment as well as the methodology for calculation of the connection fee is exercised by the Competition Authority (in wastewater collection areas of over 2,000 p.e.) and by city and municipality governments (in wastewater collection areas of under 2,000 p.e.) according to the water company's operating region. Additional oversight of the connection fee and tariff of the water service is exercised by the Competition Authority at its own initiative, on the basis of a justified request received from a local government agency, the Ministry of the Environment or the Environmental Board.

The compliance of the tariff of the water service with the Public Water Supply and Sewerage Development Plan is inspected by municipality and city governments (that require the water company to submit applications to set tariffs if the price of the water service does not cover the expenses set forth in the Public Water Supply and Sewerage Development Plan). The state and local governments are responsible for the oversight of the activities of water companies. For example, the state supervises compliance with the terms

and conditions of environmental permits. In addition, local governments are interested in how the population is served – are there any leaks, has water been shut off, what is the quality of the tap water, whether and how fast the queries of clients are addressed, etc. No major changes has occurred in the allocation of responsibility over the last 10 years.

City and municipality governments exercise oversight of the compliance of a water company's activities with the Public Water Supply and Sewerage Act, local government legislation (including the rules on connection to public water supply and sewerage and rules on the use of public water supply and sewerage) and the public water supply and sewerage development plans.

Water companies disclose a report on their own website or on that of the local government once a year within 30 days after approval thereof by the water company. This obligation arises from the Public Water Supply and Sewerage Act. The report must include a summary of the financial year, an overview of the investments made in the last year, quality of drinking water, wastewater treatment, future development trends and the investments planned for the development of public water supply and sewerage.

Performance management and benchmarking of utilities may help to attract more effective and efficient business arrangements. However, performance is not systematically benchmarked across utilities. For instance, there is no information on the rate of water losses and recent trends. Collection of information on water leakages started in 2019 with annual reports on water use, but the submitted information is still too incomplete for making summaries. However, leakages and water losses have been discussed in section 2.4.3 "Share of Leakages and Breakdowns" of Part 2 of Stage II of the study "Development of a Strategy Towards a Sustainable Water Sector", which was completed in 2018. The analysis in the study was prepared on the basis of the data for 2016. However, considerable investments have been made in infrastructure in the last four years and the number of leakages has certainly decreased even further as a result of this.

Incentives to improve performance and sanctions for poor performance are lacking, not enforced or not effective. The independent regulator is not involved in performance definition, monitoring and enforcement.

The City of Tallinn established the Tallinna Vee-ettevõtjate Järelevalve Sihtasutus (Tallinn Foundation for Oversight of Water Companies), which checks the compliance of the quality of drinking water and wastewater treatment with norms and assesses the performance of the service agreements entered into with the city. The Foundation also checks the adequacy of the investments made by water companies, adherence to construction volumes and deadlines, protects the interests of the consumers of the service and also solves consumers' problems. However, this remains a local solution and an exception rather than the rule.

1.5.3. Tariff setting and tariff levels

Water supply and wastewater services are regulated by Public Water Supply and Sewerage Act (Water Law) in Estonia. According to the law, water tariffs must be cost based – including a reasonable rate of profit - and approved by the regulator. The Estonian Competition Authority (ECA) is a multisector regulator, established in 1993. ECA regulates prices in district heating, electricity (network) and gas (network) sectors and has supervisory functions in area of airport, railway and postal communications, as well as supervising overall competition at state. ECA has been the regulator of water companies since 1st November 2010, when the Water Law was amended. Since then, ECA approves prices for water service and methodologies for calculating connection fees to public water supply and sewerage systems. In accordance with the Water Law, ECA also issued recommendations on calculating the price for water services. In addition, the Competition Authority has oversight of the tariff of the water service and the revenues from connection fees.

ECA is not an only regulator approving prices of water companies. If the territory of operations of a water company is situated in the wastewater collection area with pollution larger than 2000 p.e., prices (or

methodology for calculating connection fees) are approved by ECA. If the territory of a water company is situated in the wastewater collection area with pollution smaller than 2000 p.e or outside a wastewater collection area, prices (or methodology of connection fees) are approved by local government. In case a water company provides the water services in several different wastewater collection areas and intends to set uniform prices for water services in these areas based on its total costs, ECA approves prices (or methodology of connection fees in that area).

WSS tariff regulation process:

The WSS tariff regulation process goes through the following four phases:

I. Submitting price application by water company
II. Evaluating the price application accordance to the requirements (by regulator)
III. Analysing the price application, a water company can be contacted for further clarifications.
IV. Decision on price approval or disapproval made by regulator. In case regulator does not approve the price application, a water company can provide comments on the decision.

For further clarification - prices are set for indefinite period of time and are in force until new prices are approved by regulator (ECA or local governments, depends on competency of a regulator). Approval takes place upon water company`s application. Water company's rights to submit an application to set prices for water services are not restricted.

Table 1.6.Average service tariffs of EVEL members as at the end of 2019

Water tariff €		Sewerage tariff €		Water tariff €+VAT		Sewerage tariff €+VAT	
resident	company	resident	company	resident	company	resident	company
1.10	1.23	1.57	1.75	1.32	1.44	1.89	2.05

Source: http://evel.ee/teabepank/infomaterjalid/

The water tariff regulation was revised in 2010. However, the reinvestment component is not part of the tariff formula for most water companies. The cost of replacing decaying assets is not properly reflected in the tariff-setting process. Therefore, most utilities are unable to generate the revenues to renew and upgrade (where appropriate) existing infrastructures. Capital is not being amortised adequately.

Concerns about the financial sustainability of water companies are serious, because the capital component included in the tariff of the public water supply and sewerage service according to the effective methodology is not sufficient for the modernisation and maintenance of their assets.

Another issue is that, according to the regulator's model, the calculation of capital expenses is linear and calculated according to the acquisition cost, and the average useful life of the fixed assets belonging to water companies is 30–40 or even more years. The capital expenses calculated according to the guidelines ignore the time value of money and the fact that the cost of the investments made today is considerably higher than the investment made in equivalent assets at the time. Also, there have been several monetary reforms since some of the assets of water companies were acquired. The regulation would serve its purpose and it would be possible for the companies to make the necessary investments if the capital component covered the amount required for the investments, e.g. considering the indexed value of fixed assets instead of the replacement value. The actual investment needs are considerably bigger.

A proper maintenance and operation of the WSS system in Estonia would require a significant increase of WSS tariffs, possibly beyond the affordability level for most of the municipalities. Currently, an average

affordability rate is estimated by Estonian experts about 2.2 -2.5% of household disposable income, reaching 4% for low-income households.

An affordability check is not a part of the tariff setting procedure in Estonia. Here, the issue of affordability of the water tariff is solved at the level of the local government (e.g. income support etc.) by granting social support to specific people. In practice, the water tariff is less than 2.5% of the income of a household member, which is why affordability is not considered yet. However, it may have to be considered in the future when the proper functioning of the infrastructure has to be guaranteed.

