MINISTRY OF FOREIGN AFFAIRS
OF DENMARK
The Trade Council

SDG 6 Clean Water and Sanitation focused

Market Mapping and Project Identification
in Belgrade, Bucharest, Istanbul, and Zagreb
to create resilient and liveable cities with inspiration from Denmark
Project

SDG 6 Clean Water and Sanitation Report

Belgrade | Bucharest | İstanbul | Zagreb

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REC TÜRKİYE

Executive Summary

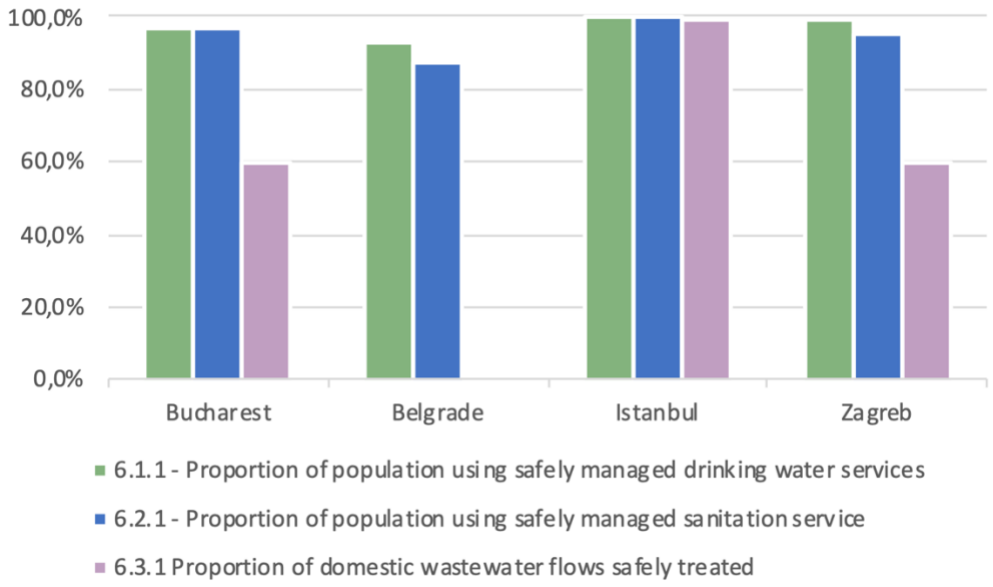
This report is prepared within the scope of the "***SDG 6 Clean Water and Sanitation focused Market Mapping and Project Identification in Belgrade, Bucharest, Istanbul, and Zagreb to create resilient and liveable cities with an inspiration from Denmark Project***" which is supported by the Ministry of Foreign Affairs of Denmark.

The **overall objective of the project** is to contribute to the **Danish Water Vision 2025,** which is to position Denmark as a world-leading supplier of intelligent, sustainable, and efficient waterm management solutions.

This report **aims** to create a business development and sales platform for the Danish companies/stakeholders in the target cities to help these cities become more resilient and sustainable against water challenges, in line with the goals and targets of the UN SGD6. The report explores the current state of affairs for water and wastewater services in each city, provides an overview of market needs via analytical matrice, and finally, delivers recommendations for the market actors. Although the research will cover the water and wastewater sector in general, it will mainly concentrate on the **municipal wastewater sector** within the water cycle, where services and products are provided to the market.

The study highlighted several significant market opportunities for Danish companies that could match the company base and the emerging strengths of the Danish water sector.

At the 70th session of the UN General Assembly (UN Sustainable Development Summit) held on September 25-27, 2015, Presidents, World Leaders, High-level UN representatives, and civil society representatives came together and accepted the SDGs. The SDGs are universal calls for action to eliminate poverty, protect our planet, and ensure that all people live in peace and prosperity. One of the 17 SDGs directly addresses water management and its challenges: SDG6 Ensure access to water and sanitation for all. SDG6 is a comprehensive cross-cutting dimension with a direct impact on all SDGs. Cities became more crucial than ever to provide entry points to succeed with SDG6 objectives. Municipalities are the primary stakeholders to manage the water-related challenges and ensure equitable access to safe and affordable drinking water and wastewater services to all. Below table summaries the current situation of project cities on selected SDG6 indicators.



Market Needs

Each city has both and differentiated needs and challenges. Moreover, the cities' socioeconomic aspects and administration of the water/waste water services define the playground and market operations' main rules.

Market Needs Table

	Belgrade	Bucharest	Istanbul	Zagreb
Expansion of the water supply networks				
Expansion of the sewage networks				
Expansion of the existing stormwater collection networks				
Repair and expansion of the existing water treatment facilities				
Repair and expansion of the existing urban WWT facilities				
Construction of new urban WWT and associated infrastructures				
Construction of new industrial waste water treatment plants and associated infrastructures				
Construction of the sludge treatment facilities and associated infrastructures				
Replacement of the existing water supply networks				
Replacement of the existing stormwater collection networks				
Replacement of the existing sewage collection networks				
Building, rehabilitation and/or replacement of the necessary water pumping stations				
Building, rehabilitation and/or replacement of the necessary waste water pumping stations				
Manufacture and/or supply of water meters				
Renewal of meters and extension of the automatic reading systems				
Design, manufacture or supply of equipment for water treatment, testing and monitoring				
Design and manufacture of equipment for urban WWT, testing and monitoring				
Design and manufacture of equipment for industrial WWT, testing and monitoring				
Design, manufacture, or supply of pipes, valves, filters, etc.				
Membrane technology use for water treatment plants				
Smart Water Systems for products and services that improve water treatment efficiency				
Smart Waste Water Systems for products and services that improve WWT efficiency				
Urban flash flood protection and urban sewage overflows improvements				
Energy consumption reductions and energy efficiency measures				
Digitalisation of all activities within the water company				
SCADA for water operations				
SCADA for waste water operations				
Products and services reuse of waste water				
Consultancy for feasibility studies and other technical reports				
Institutional capacity building for water treatment				
Institutional capacity building for waste water treatment				
Institutional capacity building for access to financing				

High :red **Intermediate**: orange **Low**: blue

City Summary Fact Sheets

Romania/Bucharest

Since Romania joined the European Union in 2007, the country's water sector has been gradually improved. However, as there is still room for further improvement, the sector is still investing in improving all water cycle parts, from water supply to wastewater treatment.

Romanian local authorities and private utility operators are focused on the upgrade and modernisation of water supply and sewage networks, including smart metering, automation, IoT, new technologies, cleantech.

Romania benefits from EU non-reimbursable funding, as well as other grants for the development and modernisation of its water and wastewater systems, parts of the water cycle, from water supply to wastewater treatment.

The water operator in Bucharest is the "Apa Nova" company, controlled by the French group Veolia Water (73,69%), the Apa Nova Employees Association (10%), and the Bucharest Municipality Council (16,31%). Apa Nova manages the water and sewerage system, water treatment and distribution to consumers, wastewater, and stormwater discharge from Bucharest, according to the Concession Agreement, renewed in 2020 until 2037.

In 2019, Apa Nova served 135307 customers in Bucharest, covering 97.2% of the Bucharest population regarding connectivity to water supply and wastewater networks.

Apa Nova supplied approx. 123 million m3 of water and collected approx. 163 million m3 of wastewater in 2017. The wastewater can treat 100% of the wastewater mechanically on a dry weather flow. Only 60% is of the wastewater is biologically treated.

In the last 20 years since Apa Nova became the water operator for Bucharest, it invested more than 500 million EUR. In 2020, Apa Nova undertook to make investments of 367 million EUR and not to increase the tariff paid by Bucharest residents for water and sewer.

Extension of the wastewater treatment plant at Glina in the Bucharest-Ilfov area is the most urgent priority. The second phase of renovations to the main sewerage collection system running beneath the course of the Dâmbovița river is also being carried out as part of the project.

Among the priorities for development are the extension and resizing of water supply distribution and wastewater collection network, separation of wastewater and rainwater collection systems, but also continuous reduction of the exploitation and use of depletable natural resources.

Deep digitalization of as many activities within Apa Nova, with the help of integrating technology in all operational processes, construction of wastewater treatment facilities/use of associated technologies is in the priorities list as well.

Romania/Bucharest	
Background: The Bucharest water operator is the "Apa Nova" company, controlled by the French group Veolia Water (73,69%), the Apa Nova Employees Association (10%), and by the Bucharest Municipality Council (16,31%). Apa Nova manages the water and sewerage system, water treatment and distribution to consumers, wastewater, and stormwater discharge from Bucharest, according to the Concession Agreement signed with local authorities, renewed in 2020 2037.	
City Data	
Population (% Urban and Rural %)	2,155,240 (100% urban)
Population Density (km²/population)	8,771
Number of subscribers	135,307 (108,470 private houses, 12,842 building owners' associations, 13,944 economic operators and public institutions, 51 industrial clients)
Water and Waste Water Sector Data	
Available Water (water yield, Efficiency of water resources)	600,000,000 m3/year
Annual Water consumption (served)	123 million m3
Daily Water consumption (served)	145 litres/capita/day
Sources of Water Served	Surface water
Sewer System (Combined/Separate)	Mostly combined
Stormwater Coverage Rate (as a share of whole collection network)	Approx. 100%
Water loss rate	27%
Metered Water	99.54%
Electricity Consumption	No exact data, but 79% less energy consumption compared to 2000. Energy consumption still "significant."
Electricity Produced (Cogeneration and/or Renewables)	No exact data, but 55,4% of the energy necessary for the functioning of the Glina Wastewater Treatment plant was self-produced in 2019
Waste water reuse (amount or share of total waste water formed)	0%
Financing of Services	
Total Expenses Realized	150 million EUR in 2019
CAPEX	30 million EUR in 2019
Expenditures for purchase of goods and services	61 million EUR in 2019
Total Revenues Realized	175 million EUR in 2019
Average annual investment [€/capita/year]	14 EUR/capita/year
Average residential tariff for water supply services	0.80 EUR/mc (VAT included)
Average residential tariff for waste water services	0.42 EUR/mc (VAT included)
SDG 6 Data	
The proportion of the population using safely managed drinking water services	97.2%
The proportion of the population using safely managed sanitation service	97.2%
The proportion of domestic and industrial wastewater flows safely treated	60%
The proportion of bodies of water with good ambient water quality	0%
Level of water stress: freshwater withdrawal as a proportion of available freshwater resources (%)	4.4% (at the national level, no information for Bucharest)
Findings and Recommendations (for Investors, Market Road Map) - Extension of the wastewater treatment plant at Glina in the Bucharest-Ilfov area is the most urgent priority for wastewater. The second phase of renovations to the main sewerage collection system running beneath the course of the Dâmbovița river is also being carried out as part of the project. - Replacement of the chlorination channel at Rosu water plant with an electrochlorination system - Resizing the oversized water supply distribution network and the undersized wastewater network - Expansion of the water supply and wastewater network - Separation of wastewater and rainwater collection systems - Continuous reduction of the exploitation and use of depletable natural resources (water and energy); - Deep digitalization of as many activities within Apa Nova, with the help of integrating technology in all operational processes and of e-learning and training tools.	

Table I - SDG6 Table for Bucharest

SDG 6 Indicators	Value
6.1.1 - Proportion of population using safely managed drinking water services	
Proportion of population using safely managed drinking water services	97.2%
6.2.1 - Proportion of population using safely managed sanitation service	
Proportion of population using safely managed sanitation services	97.2%
6.3.1 Proportion of domestic and industrial wastewater flows safely treated	
Proportion of safely treated domestic wastewater flows (%)	60%
6.3.2 Proportion of bodies of water with good ambient water quality	
Proportion of river water bodies with good ambient water quality (%)	0%
Proportion of open water bodies with good ambient water quality (%)	0%
Proportion of groundwater bodies with good ambient water quality (%)	0%
6.4.1 Change in water-use efficiency over time	
Water Use Efficiency (United States dollars per cubic meter)	25[1]
6.4.2 Level of water stress: freshwater withdrawal as a proportion of available freshwater resources	
Level of water stress: freshwater withdrawal as a proportion of available freshwater resources (%)	4,4%[2]
6.5.1 Degree of integrated water resources management	72[3]
Enabling environment	96
Institutions and participation	65
Management instruments	84
Financing	44
6.5.2 Proportion of transboundary basin area with an operational arrangement for water cooperation	
Proportion of transboundary aquifers with an operational arrangement for water cooperation (%)	100%
Proportion of transboundary river and lake basins with an operational arrangement for water cooperation (%)	100%
Proportion of transboundary basins (river and lake basins and aquifers) with an operational arrangement for water cooperation (%)	100%
6.6.1 Change in the extent of water-related ecosystems over time	+1%[4]
Change in quantity of open water bodies (million of cubic meters per annum)	475
Change in quantity of rivers (millions of cubic meters per annum)	0
Change in quantity of groundwater (millions of cubic meters per annum)	9,600
Change in Water body extent (permanent) (square kilometers) compared to last 10 or 20 years	17
Change in the extent of rivers (square kilometers) compared to last 10 or 20 years	NA
6.a.1 Amount of water- and sanitation-related official development assistance that is part of a government-coordinated spending plan	
Total official development assistance (gross disbursement) for water supply and sanitation, by recipient countries (millions of constant 2018 United States dollars)	NA
6.b.1 Proportion of local administrative units with established and operational policies and procedures for participation of local communities in water and sanitation management	NA
Communities participating in planning programs in rural drinking-water supply, by level of participation (3 = High; 2 = Moderate; 1 = Low; 0 = NA)	NA
Procedures in law or policy for participation by service users/communities in planning program in rural drinking-water supply, by level of definition in procedures (10 = Clearly defined; 5 = Not clearly defined ; 0 = NA)	NA
Users/communities participating in planning programs in water resources planning and management, by level of participation (10 = Clearly defined; 5 = Not clearly defined ; 0 = NA)	NA
Procedures in law or policy for participation by service users/communities in planning program in water resources planning and management, by level of definition in procedures (10 = Clearly defined; 5 = Not clearly defined ; 0 = NA)	NA

[1]Percentage valid for Romania for year 2015, no specific information for Bucharest: https://www.sdg6data.org/country-or-area/Romania#anchor_6.4.1
[2]Percentage valid for Romania for year 2017, no specific information for Bucharest: https://www.eea.europa.eu/data-and-maps/indicators/use-of-freshwater-resources-3/assessment-4
[3]Percentage valid for Romania for year 2017, no specific information for Bucharest: https://sdg6data.org/indicator/6.5.1
[4]Percentage valid for Romania for year 2016, no specific information for Bucharest: https://www.sdg6data.org/country-or-area/Romania#anchor_6.6.1

Serbia/Belgrade Fact Sheet

Being an EU candidate country since March 2012, Serbia is in the process of slowly harmonizing its legislative system with EU water legislation. At the end of 2019, the first steps towards the development of the Water Management Plan for the Republic of Serbia 2021–2027 were taken. Water Management Strategy for the territory of the Republic of Serbia is adopted in 2017, stipulating the key goals, among others, the constructions of WWTP for all settlements above 5,000 inhabitants,

In the City of Belgrade, Serbia's capital city, 92.7% of its population has access to water supply services, while 87% of the population uses safely managed sanitation services. Around 145.5 million m^3 of water per annum is being served, sourced from surface water (63 %) and groundwater (37 %). Belgrade doesn't have any wastewater treatment facility, resulting in high pollution levels of untreated water being discharged to the Danube and the Sava River. Water-related issues have been accumulating for decades in Serbia/Belgrade, particularly related to water losses and the lack of communal and industrial wastewater treatment that negatively impact watercourses' status. It remains one of the biggest challenges, particularly considering the financial resources required to improve the situation. However, there are efforts and foreign investments towards improving the situation: e.g., the current EBRD loan to Belgrade Waterworks and Sewerage Public Utility and the recently signed contract with the Chinese company CMEC.