1.5.4. Financing for WSS

Recent trends in financing for WSS and emerging issues

The Investment Plan of the Water Management Infrastructure prepared in 2019 can be found here: https://www.envir.ee/sites/default/files/Vesi/Uuringudjaaruanded/veemajandustaristu_investeeringute_kava.pdf . Possible funding sources have been discussed in the aforementioned Investment Plan of the Water Management Infrastructure.

Public budget allocations and EU finance of new investments were driven largely by the need to connect more households to WSS service. The Ministry of Environment - Environmental Investment Centre (EIC[2]) can support three activities associated with the provision of water service:

- Water Economy Programme (Environmental Programme) to support drinking water supply and wastewater management. Support is provided to achieve goals stipulated in the General Part of the Environmental Code Act. The EP of EIC started in 2000 when the EIC was founded, and the programme still funds the largest number of environment projects every year. There is a specific sub-programme for WSS investments under the EP of EIC. The WSS sub-programme covers a wide sector of water management starting from construction of water treatment infrastructures to specific R&D projects. The main beneficiaries of the sub-programme are water service companies of municipalities. Over the last ten years, the annual budgets of WSS sub-programme of EP have varied from seven to twenty-four million, depending on the receipt of national pollution charges and political priorities.

  The funds of the programme come from environmental charges and the money is distributed within the scope established by the Act between local governments. The Ministry of the Environment allocates an amount for the implementation of the Environmental Programme every year, the size of which corresponds to the amount of money received by the state budget from the issuing of special water use rights. Over the last ten years, the annual budgets of WSS sub-programme of EP have varied from seven to twenty-four million, depending on the receipt of national pollution charges and political priorities.
- Development of water supply and sewerage infrastructure (European Union Cohesion Fund). The support is provided to ensure access of population to sustainable drinking water supply and wastewater collection and treatment services within wastewater collection areas approved by the Minister of the Environment.
- Development and reconstruction of water infrastructure (European Union Cohesion Fund) in wastewater collection areas with a pollution load of over 2,000 consumers, and the reconstruction of public water supply systems that serve over 2,000 people.

The last two measures are part of the operational programme of the Structural Support Act for 2014–2020 under the partnership agreement between Estonia and the European Commission. The operational programme of cohesion policy funds was prepared on the initiative of the Ministry of Finance on the basis of the partnership agreement.

The intention is to plan the use of the structural funds of the 2021-2027 period of the European Union Cohesion Fund on the basis of development needs, targets and reforms to be defined in the long-term strategy Estonia 2035 that is currently being prepared.

The WSS programme of EIC covers a wide sector of water management starting from construction of water treatment infrastructures to specific R&D projects. The main beneficiaries of the programme are water service companies of municipalities.

Local governments form a significant part of the government sector. They cover 25% of the total expenditure of the government sector. Local governments have independent budgets, which are prepared according to the basis and procedure set forth in the Local Government Financial Management Act.

The tariff of the water services is determined on cost-bases and it must cover all of the justified expenses required for the provision of the service. The local government may give support for covering certain activities (e.g. rainwater expenses), which will then be subtracted in pricing (i.e. the expenses compensated by the local government are not included in the tariff).

Cross-subsidies between other services exist at local level, but do not bridge the gap between revenues from tariffs and O&M costs. The losses of water companies tend to be accepted on the account of the profitability of other services, as smaller companies often provide other public services of local governments as well, such as district heating, maintenance, street cleaning, street lighting, asset management, etc.

The support granted to the drinking water supply and wastewater treatment strand from the Water Management Programme are shown in the table below.

Table 1.7. Support to WSS granted by the Water Management programme

Strand / €	2011	2012	2013	2014	2015	2016	2017	2018	2019
Drinking water supply	4,562,794	3,677,737	3,267,494	2,300,233	2,835,028	797,164	873,390	1,071,805	5,837,876
Wastewater treatment	15,747,727	14,190,003	5,487,279	6,178,351	12,329,719	10,347,575	8,168,245	14,410,331	

Of note: whilst many water companies have managed to modernise their old assets with the help of state aid, the state has established restrictions due to which Tallinna Vesi is the only one in Estonia that has not qualified for state aid. Namely, a condition of state aid is that only water companies that belong fully to one or several local governments and own the water management infrastructure in the region are eligible for support. As Tallinna Vesi is a public limited company listed at the stock exchange and whilst the City of Tallinn is one of its shareholders, it does not meet the rule emphasised above.

WSS sector development plans and expenditure programmes

The strategic planning of WSS generally takes place at local government level. National goals are set at the level of the state, e.g. achievement of compliance for settlements over 2,000 p.e. and consistent maintenance of this compliance. Various programmes for supporting the development of the area are also developed at the national level for the achievement of national goals and those set by local governments. At the national level, goals and programmes are developed by the Ministry of the Environment. The issues related to the budget and grants are to be approved by the Ministry of Finance, the Government of the Republic and the Riigikogu.

The main functions of the Ministry of Finance are to advise the Government of the Republic on the budget, taxation, macro-economy, spatial panning, financial, administrative and regional policies, the

implementation of regional administration and the economy. Every year, the Ministry of Finance prepares the state budget, the state's budget strategy and the stability programme in cooperation with other ministries (including the Ministry of the Environment) and constitutional institutions.

The Ministry of the Environment proceeds from the Estonian Environmental Strategy 2030 adopted in 2007 (which establishes the framework of environmental protection and use until 2030) and the Environmental Protection and Use Programme for 2020-2023 when providing input for and cooperating with the Ministry of Finance, and when preparing its budget. The environmental strategy stipulates the goals and measures of the area (lines of action). Programmes are established for the implementation of the strategy and have been prepared for the achievement of the goals set in sectoral development programmes, through which the measures, activities and services required for the development plans are planned, budgeted and implemented, and reports are prepared. The on-going Environmental Protection and Use Programme that defines the development directions of the water service has been prepared for 2020-2023.

Sector development is planned by local governments. Local governments prepare the Public Water Supply and Sewerage Development Plan for the development of public water supply and sewerage, which is prepared for at least 12 years and reviewed at least once every four years, and adjusted if necessary. The data of the wastewater collection area (boundaries, pollution load) must be checked when the Development Plan is reviewed and an application for approval of the wastewater collection area must be submitted to the Minister of the Environment. The Development Plan must be approved by the Environmental Board and the Health Board before it is approved by the local government. The guidelines for preparation of the Development Plan were set by the Ministry of the Environment.

1.5.5. Lessons from previous attempts with agglomeration of utilities

Consolidation of WSS services is not envisaged in the legal or regulatory frameworks of Estonia. However, the Ministry of the Environment claims that the potential for consolidation of water management exists in Estonia, as the service quality has improved, water infrastructures have been renovated and the water quality has become better in the regions where regional water companies have been established or where the water companies of local governments have been merged after the administrative reform.

The position of the Ministry of Finance is that the consolidation process should be voluntary. So far, attempts have been made to implement a voluntary consolidation through the establishment of regional water companies. The term *regional water company* was introduced in the regulations on granting support to water companies in 2018. A regional water company is a company that provides its service to more than 5,000 residents in at least six wastewater collection areas (WWCA), one of which is a WWCA of over 2,000 p.e. Until now, getting support on more favourable conditions has been an important incentive for the formation of water companies (and the merger of smaller water companies with larger sustainable water companies).