According to the City of Belgrade's Draft Green City Action Plan, CAPEX expenses in the water and wastewater sector for implementing this 10-year plan are estimated to 860.25 M EUR with an annual OPEX of 2.55 M EUR.

Current water tariffs are low; it cannot cover all the needs of BVK. The estimated overall economic price for drinking water for BVK is 1.44 €/m3. According to the National Water Management Strategy, until 2034, the fee is planned to reach 1.35 €/m^3 + VAT. Improvement of the financial sustainability within BVK is expected with improved cost recovery and operating efficiencies introduced by a financial and operational performance improvement program via EBRD loan[5].

A significant number of competencies, products, and services that could support the City's ongoing efforts are highlighted in this report. In the water and wastewater sector, the key objectives of the City of Belgrade are to

i. increase available clean water, reduce water losses and increase the number of connections to the public water supply system,
ii. improve water quality overall, upgrade existing WT plants, build WWT plant and relevant communal infrastructure,
iii. as well as to rehabilitate and upgrade the existing water supply distribution network and wastewater network.

Improvement of the flood protection of the City is also listed among strategic goals. Serbia needs to comply with the Water Framework, UWWTD, Drinking Water, Groundwater, Water Quality directives requiring Serbia to invest in the relevant water management and wastewater treatment facilities. High interest to invest in wastewater treatment plants in Serbia is coming from China. Based on the Memorandum of Understanding between the governments, the commercial contract for the initial phase is signed with China Machinery Engineering Corporation (CMEC) in February (2021)[6].

Serbia/Belgrade

[5]https://www.ebrd.com/work-with-us/projects/psd/belgrade-water.html
[6]https://balkangreenenergynews.com/serbia-inks-eur-3-2-billion-deal-with-chinas-crbc-for-wastewater-projects-landfills/

Background: Belgrade's water supply and sewerage system is by far the largest in the country. It is operated by the Public Utility Company Belgrade Waterworks and Sewerage (**BVK**) founded by Belgrade City. The majority of the urban population is connected to mains and sewage networks. High wastage of water is present due to low tariffs. Relatively high water losses are due to inadequate or outdated facilities and equipment. Therefore the investments are highly needed. Furthermore, Belgrade doesn't have any wastewater treatment facility, resulting in high pollution levels of untreated water being discharged to the Danube and the Sava River. The application of WWTP would reduce the influence of wastewater on surface and groundwater water conservation and improve their quality to secure the longer used as natural sources of drinking water.	
City Data	
Population (% Urban and Rural %)	1,687 million (100% urban)
Population Density (km²/population)	524
Number of subscribers	92.7 %
Water and Waste Water Sector Data	
Available Water (water yield, Efficiency of water resources)	191.26 million m³
Annual Water consumption (served)	174,81 million m³
Daily Water consumption (served)	321 L/user/day
Sources of Water Served	Surface water (63 %) and groundwater (37%)
Sewer System (Combined/Separate)	115 million m3 (combined)
Stormwater Coverage Rate (as a share of whole collection network)	Information not available
Water loss rate	33 %
Nonrevenue water	63 million m3
SCADA for water supply services	Yes
SCADA for waste water supply services	No
Electricity Consumption	160,779,198 kWh
Electricity Produced (Cogeneration and/or Renewables)	NA
Waste water reuse (amount or share of total waste water formed)	0
Financing of Services	
Total Expenses Realized	RSD 11,196,654 thousand
CAPEX	Data not found
Expenditures for purchase of goods and services	RSD 1.387.617 thousand
Total Revenues Realized	RSD 11,215,375 thousand
Average residential tariff for water supply services	0.44 €/m³
Average residential tariff for waste water services	0.18 €/m³
SDG 6 Data	
The proportion of the population using safely managed drinking water services	92.7%
The proportion of the population using safely managed sanitation service	87%
The proportion of domestic and industrial wastewater flows safely treated	13.1%
The proportion of bodies of water with good ambient water quality	NA
Level of water stress: freshwater withdrawal as a proportion of available freshwater resources (%)	6%

Findings and Recommendations

- Serbia needs to comply with the Water Framework, UWWTD, Drinking Water, Groundwater, Water Quality directives requiring Serbia to invest in the relevant water management and wastewater treatment facilities.
- Current water tariffs are low; it cannot cover all the needs of BVK. The estimated overall economic price for drinking water for BVK is 1.44 €/m3. According to the National Water Management Strategy, until 2034, the fee is planned to reach 1.35 €/m³ + VAT.
- Improvement of the financial sustainability within BVK is expected with improved cost recovery and operating efficiencies introduced by a financial and operational performance improvement program via EBRD loan[7].
- High interest to invest in wastewater treatment plants in Serbia is coming from China. Based on the Memorandum of Understanding between the governments, the commercial contract for the initial phase is signed with China Machinery Engineering Corporation (CMEC) in February (2021)[8].

[7]https://www.ebrd.com/work-with-us/projects/psd/belgrade-water.html
[8]https://balkangreenenergynews.com/serbia-inks-eur-3-2-billion-deal-with-chinas-crbc-for-wastewater-projects-landfills/

Table II - SDG6 Table for Belgrade

SDG 6 Indicators	Value
6.1.1 - Proportion of population using safely managed drinking water services	
Proportion of population using safely managed drinking water services	92.7 %
6.2.1 - Proportion of population using safely managed sanitation service	
Proportion of population using safely managed sanitation services	87 %
6.3.1 Proportion of domestic and industrial wastewater flows safely treated	
Proportion of safely treated domestic wastewater flows (%)	0 %
6.3.2 Proportion of bodies of water with good ambient water quality	
Proportion of river water bodies with good ambient water quality (%)	0%
Proportion of open water bodies with good ambient water quality (%)	0%
Proportion of groundwater bodies with good ambient water quality (%)	0%
6.4.1 Change in water-use efficiency over time	
Water Use Efficiency (United States dollars per cubic meter)	N/A
6.4.2 Level of water stress: freshwater withdrawal as a proportion of available freshwater resources	
Level of water stress: freshwater withdrawal as a proportion of available freshwater resources (%)	6[9]
6.5.1 Degree of integrated water resources management	30[10]
Enabling environment	33
Institutions and participation	25
Management instruments	37
Financing	24
6.5.2 Proportion of transboundary basin area with an operational arrangement for water cooperation	
Proportion of transboundary aquifers with an operational arrangement for water cooperation (%)	100%
Proportion of transboundary river and lake basins with an operational arrangement for water cooperation (%)	100%
Proportion of transboundary basins (river and lake basins and aquifers) with an operational arrangement for water cooperation (%)	100%
6.6.1 Change in the extent of water-related ecosystems over time	+2 %[11]
Change in quantity of open water bodies (million of cubic meters per annum)	NA
Change in quantity of rivers (million of cubic meters per annum)	NA
Change in quantity of groundwater (million of cubic meters per annum)	NA
Change in Water body extent (permanent) (square kilometers) compared to last 10 or 20 years	566
Change in the extent of rivers (square kilometers) compared to last 10 or 20 years	9
6.a.1 Amount of water- and sanitation-related official development assistance that is part of a government-coordinated spending plan	
Total official development assistance (gross disbursement) for water supply and sanitation, by recipient countries (millions of constant 2018 United States dollars)	38[12]
6.b.1 Proportion of local administrative units with established and operational policies and procedures for participation of local communities in water and sanitation management	
Communities participating in planning programs in rural drinking-water supply, by level of participation (3 = High; 2 = Moderate; 1 = Low; 0 = NA)	3
Procedures in law or policy for participation by service users/communities in planning program in rural drinking-water supply, by level of definition in procedures (10 = Clearly defined; 5 = Not clearly defined ; 0 = NA)	Existing[13]
Users/communities participating in planning programs in water resources planning and management, by level of participation (10 = Clearly defined; 5 = Not clearly defined ; 0 = NA)	3
Procedures in law or policy for participation by service users/communities in planning program in water resources planning and management, by level of definition in procedures (10 = Clearly defined; 5 = Not clearly defined ; 0 = NA)	Existing

[9]Percentage valid for Serbia for year 2017, no specific information for Belgrade: https://www.sdg6data.org/country-or-area/Serbia#anchor_6.4.2

[10]Percentage valid for Serbia for year 2017, no specific information for Belgrade: https://sdg6data.org/indicator/6.5.1

[11]Percentage valid for Serbia for year 2016, no specific information for Belgrade: https://www.sdg6data.org/country-or-area/Serbia#anchor_6.4.2

[12]Percentage valid for Serbia for year 2018, no specific information for Belgrade: https://www.sdg6data.org/country-or-area/Serbia#anchor_6.4.2

[13]Percentage valid for Serbia for year 2017,only existence of procedures evaluated, not the level of definition https://www.sdg6data.org/country-or-area/Serbia#anchor_6.4.2

Turkey/İstanbul

The city of İstanbul is the most populated city of Turkey, with a population of around 16 million crowded than 131 countries globally.

The city has long experience in water and waste water management. Istanbul Water and Sewerage Administration (İSKİ), the municipal public utility, is the principal agent for the management and planning of the water and waste water sector. İSKİ serves the whole city.

The city has a severe water supply problem, and the water stress risk is increasing with climate change. The city consumes 3 million m³/day on average and transfers most of the water from the outer regions. According to the ISKI data, Istanbul's total water consumption has increased by 36.5% in the last ten years, from 0.8 billion m^3 to 1.1 billion m^3. Around 98 % of water resources in İstanbul are surface water resources. The annual yield of potable water resources is 1.653 billion m^3.

By 2021, there are 21 Water Treatment Plants and 89 Waste Water Treatment Plants operated by İSKİ. Ozoning system is mainly used in water treatment plans to enable the provision of water with potable standards.

Regarding the waste water treatment technology, the Bosphorus coasts are installed with pre-treatment plants, while biological and advanced biological treatment processes are used for locations along the Marmara Sea. The pre-treatment plants treat around %40 of all treated waste water. A certain amount of waste water that is treated by advanced biological wastewater treatment plants is used for irrigation purposes in recreational areas and industrial water.

The majority of the electricity consumed annually belongs to water services (raw water pumping stations and drinking water pumping stations). The electrical energy consumed in 2019 was 1,450,417,551 kWh, while electric consumption cost was TRY 0.75 billion. There are 117 potable water pumping stations with 395.994 kVA installed capacity.

Only 9.5% of the consumed electricity is provided by cogeneration and solar energy plants of ISKI. There is an increasing electrical energy consumption trend and at the same time increasing costs (in terms of TRY) for the last five years. The ISKI aims to increase the share of renewable energy in total energy consumption to 6.52%.

The water loss due to the leaks is also reducing the efficiency of water supply operations. The current water loss rate is %22.3 based on the ISKI's data. In order to minimize the loss, more than TRY 200 million investment is planned for 2021.

İSKİ controls the SCADA systems for water and waste water operations. The SCADA controlled activities nearly cover all water supply services, and for the waste water services, its share needs to be increased. In addition to SCADA systems, robotic technologies (camera robots) are employed to repair and maintain maintenance works. The ISKI is planning to invest in Information Technology Infrastructure and smart systems and their maintenance (around TRY 200 million/year).

The budget realization in 2019 was over TRY 7.1 billion. Around half of them (49%) was CAPEX, and expenditures for purchasing goods and services were about 31%. The revenues reached 6.2 billion in 2019. The water bills are the primary sources of revenue. Water consumption is identified and measured via mechanical or card meters.

The ISKI invests TRY 1.5 - 1.7 billion (over TRY 3.0 billion) annually for water and waste water services separately. The majority of the investment is spent on network infrastructures, stream rehabilitation works, construction of new plants, pumping stations, and equipment.

Turkey/İstanbul

Background: The city of İstanbul has long experience in water and waste water management. İSKİ, the municipal public utility, is the principal agent for the management and planning of the water and waste water sector. The İSKİ serves the whole city. The water bills are the primary sources of revenue. The city has a severe water supply problem, and the water stress risk is increasing with climate change. ISKI transfers the water from the outer regions.	
City Data	
Population (% Urban and Rural %)	15.5 million (100% urban)
Population Density (km²/population)	2,987
Number of subscribers	6,615,456
Water and Waste Water Sector Data	
Available Water (water yield, Efficiency of water resources)	1.653 billion m3
Annual Water consumption (served)	1.061.769.837 m3/year
Daily Water consumption (served)	187 liter/day/capita
Sources of Water Served	Surface Water
Sewer System (Combined/Separate)	Mostly combined
Stormwater Coverage Rate (as a share of whole collection network)	26%
Water loss rate	22.3% (0.24 billion m3)
Nonrevenue water rate	23.4% (0.25 billion m3)
SCADA for water supply services	Nearly 100%
SCADA for waste water supply services	Less than 50%
Electricity Consumption	1,450 GWh (75% for water and 23% for wastewater services)
Electricity Produced (Cogeneration and/or Renewables) Operation and maintenance	136 GWh
Waste water reuse (amount or share of total waste water formed)	25,376,863 m3/year – 2%
Financing of Services	
Total Expenses Realized	Expense Budget Realization TRY 7.1 billion
CAPEX	TRY 3.5 billion (49%)
Expenditures for purchase of goods and services	TRY 2.2 billion (31%)
Total Revenues Realized	TRY 6.2 billion
Average annual investment [€/capita/year]	EUR 27/capita/year
Average residential tariff for water supply services	0.51 €/m³ for (0-15 m³) and 0.76 €/m³ (16 m³ and over) including waste water charge
Average residential tariff for waste water services	0.17 €/m³ (0-15 m³) and 0.25 €/m³ (16 m³ and over) only waste water charge
SDG 6 Data	
The proportion of the population using safely managed drinking water services	100%
The proportion of the population using safely managed sanitation service	100%
The proportion of domestic and industrial wastewater flows safely treated	99% and 73%
Level of water stress: freshwater withdrawal as a proportion of available freshwater resources (%)	64%
Findings and Recommendations (for Investors, Market Road Map) - Although most of the waste water is treated advanced level, there is an ongoing investment plan for the plants with pre-treatment levels. - There are ongoing construction works and needs for Tuzla Advanced Biological WWTP, Baltalimanı Biological WWTP, Yenikapı Biological WWTP, WWTP construction in several districts in Melen River Basin - Rainwater Stormwater network constructions (rain water tunnels and channels) are still needed. - One of the essential investment areas in stream remediation and water landscape projects - Electricity consumption is one of the challenging issues for the management of water services. Investors that have the capacity in the field of energy efficiency and energy-efficient products will have advantageous positions. - The ISKI has an advanced level of information technology and services. Their maintenance and update of the outsourced services provide a good investment opportunity.	

Table III - SDG6 Table for İstanbul

SDG 6 Indicators	Value

6.1.1 - Proportion of population using safely managed drinking water services	100%
Proportion of population using safely managed drinking water services	
6.2.1 - Proportion of population using safely managed sanitation service	100%
Proportion of population using safely managed sanitation services	
6.3.1 Proportion of domestic and industrial wastewater flows safely treated	
Proportion of safely treated domestic wastewater flows (%)	99.6%
Proportion of safely treated industrial wastewater flows (%)	73%
6.3.2 Proportion of bodies of water with good ambient water quality	
Proportion of river water bodies with good ambient water quality (%)	No data
Proportion of open water bodies with good ambient water quality (%)	No data
Proportion of groundwater bodies with good ambient water quality (%)	No data
6.4.1 Change in water-use efficiency over time[14]	
Water Use Efficiency (United States dollars per cubic meter)	0.124
6.4.2 Level of water stress: freshwater withdrawal as a proportion of available freshwater resources	
Level of water stress: freshwater withdrawal as a proportion of available freshwater resources (%)	64%
6.5.1 Degree of integrated water resources management[15]	72%
Enabling environment	78%
Institutions and participation	75%
Management instruments	73%
Financing	62%
6.5.2 Proportion of transboundary basin area with an operational arrangement for water cooperation	
Proportion of transboundary aquifers with an operational arrangement for water cooperation (%)	n.a
Proportion of transboundary river and lake basins with an operational arrangement for water cooperation (%)	n.a
Proportion of transboundary basins (river and lake basins and aquifers) with an operational arrangement for water cooperation (%)	n.a
6.6.1 Change in the extent of water-related ecosystems over time	
Change in quantity of open water bodies (million of cubic metres per annum)	No data
Change in quantity of rivers(million of cubic meters per annum)	No data
Change in quantity of groundwater (million of cubic meters per annum)	No data
Change in Water body extent (permanent) (square kilometers) compared to last 10 or 20 years	No data
Change in the extent of rivers (square kilometres) compared to last 10 or 20 years	
6.a.1 Amount of water- and sanitation-related official development assistance that is part of a government-coordinated spending plan	
Total official development assistance (gross disbursement) for water supply and sanitation, by recipient countries (millions of constant 2018 United States dollars)	n.a
6.b.1 Proportion of local administrative units with established and operational policies and procedures for participation of local communities in water and sanitation management	
Communities participating in planning programs in rural drinking-water supply, by level of participation (3 = High; 2 = Moderate; 1 = Low; 0 = NA)	1
Procedures in law or policy for participation by service users/communities in planning program in rural drinking-water supply, by level of definition in procedures (10 = Clearly defined; 5 = Not clearly defined ; 0 = NA)	1
Users/communities participating in planning programs in water resources planning and management, by level of participation (10 = Clearly defined; 5 = Not clearly defined ; 0 = NA)	1
Procedures in law or policy for participation by service users/communities in planning program in water resources planning and management, by level of definition in procedures (10 = Clearly defined; 5 = Not clearly defined; 0 = NA)	1

[14] National level data.
[15] National level data.

Zagreb/Croatia

Croatia is a member country of the European Union since July 2013, representing the 28th EU member state. Croatia is home to 4,284,889 inhabitants, has 21 units of regional self-government, with 555 units of local self-government, 126 cities, and 429 municipalities. Croatia is recognized for its natural beauty, with 47% of its land and 39% of its sea designated as specially protected areas and areas of conservation. Tourism revenues represent around 15% of the country's GDP; thus, preservation of the environment is high on the agenda.

Croatia is committed to implementing the EU water directives by 2023, which requires substantial investments to extend and upgrade the existing aging water supply and sanitation infrastructure. The fact that Croatia is part of the EU provides benefits for attracting significant EU funds and foreign direct investment due to its geographic location between the EU and South East Europe. The total estimated investments in water utility infrastructure projects from 2014 – 2023 amount to EUR 3.8 billion, out of which 23% are investments in public water supply and 77% in the public sewer system and waste water treatment. Based on the EC's Environmental Implementation Review 2019, Croatia will need to step up efforts to meet the deadlines set out in its Accession Treaty related to water quality. [16]

Zagreb's capital City lies on alluvial pebble deposits of the Sava River, which contain large amounts of groundwater naturally filtered. Groundwater provides approximately 92.6% of Zagreb's drinking water. Collection of water is performed on seven water collection sites from 30 wells. The water supply network length is approximately 3,500 kilometers, and about 310,000 cubic meters of water per day is pumped. The water operator in Zagreb is the local public utility company (*Vodoopskrba i odvodnja* – ViO), operating the city's water supply and sewerage system, serving over 900,000 inhabitants (Zagreb's metropolitan area and two neighbouring towns). 99.26% of the city's population is served by public water supply, and 95.05% of the population is connected to the sewerage network.

The biological waste water treatment plant of Zagreb's city is in operation since 2004 (first phase/mechanical treatment) and 2007 (second phase). Zagreb wastewater treatment Company (*Zagrebačke otpadne vode* – ZOV) is responsible for the Central wastewater treatment plant's operation in Zagreb and related infrastructure. ZOV is owned by a consortium consisting of WTE Wassertechnik GmbH from Essen (48.5%), innogy Aqua GmbH from Mülheim (48.5%) and local company Vodoprivreda Zagreb d.d. (3%).

Water service costs are currently fully recovered through tariffs. Full alignment with EU *acquis* will likely require substantial tariff increases, and affordability remains an issue for poor households. A major problem is also the low percentage of disbursement of available funds. Despite a large amount of investment available, a bottleneck around the technical capacity persists in sustaining and implementing these investments. Some gaps remain in the administration, project preparation, and implementation; therefore, increasing local capacity is needed.

There are still high non-revenue water rates due to water leakage, reflecting the aging water distribution networks' poor physical conditions and requiring significant rehabilitation investments. Finally, Croatia is regularly hit by flooding incidents with high economic costs. While flood management investment needs are high, the financing challenge can be considered less pressing than the water supply and sanitation.

Zagreb, Croatia

[16] http://ec.europa.eu/environment/eir/pdf/report_hr_en.pdf

Background: In the City of Zagreb, located on the Sava River, the local utility company (*Vodoopskrba i odvodnja* – **ViO**) operates the city's water supply sewerage system, serving over 900,000 inhabitants (Zagreb's metropolitan area and two neighbouring towns). 99.26% of Zagreb population is served by public water supply. 95.05% of Zagreb population connected to the sewerage network. The construction and management of the wastewater treatment facility for the City of Zagreb is given to the company Zagrebačke otpadne vode (**ZOV**), based on a concession agreement signed with the City, valid until 2028. ZOV is owned by a consortium of WTE GmbH (48.5%), innogy Aqua GmbH (48.5%) and city company Vodoprivreda Zagreb d.d. (3%).	
City Data	
Population (% Urban and Rural %)	807,254 (100% urban)
Population Density (km²/population)	1,232
Number of subscribers	101,639 connections to water supply system 75,037 connections to the sewage system
Water and Waste Water Sector Data	
Available Water (water yield, Efficiency of water resources)	121,270, 087 m³
Annual Water consumption (served)	57,313,909 m³
Daily Water consumption (served)	app. 310,000 m³
Sources of Water Served	Surface water (1.8 %), groundwater (92.6%), water purchased 5.6% [17]
Sewer System (Combined/Separate)	Combined
Water loss rate	48.7 %
Nonrevenue water	57,700,000 m³/yr due to leakages
SCADA for water supply services	In operation
SCADA for waste water supply services	Yes, 61 remote monitoring stations have been installed for Zagreb sewage system, more planned
Electricity Consumption	217,550 GJ
Electricity Produced (Cogeneration and/or Renewables)	n/a
Waste water reuse (amount/share of total waste water formed)	n/a
Financing of Services	
Total Expenses Realized	HRK 700 million (estimate) (MEur 95)
CAPEX	HRK 223.7 million (MEur 30.2)
Expenditures for purchase of goods and services	HRK 40 million (estimate) (MEur 5.4)
Total Revenues Realized	HRK 460 million (estimate) (MEur 62)
Average annual investment [€/capita/year]	HRK 223.7 million (MEur 30.2)
Average residential tariff for water supply services	Fixed price of 2.5 EUR/mth per household, plus variable part of 1.2 - 2.0 EUR/m³, depending on household's social status and sewage connectivity
SDG 6 Data	
The proportion of the population using safely managed drinking water services	99.26 % of Zagreb population served by the public water supply
The proportion of the population using safely managed sanitation service	95.05 % of Zagreb population connected to the sewerage network
The proportion of domestic and industrial wastewater flows safely treated	The central WWTF serves cca 883,500 IE (domestic and commercial sector). There are no separate WWT facilities for industry.
The proportion of bodies of water with good ambient water quality	56 (Country data 2020, SDG6data.org)
Level of water stress: freshwater withdrawal as a proportion of available freshwater resources (%)	Estimated as low (under 50%)[18]
Findings and Recommendations (for Investors, Market Road Map) - (Re)construction works are ongoing to achieve 100% connectivity to the public sewage network and connect the remaining parts of the current sewage network to the central WWTF. - For the implementation of EU water directives by 2023, substantial investments are needed to extend and upgrade the existing aging water supply and sanitation infrastructure - providing good investment opportunities. - Water service costs are currently fully recovered through tariffs; affordability could be a challenge with the cost increase.	

Table IV - SDG6 Table for Zagreb

[17] Zagreb Holding Group, Sustainability report 2019, https://www.zgh.hr/UserDocsImages/Marketing/DOP/HOLDING%20izvjesce%20o%20odrzivosti%202019.pdf

[18] Nakić et al.: Conceptual model for groundwater status and risk assessment – case study of the Zagreb aquifer system, *Geologia Croatica : Journal of Croatian Geological Survey and the Croatian Geological Society*, 66 (2013), 1; 55-77 doi:10.4154/gc.2013.05, https://www.bib.irb.hr/615334

SDG 6 Indicators	Value
6.1.1 - Proportion of population using safely managed drinking water services	
Proportion of population using safely managed drinking water services	99.26%
6.2.1 - Proportion of population using safely managed sanitation service	
Proportion of population using safely managed sanitation services	95.05%
6.3.1 Proportion of domestic and industrial wastewater flows safely treated	
Proportion of safely treated domestic wastewater flows (%)	60%[19]
6.3.2 Proportion of bodies of water with good ambient water quality	
Proportion of river water bodies with good ambient water quality (%)	56%[20]
Proportion of open water bodies with good ambient water quality (%)	
Proportion of groundwater bodies with good ambient water quality (%)	
6.4.1 Change in water-use efficiency over time	
Water Use Efficiency (United States dollars per cubic meter)	59[21]
6.4.2 Level of water stress: freshwater withdrawal as a proportion of available freshwater resources	
Level of water stress: freshwater withdrawal as a proportion of available freshwater resources (%)	
6.5.1 Degree of integrated water resources management	90[22]
Enabling environment	97
Institutions and participation	98
Management instruments	84
Financing	80
6.5.2 Proportion of transboundary basin area with an operational arrangement for water cooperation	
Proportion of transboundary aquifers with an operational arrangement for water cooperation (%)	100%
Proportion of transboundary river and lake basins with an operational arrangement for water cooperation (%)	100%
Proportion of transboundary basins (river and lake basins and aquifers) with an operational arrangement for water cooperation (%)	100%[23]
6.6.1 Change in the extent of water-related ecosystems over time	-0.1%
Change in quantity of open water bodies (million of cubic meters per annum)	NA
Change in quantity of rivers(million of cubic meters per annum)	NA
Change in quantity of groundwater (million of cubic meters per annum)	NA
Change in Water body extent (permanent) (square kilometers) compared to last 10 or 20 years	
Change in the extent of rivers (square kilometers) compared to last 10 or 20 years	630[24]
6.a.1 Amount of water- and sanitation-related official development assistance that is part of a government-coordinated spending plan	
Total official development assistance (gross disbursement) for water supply and sanitation, by recipient countries (millions of constant 2018 United States dollars)	NA
6.b.1 Proportion of local administrative units with established and operational policies and procedures for participation of local communities in water and sanitation management	
Communities participating in planning programs in rural drinking-water supply, by level of participation (3 = High; 2 = Moderate; 1 = Low; 0 = NA)	NA
Procedures in law or policy for participation by service users/communities in planning program in rural drinking-water supply, by level of definition in procedures (10 = Clearly defined; 5 = Not clearly defined ; 0 = NA)	NA
Users/communities participating in planning programs in water resources planning and management, by level of participation (10 = Clearly defined; 5 = Not clearly defined ; 0 = NA)	NA
Procedures in law or policy for participation by service users/communities in planning program in water resources planning and management, by level of definition in procedures (10 = Clearly defined; 5 = Not clearly defined ; 0 = NA)	NA