Well-performing utilities have been reluctant to agglomerate with poor-performing ones, as this may affect their overall performance and capacity to deliver over the long term. What kind of incentive, support or compensation mechanism may address this concern?

A study in 2018 considered four alternatives of WSS consolidation, aimed at developing strategies towards a sustainable water sector. The study analysed the situation after the implementation of the afore-mentioned administrative reform in Estonia. It considered a business as usual scenario (rural municipality, or city-based water companies) and 3 main alternatives: county-based, regional and country-wide water companies. According to the sustainability criteria (service quality, affordability, company's investment capacity, dependence on state aid and feasibility to implement the model on a voluntary basis), the options of regional and country-wide water companies can be considered as sustainable solutions. In terms of affordability, the optimal solution is the country-wide model including Tallinn. However, establishing a country-wide water company on a voluntary basis, i.e. involving all local governments as shareholders, is

quite complex. The local government-based model cannot be considered sustainable as it would require state support to ensure affordable tariffs in all regions.

Previous attempts have focused on agglomeration, looking for a blanket solution at national level based on the geographical scale (local; county; regional; national). Additional options could be considered, that may promote different types of agglomeration (e.g. ownership and operation being arrangement at different scales; organising different functions at different scales), and a dynamics that may evolve differently in different parts of the country (at least in the short and medium term).

Of note: the largest Estonian network company Elektrilevi, which has covered 93% of Estonia with an electricity network, has contacted the Ministry of the Environment and shown interest in the management of the water network. Analysing the merger of services (e.g. network management service, centres of excellence, etc.) is an alternative that could certainly be considered.

Rules for the connection and use of services vary between municipalities, complicating agglomeration. Each local government establishes its own rules for the use of and connection to the public water supply and sewerage system. This is particularly an issue for regional water companies, as the rules for the use of and connection to the public water supply and sewerage systems of local governments are different and thus, there is no common approach in the service area of the regional company.

Points to be considered include the following:

- Particular attention needs to be paid to multi-purpose utilities: how would consolidation of the operation of water services affect the capacity to deliver other services (district heating, or else)?
- There seems to be a legal issue with the ownership of the assets and the utilities. What are the options to combine – and legal consequences of combining - ownership at municipal level and bundling assets at a larger geographical scale?

One observer notes that, according to the constitution the central and local level functions are and should be clearly separated. As water service is mandatory local function of local governments and the service property (as well as service companies) belongs to municipalities, there are limited possibilities for compulsory consolidations. Consolidation policy could focus on regulatory aspects (e.g. competencies, water management, separation of operation and infrastructure, etc.) and mechanisms to stimulate voluntary consolidation providing at the same time consulting, guidance, monitoring and other motivation packages.

1.6. Suggestions for further work

Background information on the state of play and preliminary understanding of concerns about its sustainability and pending issues help characterise a list of topics that deserve further attention, as they can support reforms that effectively encourage agglomeration of water utilities and put water supply and sanitation services in Estonia on a sustainable basis.

The proposed topics for further investigation are listed below. This list is destined to ignite a discussion with Estonian authorities and stakeholders. A fine-tuned programme of work in the context of this project will unfold, in line with the detailed project description and with the experience and ambition of Estonian counterparts.

Preliminary list of topics for further analysis:

- Make the case for change. Explain that business as usual is not an option and the national and local governments and water users will be affected by the unsustainable management and operation of WSS services.

- Consider a range of options for agglomeration, which are flexible and can adjust to local contexts. They are not only based on geographical scale only. They may vary according to functions (planning; programming expenditure; technical skills; relationship with users; billing and tariff collection).
- Address practical issues, such as the case of multipurpose utilities: how to secure proper operation of these utilities if water services are severed from them? What are the consequences for water supply and sanitation services (losing capacity, revenues and benefits of cross-subsidies, else)?
- Beef up the role for the economic regulator. Define a role for setting and enforcing performance targets; assessing the opportunity and efficiency of expenditure programmes; setting tariffs as a policy instrument to drive investment and performance. Offer options regarding the status, skills and governance of the economic regulator.
- Clarify and address legal issues related to asset ownership. Explore options to transfer ownership to entities operating at larger geographical scales, or to combine local ownership with operation at larger geographical scales.

Annex 1.A. The performance of water utilities. Selected cases

Annex Box 1.A.1. The performance of water utilities. The case of Tallina Vesi

Tallinna Vesi is the largest water company in Estonia that provides water supply and sewerage services to almost a third of the population of Estonia. The company serves over 23,600 private and corporate clients and over 450,000 final consumers in Tallinn and surrounding municipalities: Maardu, Saue and Harku.

The company must proceed from the terms and conditions of the administrative contracts entered into with local governments and legislation in its operations. For example, they must implement the Public Water Supply and Sewerage Act, the Water Act, the Emergency Act and the other legislation established on the basis of these as well as the environmental permits in which environmental obligations have been set for the companies in respect of water use, air pollution and waste handling. However, the administrative contract is the main operating document for a water company. For example, the company is obliged to guarantee service quality at the level of 97 according to the administrative contract entered into with the City of Tallinn in 2001. A similar administrative contract has also been entered into with the second largest local government, i.e. Maardu Town, which also sets service levels.

A contract entered into with a local government may include higher quality levels than specified by law or introduce more criteria if this is agreed between the parties, also in respect of reporting. In respect of the Tallinn service area, for example, the company must submit to the City of Tallinn within 90 days of the end of the previous calendar year a report on the compliance of its activities with the quality levels established with the administrative contract for services in the previous calendar year, where the achievement of the quality level and the emerged deficiencies are indicated with their reasons in comparison with the level requirements as well as the measures taken for the elimination of the deficiencies.

The requirements arising from environmental permits, the law or administrative contracts are used to assess service quality – did the company comply with these requirements or are there shortcomings in its activities.

For example, the company has agreed on an inspection plan with the Health Board, which is followed in terms of water quality. The administrative contract and the local government continuity regulation established on the basis of the Emergency Act also stipulate the permitted duration of water outages and what the water company has to do if the permitted duration is exceeded – guarantee water in another manner. Tallinna Vesi has water tank trucks for this purpose. The level of permitted leakage, which the company has tried to reduce year on year, is also regulated in administrative contracts. The number of sewer blockages, which is stipulated in the administrative contract, is also an indicator alongside many others.

The most important indicators that illustrate the company's results in guaranteeing service levels are disclosed by the company to its stakeholders on a quarterly basis. The information for six months in 2020 was as follows:

Annex Table 1.A.1. Performance indicators. The case of Tallina Vesi

Performance indicator	Unit	2020	2019	2018
Compliance of water quality samples taken from consumer's tap with requirements	%	100.0	99.5	99.9
Level of leakages in network	%	13.9	12.2	14.1
Average duration of water outage per registered immovable	h	3.05	2.63	3.28
Sewer blockages	pcs	227	302	295
Breakages of sewerage pipes	pcs	41	59	50
Compliance of treated wastewater with environmental requirements	%	100.0	100.0	100.0
Number of complaints	pcs	28	81	69
Client contacts about water quality	pcs	164	172	101
Client contacts about water pressure	pcs	149	154	183
Client contacts about blockages and rainwater discharge	pcs	473	542	516
Replying to written contacts in at least two business days	%	100.0	100.0	100.0
Cases of violation of promises made to clients	pcs	0	2	2
Notification of unscheduled water outages at least 1 hour before the outage	%	99.2	97.7	94.4

Annex Box 1.A.2. The performance of water utilities. Järve Biopuhastus (JBP)

The goals concerning the quality of the water service are established as follows in the acts adopted by the Riigikogu and the legislation based on these (the list is not exhaustive).