[19]Data available for the Country,2015, SDG 6.3.1, https://sdg6data.org/
[20]Data available for the Country,2020, https://sdg6data.org/
[21]Data available for the Country, 2017, https://sdg6data.org/
[22]Data available for the Country, 2020, https://sdg6data.org/
[23]https://sdg6data.org/country-or-area/Croatia#anchor_6.5.2
[24]https://sdg6data.org/country-or-area/Croatia#anchor_6.6.1

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Abbreviations

BVK	Belgrade Waterworks and Sewerage Public Utility Company: **B**eogradski **v**odovod i **k**analizacija
ISKI	Istanbul Water and Sewage Administration
NRW	Non-revenue water
PUC	Public Utility Company
SDG	Sustainable Development Goal
UWWTD	Urban Waste Water Treatment Directive
WTP	Water Treatment Plant
WWTP	Wastewater Treatment Plant
ViO	Zagreb water utility company: Vodoopskrba i odvodnja
ZOV	Zagreb wastewater company: Zagrebacke otpadne vode

1. INTRODUCTION

1.1. Objective and scope

This report is prepared within the scope of the "***SDG 6 Clean Water and Sanitation focused Market Mapping and Project Identification in Belgrade, Bucharest, Istanbul, and Zagreb to create resilient and liveable cities with an inspiration from Denmark Project***" which is supported by the Ministry of Foreign Affairs of Denmark.

The **project's overall objective** is to contribute to the **Danish Water Vision 2025** to make Denmark a world-leading supplier of intelligent, sustainable, and efficient water solutions.

This report **aims** to create a business development and sales platform for the Danish companies/stakeholders in the target cities to help cities be more resilient and sustainable against water challenges, in line with SGD6 goals and targets.

The report explores the current state of affairs for water and waste water services in each city, provides a picture of market needs via an analytical matrix, and finally, delivers recommendations for the market actors.

Although the research will cover the water and wastewater sector in general, it will mainly concentrate on the **municipal wastewater sector** within the water cycle, where services and products are provided to the market.

The study highlighted several significant market opportunities for Danish companies that could match the company base and the Danish water sector's emerging strengths.

The report has six main chapters and annexes:

Section 1 briefly describes the study's background and informs the readers about the relevance of the water sector and its position within the UN SDG as well as details its relevance to SDG6.

Section 2 and Section 3 provides country and city-level information and baseline data for water/waste water services and their management. Section 2 present benchmark data for water &waste water market in each city.

Section 4 enables the readers to understand the current level of implementation success of SDG 6 in the selected cities as much as possible. Due to the lack of city-level SDG target inventory, the country-level data is used instead of city-level targets.

Section 5 presents the needs and opportunities based on the priorities of the cities. Finally, in section 6, the readers will find the specific conclusions and recommendations for each city.

1.2. Project Cities

The project reports analysis for four cities: Belgrade, Bucharest, Istanbul, and Zagreb. To better explain the current situation in these cities, the report also includes information about their respective countries: Croatia, Romania, Serbia, and Turkey. (see Figure 1)

Figure 1 – Project Cities and Their Respective Countries

Among four countries, **Croatia and Romania are EU member states**. According to findings, these two countries benefited from EU membership in developing their wastewater sector. At the same time, the other two, **Serbia and Turkey, are EU accession countries**. In contrast to other countries, water availability is the lowest for Turkey, posing a primary challenge to the country. In terms of the total population, Turkey has the highest with 83.6 million. Among the cities, Istanbul also has the highest population and a couple of times bigger than other project cities.

While three countries have very similar GDPs (PPP), spreading from 28,1 to 33,3 thousand EUR, Serbia has a lower amount with 19,5 thousand EUR. (see

Table 1 - General Overview of the Project Countries *Table 1 - General Overview of the Project Countries*

Country	Population	GDP per capita, PPP (USD)	EU Status	Share of the population of the Selected City in the country (%)	Total water availability [m3/cap/year]	Water withdrawal: per capita [m3/cap/year]
Croatia	4.1 million	31.131	EU Member State	20%	24.882	113
Romania	19.4 Million	33.340	EU Member State	10%	10.773	324
Serbia	6.9 Million	19.495	Accession Country	24%	18.326	535
Turkey	83.6 Million	28.133	Accession Country	18%	1.519	530

1.3. Water Management Challenges

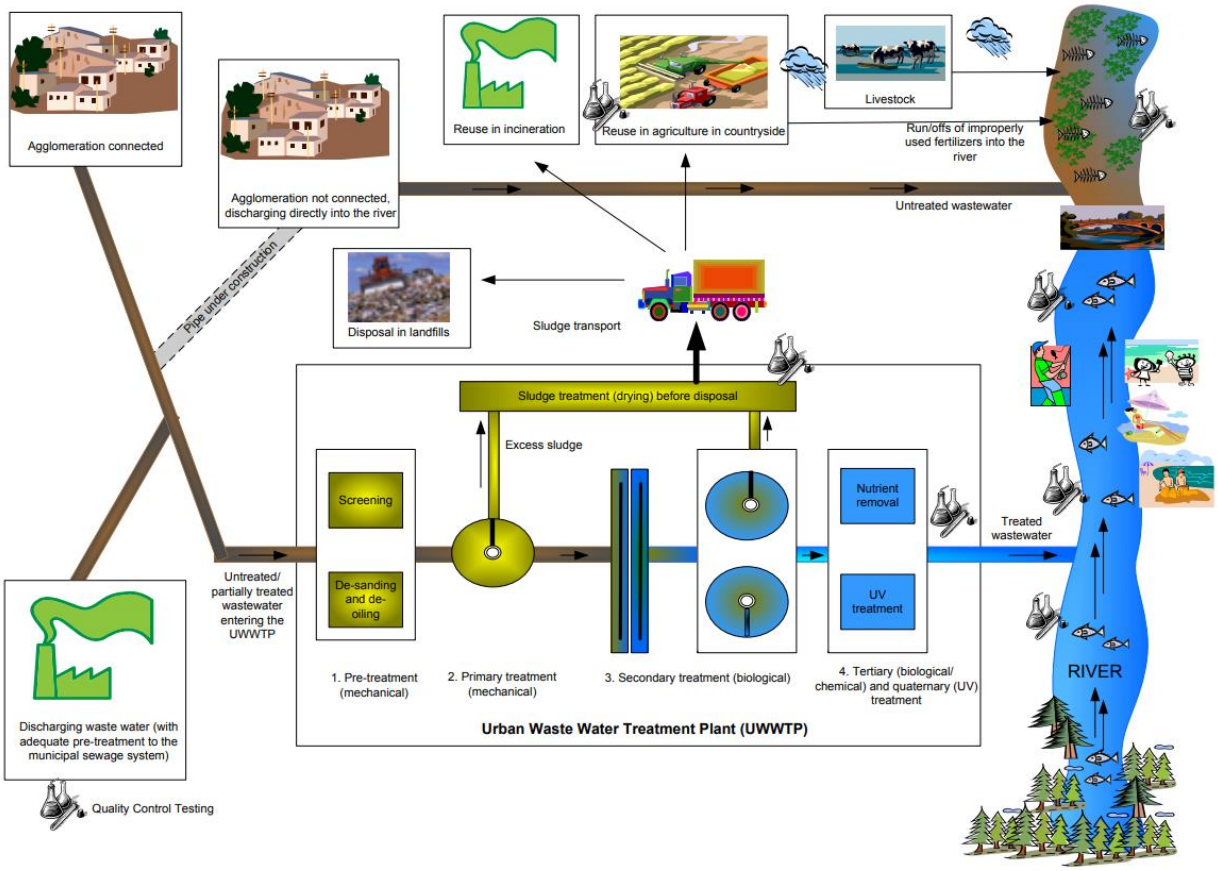
The increasing effects of climate change (more frequent droughts, floods, or heavy rains) and the growing urban population and the rapid urbanisation -more frequent droughts, floods, or heavy rains; and the search effective wastewater treatments and new technologies in both developed and developing countries are increasing.

Yet, there is substantial finance and investment need to develop more sustainable and innovative solutions to meet the municipal targets in the urban water cycle.

The pilot cities in this study have varying amounts of investments in the upstream and downstream of their particular water cycle structures. But one thing is common for all cities, the deficit is present in the waste water services.

The below figure displays the urban waster water cycle elements.

Figure 2 - Urban waste water cycle elements[25]



[25] https://www.eca.europa.eu/Lists/ECADocuments/SR15_02/SR_DANUBE_RIVER_EN.pdf

1.4. Overview of SDG 6

In 2015, countries globally adopted the 2030 Agenda for Sustainable Development and achievement of the Sustainable Development Goal (SDGs). SDG6 is a comprehensive cross-cutting dimension with a direct impact on all SDGs. Cities became more important than ever to provide entry points to succeed with SDG6 objectives. Local governments and municipalities are the primary players to manage the water-related challenges and ensure equitable access to safe and affordable drinking water and waste water services to all.

This section summarizes the SDG6 targets and indicators. The latest data for the SDG6 targets is presented in Figure 2.

Table 2 - SDG6 Target and Indicators

Target	Indicator	Group
6.1 By 2030, achieve universal and equitable access to safe and affordable drinking water for all	6.1.1 Proportion of population using safely managed drinking water services	Drinking water
6.2 By 2030, achieve access to adequate and equitable sanitation and hygiene for all and end open defecation, paying special attention to the needs of women and girls and those in vulnerable situations	6.2.1 Proportion of population using (a) safely managed sanitation services and (b) a hand-washing facility with soap and water	Sanitation and hygiene
6.3 By 2030, improve water quality by reducing pollution, eliminating dumping and minimizing release of hazardous chemicals and materials, halving the proportion of untreated wastewater and substantially increasing recycling and safe reuse globally	6.3.1 Proportion of domestic and industrial wastewater flows safely treated	Waste water
	6.3.2 Proportion of bodies of water with good ambient water quality	Water Quality
6.4 By 2030, substantially increase water-use efficiency across all sectors and ensure sustainable withdrawals and supply of freshwater to address water scarcity and substantially reduce the number of people suffering from water scarcity	6.4.1 Change in water-use efficiency over time	Water-use efficiency
	6.4.2 Level of water stress: freshwater withdrawal as a proportion of available freshwater resources	Water stress
6.5 By 2030, implement integrated water resources management at all levels, including through transboundary cooperation as appropriate	6.5.1 Degree of integrated water resources management	Integrated water management
	6.5.2 Proportion of transboundary basin area with an operational arrangement for water cooperation	Transboundary cooperation
6.6 By 2020, protect and restore water-related ecosystems, including mountains, forests, wetlands, rivers, aquifers and lakes	6.6.1 Change in the extent of water-related ecosystems over time	Ecosystems/Nature Protection
6.a By 2030, expand international cooperation and capacity-building support to developing countries in water- and sanitation-related activities and programmes, including water harvesting, desalination, water efficiency, wastewater treatment, recycling and reuse technologies	6.a.1 Amount of water- and sanitation-related official development assistance that is part of a government-coordinated spending plan	International cooperation
6.b Support and strengthen the participation of local communities in improving water and sanitation management	6.b.1 Proportion of local administrative units with established and operational policies and procedures for participation of local communities in water and sanitation management	Participation

Figure 3 - UN-Water SDG 6 Summary Progress Update 2021[26]

[26] https://www.eca.europa.eu/Lists/ECADocuments/SR15_02/SR_DANUBE_RIVER_EN.pdf

SUMMARY PROGRESS 2021: SDG 6 INDICATORS

United Nations | UN WATER

February 2021

6.1.1 DRINKING WATER

2.2 billion people — 29% of the world's population — lacked safely managed drinking water services in 2017

6.2.1a SANITATION

4.2 billion people — 55% of the world's population — lacked safely managed sanitation services, and 673 million people practised open defecation, in 2017

6.2.1b HYGIENE

3 billion people — 40% of the world's population — lacked a basic handwashing facility with soap and water at home in 2017

6.3.1 WASTEWATER

Less than **50%** of domestic wastewater is safely treated in 24 out of the 75 reporting countries (most of the 75 are high-income countries)

6.3.2 WATER QUALITY

Lack of water quality data means over **3** billion people are at risk because the health of their rivers, lakes and groundwater is unknown

6.4.1 WATER-USE EFFICIENCY

Since 2015 water-use efficiency has increased by **4%** globally

6.4.2 WATER STRESS

2.3 billion people live in water-stressed countries

of which 721 million live in high and critically water-stressed countries

6.5.1 INTEGRATED WATER MANAGEMENT

129 countries are not on track to have sustainably managed water resources by 2030

Globally, the current rate of progress needs to be doubled

6.5.2 TRANSBOUNDARY COOPERATION

Only **22** countries reported that all the rivers, lakes and aquifers that they share with their neighbours are covered by operational arrangements for cooperation

6.6.1 ECOSYSTEMS

1/5 of the world's river basins are experiencing rapid changes in the area covered by surface waters

6.a.1 INTERNATIONAL COOPERATION

Official development assistance (ODA) commitments to the water sector increased **11%** from 2015 to 2019, but disbursements only rose by 3%

6.b.1 PARTICIPATION

Only **14** countries out of **109** report having high levels of participation by communities in water and sanitation decision-making

2. WATER SECTOR POLICY OVERVIEW AND LEGISLATION IN REGION

2.1. Relevant EU Policies and Legislation

EU directives are the major driver for the growth of the water and wastewater sector as the regulations aim to enhance water and the wastewater infrastructure, and these regulations are anticipated to spread from the EU as the standard drivers globally for the industry. EU's waste water policies are regulated with the aim of zero pollution and improving the quality of the rivers, lakes, and seas in the EU continent. Together with Water Framework Directive, the Urban Waste Water Treatment Directive (UWWTD) are the main tools for the regulation of water and waste water management services in the EU.

The UWWTD requires the Member States to ensure that their towns, cities and settlements properly collect and treat waste water. According to the 10th report on the implementation of the Urban Waste Water Treatment Directive (UWWTD), there is an overall improvement in the collection and treatment of waste water in Europe's cities and towns with different success levels between the Member States. The report covers over 23 500 EU towns and cities that fall under the scope of the Directive, where people and industry generate over 610 million population equivalents of waste water every year

Although the compliance rates with EU waste water collection and treatment rules are high, full compliance has not yet been achieved. Finance and planning remain the main challenges for the water service sector. According to the 10th report on the implementation of the UWWTD;

- 95% of waste water in the EU is collected and 88% is biologically treated.
- 1% of urban wastewater is still not collected and over 6% is not sufficiently well treated to meet secondary biological treatment standards.
- The current level of investments in the many Member States is too low to reach and maintain compliance with the Directive in the long term, with several EU towns or cities still needing to build or modernise their infrastructure for collecting waste water, as well as to put modern treatment plants in place.

The Commission aims to work with the relevant Member States to make the best use of the opportunities offered by the new Multiannual Financial Framework and the Recovery Plan for Europe by including water treatment and sanitation as a top priority. The Commission has launched an impact assessment to evaluate different policy options with the aim of modernising the Directive. This includes, amongst others, finding ways to deal with contaminants of emerging concern such as pharmaceuticals and microplastics, and considering whether regular surveillance of waste water can enhance the EU preparedness in managing the COVID-19 pandemic, or similar diseases.

The impact assessment will provide the basis for securing a better alignment of this Directive to the new policy objectives as defined in the Green Deal, in particular its zero pollution ambition. In addition, the 2020 Circular Economy Action Plan announced that the Commission would consider the review of the Directive in light of its potential to contribute better to the clean and circular economy. The 2030 Biodiversity Strategy stresses the crucial importance of stepping up the protection of aquatic and marine ecosystems, also by reducing pollution.

Additionally, the recently published EU Strategy for Energy System Integration calls for the exploration of energy efficiency and energy production potentials in the waste water sector. The ongoing COVID 19 pandemic, triggered by the coronavirus outbreak, further underpins that the water sector plays an essential role in protecting human health and the environment. The importance to have a strong, sustainable and energy-efficient EU water sector and ensuring its long-term financial sustainability needs to be recognised when assessing options to improve a key Directive governing this sector.

2.2. Policy Overview and Legislation for Serbia

The Republic of Serbia, as an EU candidate country granted in March 2012, is in the process of slowly harmonizing its legislative system with EU water legislation, and is in a process of preparation of first River Basin Management Plan for the territory of Serbia (2021-2027), in accordance with EU Water Framework Directive.

Approximately 92% of the country, 81,560 km^2, lies within the Danube Basin, (10% of the total basin). Serbia is largely dependent on water resources that originate outside its national territory. Among the annual average 162 billion m^3 of available water in Serbia (FAO Aquastat 2015), over 90% are transit waters flowing through the country via the Danube, Sava, Tisa Rivers, and other waterways.

The percentage of the population in Serbia connected to public water supply systems is around 85%. The quantity abstracted for municipal water supply in 2018 was about 660 million m^3, out of which 425 million m^3 was distributed to households and other users. This means that losses are still pretty high – 36%.

The level of development of sewerage systems and infrastructure, in particular public wastewater treatment plants, is very low (56% of the total population is connected to sewerage systems and less than 10% of the collected wastewaters is treated to some level, while less than 7% is treated at the level called for by the UWWTD). Many of the existing collection and treatment systems are relatively old and in need of major reconstruction and renewal[27].

Water management is under the jurisdiction of the national government, which has delegated the various tasks to the Ministry of Agriculture, Forestry and Water Management, other ministries, provincial administrative bodies, agencies of local administrations, and government-held water management companies. According to the Law on Water (Off. Gaz. of the RS 30/10, 93/12), major administrative functions related to water management reside with the Ministry of Agriculture, Forestry and Water Management, or rather the National Water Directorate attached to it, responsible for integrated water resources management in Serbia. Two government-held water management companies operate in Serbia: *Srbija vode (Serbia Waters*) and *Vode Vojvodine (Vojvodina Waters)*.

Water Management Strategy for the Territory of the Republic of Serbia by 2034 is adopted in 2017 (Of. Gaz. of the RS, 3/2017), and is based on the existing Water Law (Off. Gaz. of the RS 30/10, 93/12). Among the key goals listed in the Water Management Strategy are the following:

- Increase continuity, water and sanitation services coverage to 92%,
- reduce Non-Revenue Water by 25% by 2034,
- Improve drinking water quality through (re)construction of water treatment plants,
- Development of water distribution network and sewerage network,
- Constructions of WWTP for all settlements above 5,000 inhabitants,
- Introduce pre-treatment of industrial wastewater and water-saving measures,
- Enhance the water sector institutional framework with clearly defined competencies across responsible administrative bodies at the state level,
- Encourage aggregation of public water supply or public sewer operators,
- Reduce water pollution and further develop the systems for flood protection,
- Finalize legal harmonization towards reaching full compliance with relevant EU Directives.

According to the estimates provided in the National Water Management Strategy, in order to reach the envisaged goals until 2034, 20.5 billions EUR of investments is needed (various sources: *national budget; public utilities through collected fees; municipal funds; EU funds; credits and other*), with over 40% of the total to be used for development purposes.

[27]https://www.icpdr.org/main/sites/default/files/nodes/documents/serbia_facts_and_figures_2020.pdf

2.3. Policy Overview and Legislation for Romania

The Romanian water legislation water was entirely harmonized with the European legislation. The most important national water legislation, that also transposed the Water Framework Directive, the Nitrates Directive, the Urban Waste-water Treatment Directive and the Quality of Drinking Water Directive is presented below[28]:

- Water Law 107/1996, amended and completed;
- Law 458/2002 on the quality of drinking water, republished, amended and completed;
- GD 964/2000 - water protection against pollution with nitrates from agricultural sources, amended;
- GD 100/2002 - quality of surface waters intended for drinking water production, amended and completed;
- GD 570/2016 - programme for the gradual elimination of the discharge of dangerous substances;
- GD 188/2002 - conditions for wastewater discharge in the aquatic environment, amended.

While Romanian water legislation accurately reflects EU requirements, their implementation on the ground is a challenge in several areas, prompted inter alia by a lack of planning, coordination and appropriate funding.

In 2017, 51.28 % of water bodies that have been taken stock of achieved a good or a very good ecological status, while 48.72% achieved less than satisfactory status: 44.33% with a moderate status, 2.82% with a poor status and 1.57% with a bad status. The quality of water bodies decreased constantly between 2011 to 2017 (NEPA,2020).

In relation to water supply, in 2019, 70.9% of the Romanian population was connected to the public drinking water network. 54,2% of the Romanian population was connected to sewage networks and 52.9% of the Romanian population was connected both to sewage networks and urban wastewater treatment plants. (Source: National Statistics Institute, 2020). Most of the population not connected to the public drinking supply/sewage network resides in the rural areas. The rate of connection in large urban areas is similar to the EU rates.

Romania is still struggling to comply with the standards of the Urban Wastewater Treatment Directive. According to the latest EC Report Environmental Implementation Review 2019 — Romania, only 2.5 % of Romania's waste-water load was collected (eight agglomerations) in accordance with the Directive, while six agglomerations met the secondary treatment requirements and only one met the more stringent treatment requirements.

In 2020, while some large agglomerations have not ensured adequate collection of urban waste water, additional ones were found to be non-compliant. 188 large agglomerations still do not conform with the urban wastewater collection obligations under EU law, while 192 large agglomerations do not comply with secondary treatment obligations, and 193 large agglomerations with the strictest treatment. For this reason, the EU has started an infringement procedure against Romania, which is still on the role[29].

The estimated investment needed to ensure the appropriate collection and treatment of wastewater from the remaining agglomerations is estimated at EUR 12 billion. This figure remains high in spite of a significant number of EU-supported projects. Other ongoing studies suggest even higher investment needs. According to the latest reports, the last forecasted projects should be completed by 2027-2030, far beyond the final deadlines of 2015 and 2018 set in Romania's Accession Treaty.

[28] Full information on the transposition of EU Directives referring to water quality can be found here (in Romanian): http://www.mmediu.ro/beta/wp-content/uploads/2012/05/2012-05-14_directive_ue_calitateapei.pdf
[29] https://ec.europa.eu/commission/presscorner/detail/EN/INF_20_1687

In order to reach compliance, Romania should improve the prioritisation of the water projects proposed for support from EU funds and speed up their preparation and implementation. Moreover, the revenues generated by water companies should ensure the sustainability of the newly constructed infrastructure.

2.4. Policy Overview and Legislation for Turkey

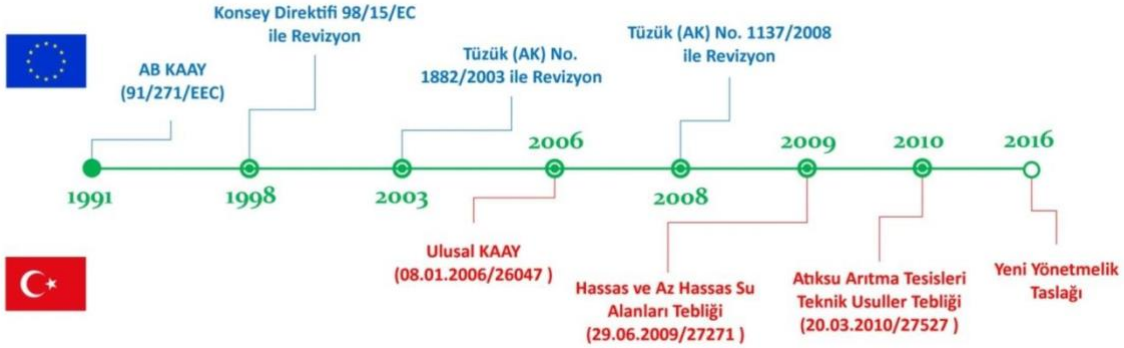
Turkey has started to EU accession negotiations on 3 October 2005 and the Chapter on Environment was opened to accession negotiations on December 21, 2009.

The implementation of the Water Sector Legislation is one of the most cost intensive European legislation in the environmental sector and need further investments in Turkey. Although many efforts have been taken to implement the relevant legislation, there are certain problems exist for fully implementation of the Directive as well as in Turkey.

The main Turkish regulations that regulate urban wastewater discharges and respond to the EU Water Legislation are:

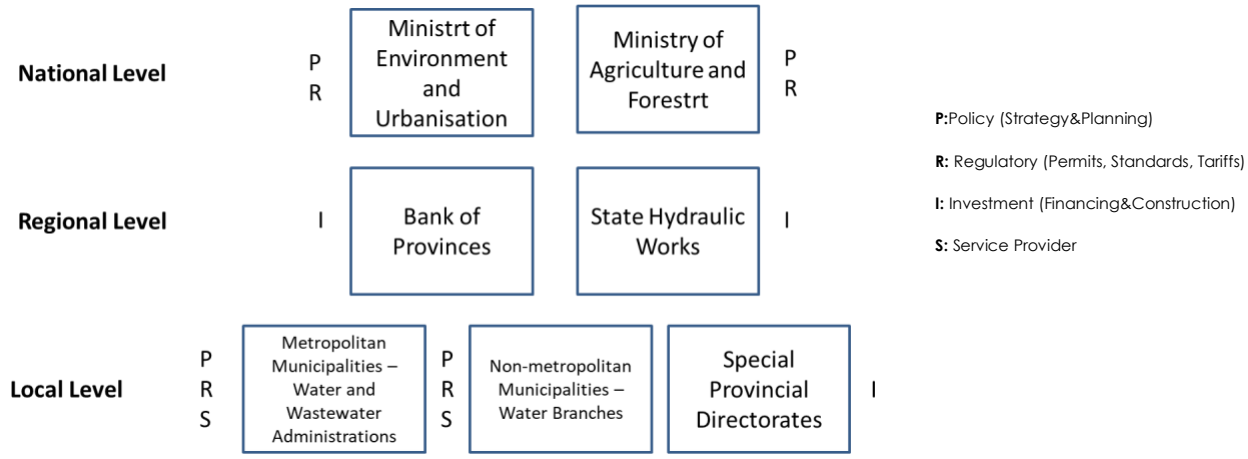
- Law on Environment
- By-law on Urban Wastewater Treatment (UWWT) regulates the collection, treatment and discharge of urban wastewater (Official Gazette No. 26047 dated 8 January 2006)
- By-law on Control of Water Pollution, regulate the water pollution of all discharges of households and industries on surface water (Official Gazette: 31 December 2004, No. 25687)

Figure 4 - Important Legislation Overview



The building of physical infrastructures and management of waste water services include planning, design, financing, construction, and operation phases.