- The Public Water Supply and Sewerage Act regulates how supplying registered immovables with water, and leading off and treatment of wastewater, rainwater, drainage water and other soil and surface water from registered immovables should be organised, including definition of areas to be covered by the water service, development of the public water supply and sewerage, continuity of the provision of the water service, and use of the Development Plan in common interests.
- The Water Act stipulates the requirements for the organisation of water use and protection and the water protection requirements, which guarantee the long-term protection of water resources and the rights, obligations and responsibility of a person when using water.
- The General Part of the Environmental Code Act sets goals concerning the reduction of environmental nuisances, the promotion of sustainable development, the preservation and protection of natural diversity, the good state of the environment, the prevention of damage to the environment and the remedying of damage caused to the environment.
- The Atmospheric Air Protection Act stipulates the requirements set for affecting ambient air by chemical and physical pollutants and the measures for maintaining and improving the quality of ambient air.
- The Emergency Act stipulates the requirements for the continuity of water supply and sewerage.
- The Waste Act stipulates the organisation of waste management, the requirements for preventing waste generation and the health and environmental hazards arising from waste.

The requirements to the extent, water pressure, headwater level and continuity, construction, maintenance, repairs and inspection of the water works and sewerage of registered immovables, interruption and restoration of the provision of the water service, provision of the service in the case of breakdown, including provision of water in the case of a breakdown or repairs of the public water supply, and for the wastewater and rain water that is led off, which have been specified and adapted to the local conditions, are stipulated in the rules for use of public water supply and sewerage approved by the councils of Jõhvi Municipality, Lüganuse Municipality and Kohtla-Järve City.

Administrative contracts for the use of public water supply and sewerage in the company's operating region do not include agreements for the establishment of stricter conditions for the water service than the one established with effective legislation.

The investments necessary for guaranteeing the required quality of the water service are set forth in the public water supply and sewerage development plans approved by the councils of Kohtla-Järve City, Jõhvi Municipality and Lüganuse Municipality. In accordance with the approved plans, the shareholders of JBP approve the company's investment plan, in which the investments of JBP will be determined in terms of money and partly in terms of items by five-year periods.

JBP submits regular financial and environmental reports to the state. The quality indicators, flow rates and quantities of drinking water and wastewater are given in the environmental reports. The state can use these data to assess the performance of the water company. The companies belonging to the Estonian Water Works Association voluntarily monitor a number of key indicators.

Local governments control the activities of JBP mainly via the representatives of the shareholders and the supervisory board, the members of which are appointed by the local governments that are the shareholders of the company – Kohtla-Järve City, Jõhvi Municipality and Lüganuse Municipality

Annex Box 1.A.3. The performance of water utilities. Narva Vesi AS

The performance of Narva Vesi is checked by three to four control bodies:

- in everyday activities by the management board, which has one member, and middle managers (heads of departments)
- upon the implementation of major investments and decision of strategically important issues by the supervisory board, which consists of the representatives of shareholders (city councils); and
- the annual inspections of the company's activities in the year are checked and assessed by the company's supervisory board, auditor and shareholders (representatives of the city).

Both of the above consider and assess the production and financial results as well as the success and achievement of major goals (e.g. medium or major construction procurement or investments).

Narva Vesi uses different indicators to assess the success of its operations, which are checked and viewed according to the areas of operation (Narva City separately and Narva-Jõesuu separately), either:

- weekly – inspection of the quality of drinking water (route drinking water samples), routine inspection of appropriate treatment of wastewater treatment (routine wastewater samples, number of breakdowns in the water or sewerage network, customer complaints, orders for water and sewerage works, issue of technical specifications, approval of working designs and/or detailed spatial plans, occurrence of disruptions or breakdowns in wastewater treatment plants or drill well and/or wastewater pumping stations
- monthly – water losses in drinking water and filtration/infiltration in wastewater, change in the quantity of raw water pumped out (decrease/increase), scheduled repairs of the public water supply and sewerage network, number of people connected to the water supply and sewerage system, changes in the drinking water and wastewater volumes of the biggest consumers of water and sewerage services in the current month (increase/decrease), scheduled maintenance and/or repairs of the drinking water and wastewater treatment plants, inspection of the deliveries of chemicals; if there are any construction projects, routine monitoring of the progress of construction and compliance with the schedule and budget; monthly summary of the compliance of drinking water quality and performance of wastewater requirements, and summary of appropriate treatment of wastewater – the daily work of the plants will be made more efficient and/or adjusted according to the results
- semi-annually – aggregate summaries of monthly data are made and the operation of the most important infrastructures and the activities and expenses required for technical maintenance are primarily monitored; changes in water losses (decrease/increase), the actual fixed and variable expenses are compared with the expenses planned at the start of the year are monitored and based on the results, we either adjust our plans or make our daily operations more efficient
- annually – inspection of drinking water and wastewater treatment plants, the stock of spare parts for the water supply and sewerage network in departments, comparison of the financial indicators with the previous year, inspection of the results in the company's annual report

with the previous years; the success of construction sites is assessed in the case of construction projects, if any. Plans are made for the next year and goals are set in production and financial plans. In the case of major constructions (concerning external networks or stations or drill well pumping stations or wastewater pumping stations), the goals are set by the head of department, member of the management board and/or the supervisory board. The achievement of the company's financial results and correctness of accounting (incl. the correct recognition of revenue/expenses, profit/loss) are checked by an auditor. The sustainability of the company is assessed, among others, by the shareholders at the annual general meeting of shareholders.

The most important indicators and goals in Narva Vesi (for middle level employees, the management board, the supervisory board as the owners – representatives of Narva and Narva-Jõesuu – city governments) are guaranteeing safe drinking water for the population and wastewater treatment according to requirements, and the company tries to achieve both of these goals at optimal cost. Guaranteeing the smooth operation, good technical order and long life of the existing infrastructures (water plant, wastewater treatment plant, external water supply and sewerage networks, wastewater and drill well pumping stations) is extremely important to the company. In addition to the above, the management board and the supervisory board monitor the company's economic sustainability and annual economic results.

Annex 1.B. Questionnaire for data collection on the state of play

Legislation, institutional and regulatory framework

1. Please briefly describe the key pieces of legislation (e.g. water law/code, acts defining WSS assets ownership) and the regulatory framework (e.g. water quality standards, permitting/licensing) for WSS services provision.

2. Is the WSS services consolidation envisaged in the legal or regulatory frameworks? If yes, is it a mandatory or voluntary process, please describe the mandatory provisions and the legal forms that consolidation may take place.

3. Which institutions are in charge of setting WSS policies, development planning?

4. Characterise the main priorities (access in cities; access in rural areas; health or environmental standards; quality of service; adaptation to climate change; energy efficiency; connection to existing infrastructures; else).