Figure 5 - Administrative Structure of the Water&Wastewater Management at different levels



The national water waste and waste water policies are formulated by the Ministry of Agriculture and Forestry and Ministry of Environment and Urbanisation.

The General Directorate of State Hydraulic Works supply potable and non-potable water to large cities; however, it is the task of municipalities to operate the urban water distribution system, and treat waste water. For the metropolitan municipalities, *the Water and Sewer Administration* as an affiliated entity of the municipality delivers water and sewer services.[30]

2.5. Policy Overview and Legislation for Croatia

As an EU member state since 2013, Croatia is committed to implementing the EU water directives by 2023, which requires substantial investments to extend and upgrade the existing aging water supply and sanitation infrastructure, as well as the waste water treatment infrastructure. The total estimated investments in water utility infrastructure projects (2014 – 2023) amount to EUR 3.8 billion: 23% in public water supply and 77% in the public sewer system and waste water.

The water sector in Croatia is managed at the **national level: Croatian Waters** (*Hrvatske Vode*), is the national water management agency, which grants and controls water extraction and discharge rights, collects corresponding fees, and reinvests into the sector. It is also charged with a flood protection policy. Croatian Waters also delivers support to public providers and units of **local self-government** in the preparation, implementation and procurement of projects of public water supply and wastewater collection and treatment. [31]

The Ministry of Environmental Protection and Energy, through its **Directorate for Water Management**, is the body responsible for the implementation of water policies in Croatia, including those related to water supply and sanitation services, as well as for the administrative supervision of Croatian Waters.

Under the **Water Act** (Official Gazette 153/2009), public water suppliers are the responsible entity for ensuring that the quality of the water meets regulated standards, and microbiological and chemical parameters are in accordance with the **Drinking Water Directive**. The **Water Management Financing Act** is adopted in 2010 (Official Gazette 153/2010). Local governments, which operate through public utility companies, manage water supply and sanitation services, pursuant with the provisions of the **Utilities Act**. Past consolidation efforts among utilities resulted in one company, **Zagreb Waterworks** (ViO), serving 17% of the population.

In 2018, Croatia transposed the requirements of the **Urban Waste Water Treatment Directive** into its national legal framework. Pursuant to its Accession Treaty, Croatia should be fully compliant with the requirements of the Directive by the end of 2023.

[30] Functions of Municipalitieshttps://www.tbb.gov.tr/en/local-authorities/functions-of-municipalities/
[31] https://www.oecd.org/environment/resources/financing-water-supply-sanitation-and-flood-protection-croatia-workshop.pdf

Zagreb wastewater Ltd. i.e. *Zagrebačke otpadne vode* d.o.o. **(ZOV),** is responsible for the operation of the Central wastewater treatment plant Zagreb and related infrastructure. ZOV is owned by a consortium consisting of WTE Wassertechnik GmbH from Essen (48.5%), innogy Aqua GmbH from Mülheim (48.5%) and city company Vodoprivreda Zagreb d.d. (3%).

Strategic objectives for Croatian Waters are defined by their **Water Management Strategy** (2008-2038) and related commitments are stipulated under EU Accession treaty negotiations. Relevant water and wastewater infrastructure construction plans are currently set for 2014-2023.

The 2nd **River Basin Management Plan** (RBMP) is adopted by the Government of Croatia in 2016, covering the period of 2016 to 2021, following the harmonization process with the comments and suggestions received during public consultations and the strategic environmental impact assessment procedure. It complies with the requirements of the EU water directives and covers water status management and flood risk management.

Based on the EC's Environmental Implementation Review 2019, Croatia will need to step up efforts if it is to meet the deadlines set out in its Accession Treaty related to water quality. [32]

[32] http://ec.europa.eu/environment/eir/pdf/report_hr_en.pdf

3. CITY LEVEL DATA

This section provides city-specific information for the below themes:

- Administrative Structure and Organization of Services
- Access to Services and Performance
- Financing of Service

Each section describes the current state of affairs in the water and waste water management sector within the cities.

3.1. Belgrade

3.1.1. Socioeconomic Context and Data

Belgrade is the capital and the most populated city of Serbia, with a population of nearly 1.7 million, representing a quarter of Serbia's total population.

Geographically, Belgrade is located at the confluence of two major transboundary rivers: the Danube and the Sava River. Belgrade represents Serbia's financial center and the region, with the highest GDP (total of EUR 16.21 billion and per capita of EUR 9,614).

Table 3 - Socioeconomic Data, Belgrade, Serbia

Parameter	Data	Date
Population (Person)	1.7 million	2019
Share of the urban population [%]	100 %	2019
Total Area (km^2)	3,234 km^2	2019
Population Density (km^2/population)	524	2019
Total GDP ($)	EUR 16.21 billion	2017
Per Capita GDP ($)	EUR 9,614	2017
Consumption of Electricity per capita (kWh)	4,272 kWh	2014
Average Size of Households (Person)	2.7	2019

3.1.2. Administrative Structure and Organization of Services

The **Assembly of the City of Belgrade** is a representative body that executes the local government's essential functions stipulated by the national legislation and the City Charter.

The City Council is a body of the City of Belgrade that coordinates the implementation of the Mayor and City Assembly's functions. It carries out the control and supervision over the performance of the City Administration.

The City Administration performs administrative affairs in the City of Belgrade's rights and responsibilities and specific professional tasks required by the City Assembly, Mayor and City Council.

The internal organizational units are established as part of the City Administration with a view to performing related affairs. The management of the internal organizational units (secretaries) is appointed by the Head of the City Administration further to the approval of the Mayor. Among 15 Secretaries, the Secretariat for Environmental Protection is the key to protecting the environment.

The Secretariat for Environmental Protection performs, among other, tasks connected with

- research, analytical, documentation, and other professional activities related to monitoring the quality of environmental factors (air, water, soil), etc;
- carries out tasks connected with analytical and other professional activities related to the development of plans, programmes and projects in the field of protection, conservation and rational use of natural resources, the use of renewable and alternative energy sources and environmental protection;
- performs administrative tasks related to monitoring and implementing laws and other regulations in protecting nature and environment and other areas that the Republic delegates to the City of Belgrade.[33]

The Belgrade Waterworks and Sewerage manage Belgrade's water supply, Public Utility Company founded by the City of Belgrade in 1946, abbreviated **BVK** -"*Belgrade Waterworks and Sewerage*."

The company performs water collection, treatment, and distribution, as follows: raw water collection, tapping, delivery, purification and treatment, water distribution, raw water and drinking water quality control, and exploitation maintenance of water supplying system facilities and devices; discharge of waste and stormwater by sewer network and sewer network maintenance[34].

Table 4 - Administrative Structure and Organization of Services in Belgrade, Serbia

Parameter	Data
No. of local government units [municipalities]	17 (in 2020)
Number of personnel of the relevant bodies in Municipality	2105 employees, Belgrade City Administration (2016) 2584 employees in BVK (2019)
Dominant service provider type	- Municipal/Public utilities
Service scope	- Water Treatment - Water supply, - Wastewater collection - Wastewater treatment, when applicable.
Ownership	City of Belgrade (Public Utility)
Geographic scope of the services	Metropolitan area
Regulatory agency	No. Planned under adopted Water Management Strategy.
Utility performance indicators publicly available	Partially
National utility association	Yes - Waterworks and Sewerage Association of Serbia[35]
Private sector participation	No

3.1.3. Access to Services and Performance

In the City of Belgrade, 92.7% of its population is having access to BVK services and using safely managed drinking water, while 87% of the population is using safely managed sanitation service. Around 145.5 million m^3 of water per annum is being served, sourced from surface water (63 %) and groundwater (37 %).

Water services systems, particularly drinking water supply, were in good condition at the beginning of the 1990s due to quite high water sector investments. Today, the price of drinking water barely covers operational and, to some extent, maintenance costs of public utility companies (PUC).

[33]https://www.beograd.rs/en/city-authority/202038-secretariat-for-environmental-protection/
[34]https://www.bvk.rs
[35] https://www.udruzenjevodovoda.org/lat/

In the last 30 years, only high-priority investments have taken place. Water supply and sewerage services degradation occurred mainly due to the lack of funding. Such a situation makes the sustainability of these systems impossible. Therefore, there is a need for capital investments and alignment of water price with real costs.

In general, Belgrade and the whole of Serbia need to further work on scaling down pollution and securing better water quality. Total wastewater discharged into waste water collecting system is estimated to nearly 113 million m^3/year. Belgrade's wastewater ends up untreated in the Danube and Sava, and only 5% of industrial wastewater is treated.

The majority of measuring results through the ICPDR/Danube Commission indicated that the Belgrade waters do not satisfy the Class II requirements (good ecological status) and have a poor ecological status. The River Danube does not comply with the Class II requirements due to microbial pollution, which can infer fecal contamination from raw wastewater discharges.[36]

The drinking water supply services for the City of Belgrade depend on surface water and groundwater sources. Therefore, the discharge of untreated sewage may cause an increase in the operating cost of the water treatment plants and safety problems in terms of the water quality of the drinking water in the future.[37] The efforts are made to secure financing for the existing situation's improvements, elaborated in Section 3.2.4.

A "*Master Plan of the Belgrade Sewerage System to 2021*" was prepared in 2011 and is in conformity with the "*Master Plan of Belgrade*" ("Official Gazette of the City of Belgrade" No. 11/16). The Sewerage System Master Plan elaborates on the sewerage system infrastructure defined in the "Master Plan of Belgrade" and develops the detailed sewer system network and options for wastewater treatment. Two of the priorities with required measures are as follows:

Priority 1: Protection of groundwater and surface water sources (the Sava River)

- Reconstruction of 8 sewerage pumping stations
- Interceptor Emergency Station (Hitna Pomoć) – Venizelosova Street
- Sewerage pumping stations Čukarica

Priority 2: Protection of the Danube river basin

- Reconstruction of 5 sewerage pumping stations
- Start-up of the interceptor from Karadjordjev Trg pumping station to Usce.[38]

Table 5 - Access to Services and Performance in Belgrade, Serbia

Parameter	Data	Date
Population Served – (inhabitants)	Over 1.5 million [92.7 %]	2014
Number of customers	573,071 of households connected to water supply system	2019
Available amount of water resources	191.26 million m^3/year[39]	
Water Consumption (per capita)	321L/capita/day	2014
Water Served	174.8 million m3/year[40]	2019
Sources of Water Served	Surface water (63 %) and groundwater (37%)	2019
Drinking Water Supply Network	5808 km	2019
Drinking Water Transmission Line Length	1,088 km of main pipelines and 4,720 km length of the distribution network	2019
Waste Water Collection Network	2,642 km	2019

[36]https://openjicareport.jica.go.jp/pdf/12120606.pdf
[37]https://openjicareport.jica.go.jp/pdf/12120606.pdf
[38]https://www.beoland.com/en/plans/master-plan-belgrade/
[39]https://www.bvk.rs/wp-content/uploads/2020/09/Izvestaj-o-poslovanju-Odluka-NO-min_2019.pdf
[40]https://www.bvk.rs/wp-content/uploads/2020/09/Izvestaj-o-poslovanju-Odluka-NO-min_2019.pdf

Parameter	Data	Date
Storm Water Collection Network	Collecting sewage network length comprises the length of covered street drainage canals for waste and atmospheric water, excluding the length of connections and network within houses. No exact data found	2019
# of Water Treatment Plants	BVK Public Utility operates 5 WT plants	2017
# of Waste Water Treatment Plants	0 - communal WWTPs, only a limited number of industrial WWTPs	2021
# of Water Elevation Stations	144 groundwater wells in total	2020
# of Waste Water Elevation Stations	30 pumping stations[41]. Reconstruction and expansion is planned.	
Capacity of Water Treatment Plants	1,025 L/s	2017
Capacity of Waste Water Treatment Plants	0 – (0 communal WWTPs, only limited number of industrial WWTPs)	
Water treatment coverage	92.7%	2016
Sewerage coverage	87 %	2016
Wastewater treatment Coverage	0% for residential WWT	2019
Municipal Wastewater Collection level	90,773,791 m^3	2020
Industrial wastewater	5% of industrial wastewater treated From manufacturing industry: 18.913 million m3/year From electricity, gas, steam and air conditioning supply: 99 thous. m3/year 6.731 million m3/year treated water from industry discharged. Share of treated water volume per total discharge: %16	2019
Stormwater Coverage	App. 65%[42]	2009
SCADA Coverage	Information not available	
Electricity Consumption	160,779,198 kWh	2019
Reuse of Wastewater	0%	2020
Reuse Rate	0%	2020
Water loss rate	31.6%[43]	2019
Nonrevenue water [%]	33 %	2019
Water supply continuity	24 h/day	
Water stress	Water consumed/Water Available = 6% (Country data) Pressures on water bodies in Serbia have not been assessed systematically and in accordance with the guidelines of the WFD until recently. This work is still in progress[44].	2017

3.1.4. Financing of Services

Dominant sector financing comes almost entirely from water tariffs, water resource fees and local-level subsidies, supported by IPA and other accession funds. The primary national funding source is the National Budget, whereas International Financing Institution (IFI) and bilateral donors continue to play a crucial role in the external funding. Foreign loans and national subsidies are used for funding new investments[45].

[41]https://link.springer.com/chapter/10.1007%2F978-90-481-2365-0_2
[42]https://link.springer.com/chapter/10.1007%2F978-90-481-2365-0_2
[43]https://www.bvk.rs/wp-content/uploads/2020/09/Izvestaj-o-poslovanju-Odluka-NO-min_2019.pdf
[44]https://www.icpdr.org/main/sites/default/files/nodes/documents/serbia_facts_and_figures_2020.pdf
[45] https://sos2018.danubis.org/

According to the SDG Indicator 6.a.1, water and sanitation-related official development assistance disbursed in 2018 in Serbia was $38 million[46]. The European Bank for Reconstruction and Development (EBRD) is a leading institutional investor in Serbia, focusing on support for private-sector development and the improvement of public utility services.