5. Characterise the main drivers for change

- Demographic trends since 2000; projections to 2030, or 2050; regional disparities; urban/rural; trends in size of households, ageing;
- GDP growth since 2000; projections for the next 5 years.

The organisation of service provision

6. Which institution is accountable for service provision (central government; municipalities; other)? Has the WSS assets ownership been transferred from the central governments to municipalities? When? To what extent?

7. How is service provided?

- Please describe WSS services provision at local level. Please describe modalities of inter-municipal cooperation for WSS provision (e.g. agreements on cooperation between municipalities) if it takes place.
- Role and status of utilities, public or private (e.g. what legal forms (delegation, lease, management contracts) it can take between municipalities and water companies). In case of municipal public utility for WSS - are revenues from water supply and sanitation service earmarked for water-related expenditure only? Or any share of revenues accrue to other types of expenditures at local level?

8. How many municipalities exist in Estonia? Changes since 2010 (any trend towards consolidation)?

- Please provide a map of municipalities in Estonia
- Population by municipality.

9. How many entities/utilities provide services for water supply? For sanitation? Changes since 2010 (any trend towards consolidation)? Are there any municipalities with 2 or more WSS utilities?

The performance of service providers

10. Who sets objectives for service quality (e.g. continuity)?

11. How is performance measured (key indicators) and monitored?

12. Has the oversight of utility performance been a responsibility of central or local governments (municipalities)? Report any major change in the devolution of responsibility over the last 5-10 years/ or planned reforms in this area. Is an independent regulator involved in setting targets, monitoring performance, benchmarking service providers?

Tariff setting

13. Have a specific/dedicated tariff regulation for WSS services (or WSS and other communal services) been adopted in Estonia? When? By which part of the government?

14. Please describe the WSS tariff regulation process.

15. Have professional regulatory bodies regulating tariffs for WSS services (or WSS and other communal services) been established? When? What is their status vis-à-vis the government?

16. Please describe the access (if any) to water utility data, potential gaps in monitoring water utilities performance.

17. Are public budget subsidies envisaged to compensate water utilities for difference between tariff and cost?

18. Has an affordability check become a part of the tariff setting procedure for WSS? Please provide the information on the recent affordability ratio for different municipalities (if available).

19. How do water users participate in tariff revision (public hearings, consultations)?

20. How is information collected and shared, on the performance of service providers, and tariffs for services?

Inter-agency co-ordination and cooperation for WSS service provision

Please briefly describe and provide information on the following items.

21. Institutions in charge of designing and implementing policies that affect water supply and wastewater management (departments in charge of Health; Environment; Urban development; Infrastructure; Investment and finance; else).

22. Arrangements in place for co-ordination and co-operation among the institutions listed above.

23. Arrangements in place for ensuring effective multilevel governance (co-ordination and co-operation among different levels of government) involved in policies that affect drinking water supply and wastewater management (authorities at national, local or other sub-national levels, such as catchments or river basins).

Mapping WS service coverage and recent trends in service provision

24. Volume of drinking water produced and wastewater collected, treated (by municipality).

25. Share of the population with access to safe water and sanitation by municipality? Please describe distinction between urban/rural areas.

26. Age of assets and main periods for the construction of existing networks for water supply? For sanitation?

27. Rate of water losses and recent trends.

28. Please provide information on regional and social differences or disparities in WSS services provision:

- regional disparities: e.g. access, challenges, state of the infrastructure, performance
- social disparities: e.g. access, affordability; lack of access to water supply and sanitation services, wastewater and rainwater collection and treatment.

WSS strategic policy making and financing water supply and sanitation

29. Please describe roles and responsibilities for WSS strategic development and investment programming in Estonia.

30. Please indicate and summarise strategic planning documents (e.g. national financing strategies) for the WSS sector in Estonia. Are these plans backed by financing strategies? If yes, please characterise these financing plans:

- Investment needs, now and in the future
- Projected sources of finance (share of revenues from water tariffs; domestic public funds; EU financial support; else).
- Please describe public budget allocations to the WSS sector (if any). Are budget transfers from national governments earmarked for water supply and sanitation services?

31. If inter-municipal cooperation/aggregation of WSS services was considered in these documents, please describe key recommendations or planned actions. Is the WSS consolidation incentivized? If yes, please explain how?

32. Please characterise past (factual) WSS financing since 2000, and provide more specific information for the last 3 years:

- Levels of investment

Capital Investment in WSS (million EUR)	2017	2018	2019
Total investment			
Total investment in fixed assets for WSS			
as % of GDP			
Total investment in fixed assets for water supply			
Total investment in fixed assets for sanitation			
Sources of finance			
Public budget, total			
National budget (or government organizations)			
Regional budget			
Municipal budget			
IFIs, EU and donors[1]			
Water utilities own funds			
Private sources, total (incl. private operators)			

1. Please specify if development finance is channelled through public budgets, to avoid double counting

- Operation and maintenance costs (total)
- Any dedicated mechanism (such as a national water/environment/climate fund) in place or considered?

Experience with consolidation of municipalities and/or service providers

33. What are the key objectives pursued of WSS consolidation in Estonia (e.g. improvement of service provision, financial sustainability, economic efficiency, capacity, environmental benefits; else)?

34. Has consolidation/aggregation of municipalities already been considered for implementation of the EU Water Directives? If yes, how did it influence service provision, investment and WSS tariffs in those municipalities?

35. What are the key drivers and objectives pursued by WSS consolidation in Estonia, e.g. improvement of service provision, financial sustainability, economic efficiency, capacity, and environmental benefits?

36. Please describe key dimensions of consolidation under consideration, or already taking place:

- Geographical scale (administrative, watershed or regional boundaries)
- Functional scale (investment and service coverage; operation and maintenance; administration & customer relationships)
- Scope of service provision (provision of raw water; water supply; wastewater collection; wastewater treatment; pluvial and storm water collection; else)

37. Please describe:

- The potential for WSS consolidation in Estonia
- Possible scenarios (from a legal, financial, technical, social or political perspectives)
- The main challenges associated with implementation of WSS consolidation in Estonia.

Operational and financial performance of WSS operators

Please provide information by municipality/service provider (2019 or most recent year).

Municipality	Water Company/ Operator	Cost Coverage Ratio[1]	Total Debt (short term +long term liabilities) / Revenues	Non- Revenue Water[2]	CAPEX/ Total Costs
XX	…	%	%	%	%

1.Defined as the share of total costs covered by revenues

2. Defined as the share of water that is losses through leakages + bills that are not recovered

Please provide information on WSS tariffs rates, revenues from user charges and affordability ratio (2019 or most recent year).

Municipality	Water Company/ Operator	Household WSS tariff, applied by water operator (EUR/m3, on average)	WSS tariff for other consumer (EUR/m3 on average)	WSS tariff collection rate for households	Revenue from user charges (households) EUR	Revenue from user chargers (other consumers) EUR	Affordability[1] for households (if estimated)
XX	…			%			%

1. Defined as a share of disposal income

In 2017-2020 what was the level of public operational subsidies* to the utilities providing WSS services? (if relevant)

WSS, EUR	2017	2018	2019
Public operational subsidies to water utilities*			

Annex 1.C. Overview of resource efficiency survey of water companies

_	Type of site	Name of site	Type of measure	Measure	Description	Potential resource savings per year	Estimated cost	Estimated payback period	Comments	Risks and threats
1.1.	General	All	Immediate	Energy consumption KPIs	The suggestion is to develop indicators for assessment of the WTP and WWTP, which can be used to compare costs between sites (e.g. kWh/m3).	Not assessable	2,400	Less than a year	The cost of the investment is calculated on the assumption that it is not in the area of responsibility of any employee today. Payroll of €15/h and time for 160 working hours maximum for the development and implementation have been calculated. As the investment comprises 0.7% of the annual total energy costs, the payback time will certainly be less than a year.	- incomparable technologies and sites are compared in the case of indicators - documentation is not prepared, which means that validation of basic principles is impossible Solution: thorough preliminary work in the case of each site for the development of efficiency indicators and documentation of the work.
1.2.	General	All	Immediate	Training in SCADA data analysis	The relevant training will be carried out for the maximum use of the information saved with the existing IT solutions for optimising the operation of sites.	Not assessable	1,200	Less than a year	Time required *ca* 80 hours and payroll €15/h. The investment expense is very low and the payback time is certainly less than a year.	- people change, the people who have passed the training leave the company Solution: systematic approach, documentation and regular sharing of experience, not a one-off project.
1.3.	General	All	Long-term	Solar panels	Establishment of solar	6,500	52,000	8 years	The price of power	- the issue of maintenance

–	Type of site	Name of site	Type of measure	Measure	Description	Potential resource savings per year	Estimated cost	Estimated payback period	Comments	Risks and threats
			and/or large-scale		park for covering own energy consumption. Savings, cost and payback time by the example of a plant of 50 kW output capacity if the support scheme is implemented (situation as at 01.12.2019). Installations with output capacity below 50 kW probably don't have an acceptable payback time as investments in the present condition.				purchased from the grid is €110/MWh, cost price of a PV plant €50/MWh, price of PV installation €700/kW, output 1,000 kWh/kW* per year excl. connection costs and plant size from 50 kW (solar plant, required area >0.16 ha). The payback time is based on financial calculations, not on simple payback time calculations.	should also be solved when the plant is installed and quality components from established manufacturers with references in Estonia should be used.
1.4.	General	All	Immediate/ urgent	Monitoring the inside temperature of buildings	An option for reducing heating consumption is to reduce the temperature maintained in the rooms. Reducing the temperature in the rooms is possible, because most wastewater treatment plants have no staff permanently on site. The measure creates the possibility to constantly check the room temperature via the automatics system. Information on deviations from the desired temperature immediately reaches the administrator, who adjusts the work of	110	1,000	9 years	All small treatment plants with buildings (5) are classified as sites.	- the investment required for completing the project is bigger than presumed Solution: the measure is not cost-effective when ordered separately, must be done during the maintenance or repairs of the automation system. The measure must also be implemented when new PRP are planned.

_	Type of site	Name of site	Type of measure	Measure	Description	Potential resource savings per year	Estimated cost	Estimated payback period	Comments	Risks and threats
					the systems on-site if necessary. Reducing the temperature of heated rooms by one degree gives energy savings of 5–7%.					
2.1.	WWTP	Kullim äe	Urgent	Replacement of blowers	The SBR rotor blowers will be replaced with more energy-efficient screw blowers during the measure. The new blowers must have frequency converters and it should be possible to control them on the basis of the O2 indicator.	40,095	117,600	3 years	The new blower uses *ca* 85% of energy for doing the same work on the basis of specific power of kW/m3. The costs of replacement and installation of 4 blowers have been considered in the investment. The blowers have integrated frequency converters. The lion's share of the savings comes from control with frequency converters and according to an O2 sensor, and the savings resulting from the increase in energy efficiency are *ca* 10,400 euros (payback period 11 years).	- the resource savings described in the project will not be achieved Solution: inclusion of energy efficiency indicators in procurement criteria, routine resource savings inspection and correction activities where necessary. - the investment required for completing the project is bigger than presumed Solution: organisation of a procurement to find the best tenderer.
2.2.	WWTP	Kullim äe	Urgent	Aeration of the SBR block according to the O2 level	Control the sequencing batch reactor (SBR) according to the reading of the O2 sensor and installation of the	29,700	26,000	< 1 year	The investment is frequency converters for four blowers, i.e. 55 kW engines with installation and	- the resource savings described in the project will not be achieved Solution: routine resource

_	Type of site	Name of site	Type of measure	Measure	Description	Potential resource savings per year	Estimated cost	Estimated payback period	Comments	Risks and threats
					necessary frequency converter on the existing blowers. The dissolved O2 content in the SBR increases considerably higher than the optimal level of activated sludge: during the on-site inspection, DO=1.4 mg/L at the start of the aeration stage in an SBR processing tank and DO=8.8 mg/L in the second half of the aeration stage in the second tank. The existing blowers are equipped with frequency converters within the scope of the measure and the capacity of the blowers will be regulated according to the reading of the dissolved oxygen sensor.				connection to the automatics system.	savings inspection and correction activities where necessary - the investment required for completing the project is bigger than presumed Solution: organisation of a procurement to find the best tenderer.
2.3.	WWTP	Kullimäe	Urgent/immediate	Updating the SCADA interface.	Allow saving and monitoring of the main operating parameters, prepare extracts of data (tables and graphs) and analyse data (e.g. flows, cycle lengths, working hours of equipment, sensor readings (e.g. DO), quantities of chemicals, quantities of sludge and waste, etc.).	Not assessable	2,400	N/A	This is a supporting measure the implementation of which supports many of the discussed measures and the daily work of the company. In the opinion of consultants, the company already updates the SCADA interface today, but the	- the collected data are not used, resource savings are not achieved Solution: develop and document a systematic approach for analysing the collected data and implementing the corrective activities arising from the analysis. Include external knowledge in data analysis:

_	Type of site	Name of site	Type of measure	Measure	Description	Potential resource savings per year	Estimated cost	Estimated payback period	Comments	Risks and threats
									SCADA interface should support monitoring when energy consumption control is set up.	consultants, respective colleges and universities.
2.4.	WWTP	Kullim äe	Long-term and/or large-scale	Liquidation of aerobic stabilisation unit	Reconstruction of pipelines (connections of tanks and pipelines) to discharge excessive activated sludge directly to the sludge compactor and lose the aerobic stabilisation point in between. The aerobic stabilisation stage before compacting is completely unnecessary in the opinion of the consultant and the water company itself, as the sediment is later discharged into the methane fermenter for anaerobic stabilisation. The process has remained in the treatment scheme from the old solution (before the establishment of the SBR block and the new sediment handling complex). “Skipping” the stage required the reorganisation of the construction processes in the treatment plant.	9,900		3-4 years		The investment required for completing the project is bigger than presumed Solution: organisation of a procurement to find the best tenderer.
2.5.	WWTP	Kullim	Long-term	Reducing the	Reconstruction of the	17,900	Additional	The	The principle should	- the investment required for