In 2020, the City of Subotica finalized a modern water and wastewater network and facilities after a decade-long engineering endeavor supported by EBRD, the European Union and bilateral donors under the Western Balkans Investment Framework (WBIF)[47]. EBRD is also providing a senior loan of up to EUR 13 million to the Belgrade Waterworks and Sewerage - BVK, comprising 2 tranches: the first tranche of up to EUR 8.5 million committed on 2 April 2015, and the second tranche of up to EUR 4.5 million committed on 3 February 2016.

Water sector revenues are insufficient to maintain the current state of affairs in the sector, let alone fund needed capital projects. Average residential tariffs are lower than the regional average. Tariff setting has often been dominated by political and social considerations rather than public utility company operation, maintenance, and investment needs. Tariffs are expected to continue to increase, given the significant investments and subsequent operating costs linked with Serbia meeting the EU environmental *acqui*s.

The estimated overall economic price for drinking water for Belgrade Public Utility Company is 1.44 €/m3[48]. According to the National Water Management Strategy, until 2034, the fee is planned to reach 1.35 €/m³ + VAT. Affordability is not yet a constraint but may become so for segments of the population.

At the end of 2019, the Belgrade Public Water Utility Company's debt is 4.5 million EUR, expected to be reduced to 2.7 million EUR by the end of 2020.[49] Improvement of the Public Utility Company's financial sustainability is expected with improved cost recovery and operating efficiencies introduced by a financial and operational performance improvement programme provided through EBRD loan[50].

According to Belgrade's Draft Green City Action Plan, CAPEX expenses in the water and wastewater sector needed to implement this 10-year plan are estimated to 860.25 M EUR with an annual OPEX of 2.55 M EUR.[51]

Potential funding for providing wastewater treatment services, collection network, plant, and pumping stations might come from February 2021 signed the first-phase contract with the China Machinery Engineering Corporation, based on the Memorandum of Understanding between the Governments of Serbia and China.[52]

[46] https://www.sdg6data.org/country-or-area/Serbia#anchor_6.4.2
[47]https://www.ebrd.com/news/2020/serbia-completes-modernisation-of-water-and-wastewater-network-in-subotica.html
[48]D. Dimkić, M. Milovanović, M. Dimkić, S. Milojković, 2020, Current and Economic Price of Water in Serbia, Environ. Sci. Proc. 2020, 2, 45
[49]https://www.bvk.rs/wp-content/uploads/2020/09/Izvestaj-o-poslovanju-Odluka-NO-min_2019.pdf
[50]https://www.ebrd.com/work-with-us/projects/psd/belgrade-water.html
[51]https://www.beograd.rs/images/file/741ccefb8afef0372f993fee441c847f_9117346413.pdf
[52]https://balkangreenenergynews.com/serbia-inks-eur-3-2-billion-deal-with-chinas-crbc-for-wastewater-projects-landfills/

Table 6 - Financing of Services in Belgrade, Serbia

Parameter	Data	Date
Total Budget	RSD 11,196,654 thousand	2019
Expenditures for purchase of goods and services	8.7 (Expenditures for purchase of goods and services (RSD) / billed revenue (m3))	2019
Total Investment	RSD 1,875,824 thousand	2019
Total Revenues	RSD 11,215,375 thousand	2019
Tariff Revenues	72.4 % water tariffs and 25 % wastewater tariffs	2019
Tax Revenues	Information not available	-
Average residential tariff	0.47 €/m^3 for water supply 0,19 €/m^3 for sewerage	2019
Unit cost	Estimated to 1.44 €/m3 (Operation and maintenance unit cost	2020
Operating cost coverage	84 % [53] (Operating cost coverage [billed revenue/operating expense)	2019

[53]https://www.bvk.rs/wp-content/uploads/2020/09/Izvestaj-o-poslovanju-Odluka-NO-min_2019.pdf

3.2. Bucharest

3.2.1. Socioeconomic Context and Data

Bucharest is the capital and largest city of Romania, with over 2 million residents. It is located in the southeast of the country, on the banks of the Dâmbovița River, less than 60 km north of the Danube River. Bucharest is the fourth largest city in the European Union by population within city limits, after Berlin, Madrid, and Rome.

Bucharest is the centre of the Romanian economy and industry, accounting for around 24% (2017) of the country's GDP and about one-quarter of its industrial production while being inhabited by 10% of the country's population. The living standard in the Bucharest-Ilfov region was 145% of the EU average in 2017, according to GDP per capita at the purchasing power parity standard (adjusted to the national price level).

Table 7 - Socioeconomic Data, Bucharest, Romania

Parameter	Data	Date
Population (Person)	2,155,240[54]	2020
Share of urban population [%]	100%	2020
Total Area (km^2)	240	2020
Population Density (km^2/population)	8,771	2020
Total GDP (EUR)	45.67 billion EUR[55]	2017
Per Capita GDP (EUR)	456.76	2017
Consumption of Electricity per capita (kWh)	3454[56]	2017
Average Size of Households (Person)	66 sqm[57]	2018

3.2.2. Administrative Structure and Organization of Services

The water operator in Bucharest is the "Apa Nova" company, controlled by the French group Veolia Water (73,69%), the Apa Nova Employees Association (10%) and by the Bucharest Municipality Council (16,31%).

It has obtained such competence after a public tender in March 2000, organized by Bucharest City Council, the Romanian Government and with assistance from the World Bank. Apa Nova manages the water and sewerage system, water treatment and distribution to consumers, wastewater and stormwater discharge from Bucharest, according to the Concession Agreement signed with local authorities, which was renewed in 2020 for another 12 years, until 2037.

[54] The data above presents official INS data that correspond to the population officially registered as resident of Bucharest. Some sources say that together with unofficially registered residents, the population of Bucharest is much higher, up to 4 million inhabitants https://www.profit.ro/stiri/social/firea-sustine-ca-in-bucuresti-sunt-peste-4-milioane-de-locuitori-19157130

[55] Latest data is 2017

[56] Own calculations based on data by Transelectrica and World Data

[57] Own calculation based on data provided by INS

Table 8 - Stakeholder map for business development purposes

Institution	Role	Contact data
Ministry of Environment, Waters and Forests	Adopts policy and legislation in the water sector	12, Libertatii Blvd, Bucharest Tel. +40 21 4089615 registratura@mmediu.ro http://mmediu.ro/
National Administration Romanian Waters	Implements water policy at national level	6, Edgar Quinet Str., Bucharest Tel. +40 21 3151301 secretariat.general@rowater.ro https://rowater.ro/
ArgesVedea River Basin Administration	Implements water policy at the level of the river basin where Bucharest is located	6-8, CaleaCâmpulung, Piteşti Tel. +40 248 223449 dispecer@daav.rowater.ro http://arhiva.rowater.ro/daarges/default.aspx
Ilfov Bucharest Water Management System	Implements water policy in Bucharest and surrounding Ilfov county	294, SplaiulIndependentei, Bucharest Tel. +40 21 3182222
National Regulatory Authority for Community Public Utilities Services	Regulates, monitors and controls activities in the field of public utilities at national level	4, Lucian Blaga Str., Bucharest Tel. +40 21 3179751 cabinet@anrsc.ro https://www.anrsc.ro/
Romanian Water Association	Professional association that gathers major players in the water sector (water operators, companies in the supply chain, etc.)[58]	202 H, SplaiulIndependentei,Bl. 2, Tronson 1, app. 2, Bucharest Tel. +40 21 3162787 secretariat@ara.ro https://ara.ro/
Bucharest City Hall	Owner of Bucharest water supply and wastewater infrastructure	47, Regina Elisabeta Blvd., Bucharest Tel. +40 21 3055555 relatiipublice@pmb.ro https://www.pmb.ro/
Municipal Authority for Regulating Public Services Bucharest	Regulation for water supply and wastewater services in Bucharest	41, Regina Elisabeta Blvd., Bucharest Tel. +40 21 3112063 secretariat@amrsp.com.ro http://www.amrsp.com.ro/
Apa Nova Bucharest	Bucharest water operator	11, Dinu Vintilă Str., Euro Tower building, ground floor, Buharest Tel: +40 21 2077777 https://www.apanovabucuresti.ro/

Table 9 - Administrative Structure and Organization of Services in Bucharest, Romania

Parameter	Data
No. of local government units [municipalities]	1 municipality with 6 sectors that have their own administration and mayors (2020)
Number of personnel of the relevant bodies in Municipality	Municipal water and wastewater sector is regulated and monitored by the Municipal Authority for Regulating Public Services Bucharest, which is an associative structure of Bucharest municipality. There are 6 experts employed that are dedicated to water and wastewater. Bucharest municipality also has a Public Services Department, which includes a unit working on water and wastewater. The number of employees working in this unit is not publicly available.
Dominant service provider type	Private concession
Service scope	- Water Treatment, Water supply, Wastewater collection, and Wastewater treatment
Ownership	Municipality (private concession)
Geographic scope of the services	Whole city and some municipalities around Bucharest
Regulatory agency	Yes (Municipal Authority for Regulating Public Services Bucharest)
Utility performance indicators publicly available	Partially
National utility association	Yes (Romanian Water Association)
Private sector participation	Yes

[58] https://ara.ro/structuri-institutionalizate-ara/consiliul-producatorilor-si-importatorilor-de-materiale-si-echipamente-si-al-constructorilor-din-sectorul-apei-membrii-ara

3.2.3. Access to Services and Performance

Apa Nova is the supplier of drinking water and the provider of the sewerage service of Bucharest. Apa Nova supplied approx. 123 million m^3 of water and collected approx. 163 million m^3 of wastewater in 2017. The WWTP can treat 100% of the wastewater mechanically on a dry weather flow. Only 60% is of the wastewater is biologically treated.

- Water bodies used for water supply by Apa Nova
  - RORW10.1_B5 (Arges river) – moderate status
  - RORW10.1_B5_C (Arges/Dambovita rivers) – moderate status
  - RORW10.1.25_B6 (Dambovita river) – good status
- Waterbody used for returning the treated wastewater into the river by Apa Nova
  - RORW10.1.25_B9 (Dambovita river) – moderate status

Table 10 - Access to Services and Performance in Bucharest, Romania

Parameter	Explanation	Date
Population Served - inhabitants	Over 2 million	2020
Number of costumers	135,307 (108,470 private houses, 12,842 building owners' associations, 13,944 economic operators and public institutions, 51 industrial clients)	2019
Available amount of water resources	There is no information for Bucharest specifically, but the Arges river sub-basin where Bucharest is located has a water availability of 2.207.766 m3/year	2018
Water Consumption (per capita)	145 liters/capita/day (Residential water consumption)	2017
Water Served	123 million m3/year	2017
Sources of Water Served	Surface water	2020
Drinking Water Supply Network	83 km	2019
Drinking Water Transmission Line Length	About 2508 km of main and secondary pipelines; approximately 275 km of aqueducts and arteries and over 132,000 connections whose length exceeds 990 kilometers.	2019
Waste Water Collection Network	Over 2380	2019
Storm Water Collection Network	84 km - The collection of waste and stormwater is done through a network of service channels and sewers, built in a unitary system. Still, there are small areas of the city with separate or separative collection networks (domestic and rainwater).	2019
# of Water Treatment Plants	3 Water Treatment Plants	2020
# of Waste Water Treatment Plants	1, partly still in the construction stage	2020
# of Water Elevation Stations	40 repumping stations (29 functional in 2016). 222 hydrophore stations (108 functional in 2016)	2016
# of Waste Water Elevation Stations	69 pumping stations (68 functional in 2016)	2016
Capacity of Water Treatment Plants	522 million m^3/year	2020
Capacity of Waste Water Treatment Plants	10 m^3/s=315 million m^3/year	2020
Waste Water Treated	160 million m3/year mechanical treatment, 96 million m3/year biological treatment	2017
Water treatment coverage	97.2%	2019
Sewerage coverage	97.2%	2019
Wastewater treatment Coverage	Approx. 65%	2017

Parameter	Explanation	Date
Industrial wastewater	No exact data. Industrial waters must be pre-treated by the economic operators.	
Stormwater Coverage	Approx. 100% (The ratio of stormwater collection line to total sewerage collection line)	2019
SCADA Coverage	Information not available	
Electricity Consumption	No exact data, but 79% less energy consumption compared to 2000. Energy consumption still "significant."	2019
Electricity Produced (Cogeneration)	No exact data, but 55,4% of the energy necessary for the functioning of the Glina Wastewater Treatment plant was self-produced in 2019	2019
Reuse of Wastewater	0	2020
Reuse Rate	0%	2020
Water loss rate	27%	2017
Metered water	99.5%	2017
Water stress	The Management Plan for the Arges-Vedea River Basin, in which Bucharest is located, mentions though that there are no special water stress issues in this river basin.	2014

3.2.4. Financing of Services

In 2000, Apa Nova signed with the Municipality of Bucharest the concession contract through which it assumed the responsibility of managing the water and sewerage system, water treatment and distribution to consumers, wastewater disposal and meteoric waters, which was extended in 2020 until 2037.

In the last 20 years since Apa Nova became the water operator for Bucharest, it invested more than 500 million EUR. There were no subsidies granted from the national and local budget. There are, however, EU funds invested for the finalisation of works at the Glina Wastewater Treatment Plant, which is owned by Bucharest municipality and is operated by Apa Nova.

Apa Nova ended 2019 with a net profit of 19.42 million EUR, the company constantly obtaining significant profits in recent years. Since the beginning of the activity, the highest annual net profit was obtained by Apa Nova Bucharest in 2015, amounting to more than 32 million EUR.

In 2020, with the extension of the Concession Agreement, Apa Nova undertook to make investments of 367 million EUR and not to increase the tariff paid by Bucharest residents for water and sewer.

This complex investment program will guarantee the people of Bucharest the current tariff for water and sewerage services, throughout these years, this being one of the lowest prices in Romania (43rd place out of 45 in the top tariffs of the leading operators in Romania). The current price of combined water supply and sewerage is 1,22 EUR/m^3.