_	Type of site	Name of site	Type of measure	Measure	Description	Potential resource savings per year	Estimated cost	Estimated payback period	Comments	Risks and threats
		äe	and/or large-scale	share of overflow discharged to the treatment plant	sewerage pipelines of Kuressaare City into a separate sewerage system, incl. use of combined solutions for on-site steeping of rainwater. The reconstruction of *ca* 20 km of canal pipe and 7 km of rainwater pipe in Kuressaare (stages I+II) is planned in the PWSS Development Plan that is being prepared, but this does not cover additional rainwater solutions of combined systems.		detailed analysis is required. We can use the investment of 1 million euros, which will be made to reduce the share of overflow by 21%.	payback period considering the energy savings alone is 56 years. The payback period may decrease significantly if we consider that flow rates will decrease when the wastewater treatment plant is reconstruct ed.	be applied to all new and reconstruction projects as a general approach. The share of overflow can be reduced by 21% in said case scenario was a result of the works (i.e. the share of overflow after the application of the measure will be 40%).	completing the project is bigger than presumed Solution: organisation of a procurement to find the best tenderer, a detailed preliminary analysis and consideration of all possible alternatives.
2.6.	WWTP	Kullim äe	Long-term and/or large-scale	Liquidation of BNR block, expansion of SBR	The additional analyses must clarify whether it would be reasonable to eliminate this in the future (when the BNR block becomes amortised) and expand the SBR.	Additional detailed analysis is required. The exact cost of the construction works will become clear after the preparation of the WWTP reconstruction project. The payback period may decrease considerably if the sediment processing solution is changed alongside the reconstruction of the WWTP.				The investment required for completing the project is bigger than presumed Solution: organisation of a procurement to find the best tenderer, a detailed preliminary analysis and consideration of all possible alternatives. The correct flow rates and pollution load are not taken into account when the WWTP is reconstructed.

_	Type of site	Name of site	Type of measure	Measure	Description	Potential resource savings per year	Estimated cost	Estimated payback period	Comments	Risks and threats
										Solution: Detailed surveys of the existing and future pollution load and flow rates must be carried out in the design stage.
2.7.	WWTP	Kullim äe	Long-term and/or large-scale	Strategic plan concerning anaerobic fermenter	Additional analyses must clarify whether and how the production of methane can be increased. If output cannot be increased with reasonable measure, an alternative case scenario should be prepared for when the useful life of the fermenter ends.	Increasing the methane output will reduce the need for diesel and could provide additional income when the generated products are marketed.	Additional detailed analysis is required.			Earlier surveys have proven that producing biogas from wastewater sediment alone is not economically justified. Agreements with bio waste suppliers must be achieved if the use of methane fermentation in sediment handling continues.
2.8.	WWTP	Orissa are	Long-term and/or large-scale	*Reconstruction of treatment plant (PWSS Development Plan 2020-2031)*	Reconstruction of the Orissaare WWTP is included in the short-term investment programme of the PWWS Development Plan, as the equipment and pipes of the activated sludge treatment plant have largely become amortised and must be replaced. The measures developed in this study, irrespective of priority, should be taken into account when reconstruction is designed. Using energy-efficient equipment must be included in the terms of	Energy consumption could be reduced by 7–10% by replacing the existing equipment with more energy-efficient solutions, and its monetary equivalent would be 500–700 euros per year.	The budget of the PWSS Developme nt Plan is €80,000	10-15 years	The works are not directly related to increasing energy efficiency, but the need to reconstruct the plant. In terms of the energy-efficiency of the equipment used, cost-efficiency must only be calculated for the price difference between 'ordinary' and 'cost-efficient' equipment, and considering the planned life of the equipment.	- the investment required for completing the project is bigger than presumed Solution: cost control, organisation of procurements to take advantage of competition. - the water consumption of the reconstructed wastewater treatment plant will remain at the same level or increase. Solution: optimisation of the consumption of resources should be a part of the terms of reference of the design.

–	Type of site	Name of site	Type of measure	Measure	Description	Potential resource savings per year	Estimated cost	Estimated payback period	Comments	Risks and threats
					reference of the design. The scope and specific solutions of the reconstruction will be clarified during the design process.					
2.9.	WWTP	Valjala	Long-term and/or large-scale	Prevention of unnecessary repumping	The sludge solidification site should be eliminated (left as an emergency solution) and a sludge tank/compactor should be established instead, and the compacted sludge should be taken to Kuressaare similar to other treatment plants.	990	25,000	25	The works are not directly related to increasing energy efficiency, but compliance with environmental requirements.	Sludge is not removed from the compactor on time. Solution: Include the activity in the WWTP maintenance plan.
2.10.	WWTP	Eikla	Long-term and/or large-scale	*Reconstruction of treatment plant (PWSS Development Plan 2020-2031)*	Reconstruction of the unsuccessfully constructed treatment plant (replacement of the technological solution with an SBR pursuant to the PWSS Development Plan). The new treatment plant must be fitted with an O2 sensor and the adjustment of the aeration blower must be connected with this. The measures developed in this study, irrespective of priority, should be taken into account when reconstruction is designed.	Resource savings depend on the designed solution. The structure of consumption will change when the technical solution is replaced.	The budget of the PWSS Development Plan is €120,000	Not assessable	The works are not directly related to increasing energy efficiency, but the need to reconstruct the plant. In terms of the energy-efficiency of the equipment used, cost-efficiency must only be calculated for the price difference between 'ordinary' and 'cost-efficient' equipment, and considering the planned life of the equipment.	- the investment required for completing the project is bigger than presumed Solution: cost control, organisation of procurements to take advantage of competition. - the water consumption of the reconstructed wastewater treatment plant will remain at the same level or increase. Solution: optimisation of the consumption of resources should be a part of the terms of reference of the design.

_	Type of site	Name of site	Type of measure	Measure	Description	Potential resource savings per year	Estimated cost	Estimated payback period	Comments	Risks and threats
2.11.	WWTP	Tagavere	Urgent	Aeration control	Create the option to reduce air quantities with the installation of a frequency converter. Installation of a stationary oxygen sensor and connecting regulation to its readings. Introduce control with an O2 sensor if at all technically possible in the case of the existing system! Otherwise, provide minimal manual control of the frequency converter (energy saving are also smaller in this case).	440	4,000	9 years		- the resource savings described in the project will not be achieved Solution: monitoring of energy efficiency, routine resource savings inspection and correction activities where necessary - the investment required for completing the project is bigger than presumed Solution: organisation of a procurement to find the best tenderer.
2.12.	WWTP	Liiva	Long-term and/or large-scale	Optimisation of energy use of the building	Options for optimising the energy consumption of the building cannot be suggested without additional research (incl. the necessary measurements, thermography) during the heating period. Most measures for reducing the energy consumption of the building are very unlikely to be cost-optimal against the energy savings that can be achieved as separate investments (not by the complete	Additional detailed analysis is required.				- optimisation of energy use of the building is not cost-effective yet Solution: thorough analysis before measures are planned, cost control, organisation of procurements to take advantage of competition.

_	Type of site	Name of site	Type of measure	Measure	Description	Potential resource savings per year	Estimated cost	Estimated payback period	Comments	Risks and threats
					reconstruction of the WWRP), i.e. they would not pay off.					
3.1.	WTP	Unimäe	Long-term and/or large-scale	Optimisation of energy use of the building	A two-storey building is located by the Unimäe WTP, which has 540 m2 of heated space according to the register of construction works. As far as the consultants know, no employees are in the building every day. As the building is heated directly with electricity and there is no regular use, we should consider the possibility of transferring the activities to some other premises where the energy consumption is already optimal (e.g. an additional workplace at the company's head office).	1,980	1,000	Less than a year	1,000 euros is the approximate cost of the move and the creation of a new workplace. The maintenance costs of the building will be added to the savings side, but the consultant has no overview of them. 10% of the electricity consumption currently spent on thermal energy will presumably remain.	- optimisation of energy use of the building is not cost-effective yet Solution: exact mapping of the activities carried out in the building before the activity is kicked off, finding alternative use for the building.
3.2.	WTP	Unimäe	Long-term and/or large-scale	Reducing the share of leakages	Reconstruction of the water pipelines of Kuressaare City to minimise network leakages and consequently the costs of raw water processing. The reconstruction of *ca* 24 km of water pipe in Kuressaare (stages I+II) is planned in the PWSS Development Plan.	6,590	500,000	76	The efficiency of the measure depends on the accuracy of mapping the regions with the biggest leakages. The goal is to reduce the number of leakages with as few means as possible. Considered in the case scenario: leakages can be	- the investment required for completing the project is bigger than presumed Solution: cost control, organisation of procurements to take advantage of competition. - the pipeline with few leakages, where resource consumption will not

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									reduced by 7% with an investment of €500,000 (i.e. the share of leakages after the application of the measure will be 10%). The payback period is too long with the parameters of the case scenario.	decrease, will be reconstructed. Solution: pipelines will be presumably reconstructed where the need for this is the biggest (there are leakages).
3.3.	WTP	Orissaare	Immediate/ urgent	Optimisation of pumping	The energy consumption of a level 2 pumping station, i.e. transfer to the consumers, comprises a big part of the energy consumption of a WTP. During the analysis, it was clarified that one of the three pumps, which also has a frequency converter, operates for the majority of the time. The frequency is only reduced to *ca* 40 Hz due to the technical features of the pump, even when there is no load on the consumption side. It's also impossible to turn the pump off altogether, as constant operation is required for maintaining the pressure. This in its turn means that energy consumption is high even if there is no actual water	481.8	2300	3-5 years	The assumption is that there is no consumption at all for 8 hours a day and the capacity of the pump could be reduced by 50% during these hours. The existing pump is dimensioned on the basis of the maximum flow rate and it operates with an efficiency of ~26% for most of the time (the efficiency could be twice as much). The capacity of the pump that will be replaced is 3 kW. The investment includes the cost of the audit required for selecting the correct pump.	- the resource savings described in the project will not be achieved Solution: inclusion of energy efficiency indicators in procurement criteria, routine resource savings inspection and correction activities where necessary. An additional audit must be carried out before the investment is planned. - the investment required for completing the project is bigger than presumed Solution: organisation of a procurement to find the best tenderer.

_	Type of site	Name of site	Type of measure	Measure	Description	Potential resource savings per year	Estimated cost	Estimated payback period	Comments	Risks and threats
					consumption.					
3.4.	WTP	Kõljala	Urgent	Replacement of the reverse osmosis membranes and optimisation of membrane washing	According to the information received from the representative of Kuressaare water works, the equipment is not as energy-efficient as it should be according to the technical specifications. Kuressaare water works cooperate with the importer of the equipment to find the best possible configuration that guarantees good quality drinking water for consumers. Savings arise from smaller water consumption in keeping the osmosis device working, i.e. less water must be pumped from the drill well.					
3.5.	WTP	Eikla	Long-term and/or large-scale	Optimisation of energy use of the building	An estimated 2,508 kWh/year, i.e. 68% of the consumed energy is used for heating the building and drying the air, which is a disproportionately high quantity in comparison with the other analysed sites. Although the share of heating as a ratio is high and there is potential for saving energy, the heating	82.5	600	Approximately 5 years	The acquisition of an air dryer with condensation is an investment. A bigger procurement should be organised for selecting the air dryer, so that the unit price of the devices would be as low as possible. Energy efficiency should be an	- the resource savings described in the project will not be achieved Solution: inclusion of energy efficiency indicators in procurement criteria, routine resource savings inspection and correction activities where necessary. - the investment required for

_	Type of site	Name of site	Type of measure	Measure	Description	Potential resource savings per year	Estimated cost	Estimated payback period	Comments	Risks and threats
					consumption as an absolute value is *ca* 275 euros per year, which is why finding cost-optional energy saving measures is not easy. Replacing the drying device in order to reduce the energy consumption of air drying could be considered. The energy consumption of the building should be regularly monitored and additional measures should be considered if consumption increases additionally or the energy prices go up (e.g. additional insulation).				assessment criterion that is at least equal to the price.	completing the project is bigger than presumed Solution: organisation of a procurement to find the best tenderer.
3.6.	WTP	All water treatment plants	Immediate	Optimisation of pumping	The price of power is likely to go up in the near future, as the power generation capacity in the region of the Nord Pool energy market decreases and the price of CO2 increases. Therefore, it could be economically reasonable to configure the energy-intensive aeration and pumping processes in such a manner that the equipment could be turned on flexibly in certain periods of time. This would				The construction of the described operating regimes for these measures alone would certainly not be reasonable today in comparison with the benefits it would have, but the additional need for control on the basis of the input coming from the electricity market should be taken into account when equipment, controllers and remote	- the optimisation of work is not cost-effective. Solution: clarification of a mire accurate model for calculating the need for investment and the possible savings, which would make it possible to adapt quickly to the changing market situation or invest rapidly. - the necessary reserve of clean drinking water should be taken into account if the pumping of clean drinking

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					ensure that power is consumed during the hours when its price is as low as possible. The power system will need additional services to guarantee the parameters that are important to the system in relation to the synchronisation of the power system of the Baltic States with the Central European frequency area. One of the services for which a market is likely to emerge in the next 5–10 years is rapidly responding electricity output. This means that value will emerge on the electricity market for electricity output that can be turned on/off in a short time. At larger WTPs and WWTPs, pumps are the capacity that can participate in the market for system services.				control systems are selected. Thus, we should ask the supplier of the software and the hardware whether they are ready to carry out such interfacing.	water and the maintained levels were to be optimised. Solution: analyse the document the quantity of necessary drinking water (provided that the emergency reserve of drinking water can also be used, i.e. that the treatment of wastewater in an emergency is guaranteed). Probability of risk materialisation: average

Notes

[1] The English version of the Law of Property and the Commercial Code can be found here: Law of Property Act–Riigi Teataja and Commercial Code–Riigi Teataja

[2] The Estonian Investment Centre (EIC) was founded in 2000 by the Ministry of the Environment (MoE). For the last 20 years EIC has served as one of the main financiers of environmental projects in Estonia. With the support of various sources of financing, the EIC has helped to implement activities within the scope of different ministries in Estonia.