Table 11 - Financing of Services in Bucharest, Romania

Parameter	Data	Date
Total Budget	172 million EUR Turnover	2019
CAPEX	30 million EUR	2019
Expenditures for purchase of goods and services	61 million EUR	2019
Total Investment	500 million EUR	2019
Average annual investment [€/capita/year]	14	2019
Total Revenues	175 million	2019
Tariff Revenues	Information not available EUR	-
Tax Revenues	Information not available EUR	-
Average residential tariff	0,8/mc (VAT included) for water supply 0,42/mc (VAT included) for wastewater	2020

Arcuda Water Treatment Plant

3.3. Istanbul

3.3.1. Socioeconomic Context and Data

The city of İstanbul is the most populated city of Turkey, with a population of around 16 million crowded than 131 countries globally.[59] It is located on the Bosphorus Strait between the continents of Europe and Asia.

Accordingly, in 2019, Istanbul has the highest GDP with TRY 1,327 billion and received a 30.7 percent share from the total national revenue. The percentage of the services sector in the total GDP of the province was 32.1%. The industrial sector ranked second with a share of 17.1%, while professional, administrative, and support service activities ranked third with an 8 % share.

Table 12 - Socioeconomic Data, İstanbul, Turkey

Parameter	Data	Date
Population (Person)	15.5 million	2020
Share of the urban population [%]	100 %	2021
Total Area (km^2)	5,461 km^2	2021
Population Density (km^2/population)	2,987	2019
Total GDP ($)	TRY 1,327 billion	2019
Per Capita GDP ($)	TRY 86798	2019
Consumption of Electricity per capita (kWh)	2500 kWh	2019
Average Size of Households (Person)	3.43	2019

3.3.2. Administrative Structure and Organization of Services

Turkish legislation differentiates the metropolitan municipalities among the municipalities as local government type. Currently, there are 30 metropolitan municipalities in Turkey, and İstanbul is one of them.

The İstanbul Metropolitan Municipality is the sole local government and its jurisdiction extends to the provincial borders covering rural areas. In the cities where the metropolitan model is in effect, microservices are entrusted to district municipalities. Today 40 districts are within the metropolitan boundaries of İstanbul.

The Metropolitan *Municipality Law no 5216*, *Municipality Law no 5393* and *Public Financial Management and Control Law no 5018* define duties, powers and responsibilities of the Istanbul Metropolitan Municipality (İMM).

The metropolitan municipal council is the decision-making body of the municipality. The district mayors are also natural members of the metropolitan council. The metropolitan mayor serves as the speaker of the metropolitan municipality council.[60]

The total budget of the İMM is around TRY 21.4 billion and more than 70% of this belongs to the *Capital Expenses* and *Expenditures for Purchasing Goods and Services*. Central Administration Shares and Other Revenues (shares are taken from general budget tax revenue and shares taken from institutions, interests, and penalty revenue) are the main sources of the revenues.

In the metropolises with at least 750,000 population, certain services as water and sewer and public transport are provided by affiliated entities of the municipality.

[59] IMM Annual Report, 2019 https://www.ibb.istanbul/Uploads/2020/7/2019-FAALIYET-RAPORU.pdf
[60] The municipal council serves as the main decision-making body of the municipality, elected by people for five years. One fifth of district municipal councillors (highest voted) shall also become councillors in the metropolitan council. The other municipal organ, the municipal executive committee is a commission that implements the resolutions of the council.
See: https://www.tbb.gov.tr/en/local-authorities/municipal-organs/

According to law, public legal personality and a separate budgetary power, water and sewer administrations are established by law.

In line with the law, **Istanbul Water and Sewerage Administration (İSKİ),** established in 1984, became the IMM subsidiary with an independent budget.

Its jurisdiction area covers all the administrative borders of Istanbul province. The ISKI is an affiliated entity under public law and cannot pursue profits though they provide and sell services.

ISKI works under the oversight of metropolitan municipalities. The metropolitan mayor is the chairperson of the governing board of ISKI, with executive powers entrusted to a director-general. The General Director of İSKİ is elected upon the Metropolitan Municipality mayor's proposal and approved by the Ministry of Interior Affairs.

Its foundation law lays down the organization and functioning of water and sewer administrations. ISKI transfers water from the water sources that lie outside the province's boundaries; therefore, it exceeds the Istanbul Metropolitan Municipality service area.

Major functions of ISKI are as follows:

- Supply potable, non-potable, and industrial water to the city, distribute to users and operate the system;
- Remove and treat waste water and stormwater;
- Protect water sources, seas, lakes and rivers in the region against pollution.

The Municipality Law enables the IMM to transfer certain concessions to market operators not to exceed 49 years.

- Supply of potable, non-potable and industrial water, removal of waste water and storm water;
- Urban public transport;
- Collecting, sorting and landfilling solid waste.

The draft concession agreement is subject to the review of the Council of State (and the transfer of concession needs to be approved by the Ministry of Interior. Although the Law permits, it is not common to transfer water and sewer services to private companies.

The IMM may also involve others through the build-operate-transfer model for concessionable services as water and sewer, public transport and waste management. To implement the model, the concession agreement needs to be approved by the relevant ministry.

Lastly, the IMM can outsource municipal services.[61] Private sector actors are usually engaged through tender procedures for constructing infrastructures such as roads, water, sewer, information processing, cartography, planning, maintenance of parks, street cleaning, and waste collection, etc. [62]

Table 13 - Administrative Structure and Organization of Services in İstanbul, Turkey

Parameter	Data
No. of local government units [municipalities]	40 (2020)

[61] There is a limit imposed by the Law on personnel expenditures for the municipalities such that it shall not exceed 30% of the municipal budget (40% for municipalities with population smaller than 10,000). Where this threshold is exceeded, the municipality cannot recruit new staff. The payments to the labour procured from market operators are accounted as service procurement, not personnel expenditures.

[62] Functions of Municipalities https://www.tbb.gov.tr/en/local-authorities/functions-of-municipalities/

Number of personnel of the relevant bodies in Municipality - ISKI	9834 (2020)[63]
Dominant service provider type	- Municipal public utility
Service scope	- Water Treatment - Water supply - Wastewater collection - Wastewater treatment
Ownership	- Municipal public utility
Geographic scope of the services	- Metropolitan area (Whole city)
Regulatory agency	No
Utility performance indicators publicly available	Yes
National utility association	No
Private sector participation	Yes

3.3.3. Access to Services and Performance

According to the ISKI data, Istanbul's total water consumption has increased by 36.5% in the last ten years, from 0.8 billion m^3 to 1.1 billion m^3. Around 98 % of water resources in İstanbul are surface water resources. The annual yield of potable water resources is 1.653 billion m^3.

Compared to waste water-related problems, the water supply has always been the city's major operation problem. In January 2021, average water levels in dams decreased to 19.79%, the lowest in the past 15 years. Climate change worsens the water supply problem.

The city consumes 3 million m^3/day on average, which is very large considering the available water resources and ecosystem capacity. The city cannot cover its water need from the water resources in İstanbul; the city's water supplies are also dependent on Yeşilçay and Melen, two rivers east of Istanbul. Water catchment basins are around 6.157 km^2 together with the Melen basin. The Melen project can deliver 1.1 million m^3 additional water annually.

By 2020, there are 21 Water Treatment Plants and 89 Waste Water Treatment Plants operated by İSKİ. Ozoning system is mainly used in water treatment plans to enable the provision of water with potable standards.

Regarding the waste water treatment technology, the Bosphorus coasts are installed with pre-treatment plants, while biological and advanced biological treatment processes are used for locations along the Marmara Sea. The specific amounts of outlet water from the advanced biological wastewater treatment plants are used for irrigation purposes in recreational areas and industrial water.

Wastewater from rural populations of 500 to 5,000 inhabitants in Istanbul is treated using individual septic systems, packaged biological treatment systems, onsite low-cost stabilization ponds, conventional activated sludge systems or, in some cases, advanced biological treatment systems that remove nutrients.

The majority of the electricity consumed annually belongs to water services (raw water pumping stations and drinking water pumping stations). The electrical energy consumed in 2019 was 1,450,417,551 (kWh), while electric consumption cost was TRY 0.75 billion. There are 117 potable water pumping stations with 395.994 kVA installed capacity.

Only 9.5% of the consumed electricity is provided by cogeneration and solar energy plants of ISKI. There is an increasing electrical energy consumption trend and at the same time increasing costs (in terms of TRY) for the last five years.

63 https://www.iski.gov.tr/web/assets/SayfalarDocs/faaliyetraporlari/faaliyetraporu/pdf/Stratejik%20Plan%20(2021-2025).pdf

The water loss due to the leaks is also reducing the efficiency of water supply operations. The current water loss rate is %22.3 based on the ISKI's data.

İSKİ controls the SCADA systems for water and waste water operations. The SCADA controlled activities nearly cover all water supply services, and for the waste water services, its share needs to be increased. In addition to SCADA systems, robotic technologies (camera robots) are employed to repair and maintain maintenance works.

Istanbul Water Control and Automation Center - ISKI

Table 14 - Access to Services and Performance in İstanbul, Turkey

Parameter	Data	Date
Population Served - inhabitants	15,519,267	2019
Number of costumers	6,615,456	2020
Efficiency of water resources	1.653 billion m^3	2019
Sources of Water Served	Surface water	2020
Water Served	1,061,769,837 m^3/year	2019
Water Consumption per capita	187 liter/year/capita	2019
Sources of Water Served	Surface water	2020
Drinking Water Supply Network	19,577 km	2020
Drinking Water Transmission Line Length	2,847 km	2020
Waste Water Collection Network	17,500 km	2020
Storm Water Collection Network	4600 km	2020
# of Water Treatment Plants	21 Water Treatment Plants	2020
# of Waste Water Treatment Plants	88 of Waste Water Treatment Plants	2020
# of Water Elevation Stations	117 Elevation Stations	2020
# of Waste Water Elevation Stations	46 Elevation Stations	2020
Capacity of Water Treatment Plants	4,352,220 m^3 /day	2020
Capacity of Waste Water Treatment Plants	5,811,660 m^3 /day	2020
Waste Water Treated	1.381 billion m^3 /year	2020
Water supply network coverage	100% (use and tap water network)	2018
Water treatment coverage	100%	2018
Sewerage coverage	100%	
Wastewater treatment coverage	99.6%	2018
Treated Industrial wastewater	73%	2019
Stormwater Coverage	26%	2019
SCADA Coverage	The ratio of wastewater managed by SCADA system to total waste water	2019
Electricity Consumption	1.450 GWh (75% for water and 23% for wastewater services)	2019
Electricity Produced (Cogeneration)	134,621,239 kWh	2019
Electricity Produced (Solar)	1,414,564 kWh	2019
Reuse of Wastewater	25,376,863 m^3/year	2019
Reuse Rate	2%	2019
Water loss rate	22.3% (0.24 billion m^3)	2019
Nonrevenue water [%]	23.4% (0.25 billion m^3)	2019
Water stress	%64	2019

3.3.4. Financing of Services

Law No. 5018 on Public Fiscal Administration and Control sets the rules for municipalities to prepare and implement their budgets and other fiscal administration matters. The fiscal and non-fiscal information and data on budget actualizations of ISKI are published in its publicly available annual reports.[64]

The Municipality and ISKI have its only two primary sources of revenue[65]:

- **Apportionments from the central government tax revenues**: The central government redistributes the tax revenue shares to local governments in proportion to their functions and responsibilities. The metropolitan municipalities receive their share; moreover, a particular amount of share of their district municipalities is also allocated to them from the state tax revenues.[66]
- **Own revenues:** These include taxes, charges, contribution to investment expenditures, fees, and enterprise revenues.
    - **1.Taxes**: property tax, sanitation tax, announcement and advertisement tax, electricity and coal gas consumption tax, communication tax, entertainment tax.
        - Sanitation tax: Residences and workplaces are levied a sanitation tax for municipalities' solid waste services. For residences, sanitation tax is collected along with water charges at a rate of 0.12 Turkish Lira (0.15 TRY in metropolises) per cubic meter of water consumed. The sanitation tax for workplaces is assessed based on the number of employees or the accommodation capacity. Workplaces are classified into five groups, and each further classified into 7 subgroups. Accordingly, the smallest workplace pays 12 TL, whereas the largest pays 1,400 TL of sanitation tax per annum. For metropolises, 25% is added to these figures.
    - **2.Charges:** Charges for certain services delivered, including primarily building construction charge, business license charge, various development charges, occupation charge, spring water charges.
        - The lower and upper limits of the charges are set in Law No. 2464 on Municipal Revenues. The municipal council has the power to set varying charge rates for neighborhoods of different economic development levels.
    - **3.Contribution to investment expenditures:** Municipalities charge property owners not to exceed 0.2% of the value of their respective property as a contribution to investment expenditures incurred by municipalities for construction of roads, water and sewer etc. infrastructure.
    - **4. Service fees:** Fees are charged for services provided by the municipality upon the buyer's request, not the subject-matter of any taxes, charges, or contributions. The municipal council shall set the fee schedules.
        - Major service fees collected by municipalities include potable water fees and public transport fees. Municipalities also provide such paid services as pesticide application to residence or work place, water tank cleaning, chimney shaft cleaning, car parking, etc.
    - **5.Other revenues:** In addition to the above, the municipality has its enterprise and property revenues

[64] https://www.ibb.istanbul/SitePage/Index/176
[65] In Turkey, Local governments are not authorized to collect taxes on revenues and expenditures. Only the state the central government have a right to collect such types of taxes and distributes shares to local governments.
[66] The Metropolitan municipalities are first allocated 6% of the tax proceeds collected by the state within the respective metropolitan municipality. Of the apportionment of 4.5% to district municipalities, they only receive 60% of such apportionment directly; 30% is given to the respective metropolitan municipality and 10% to the water and sewer administration. For more details see: Municipal Finances, https://www.tbb.gov.tr/en/local-authorities/municipal-finances/

A great majority of the income of the ISKI originates from water sales, and most of the investments are performed through this income. Water consumption is identified and measured via mechanical or card meters. Subscribers' contracts are classified according to the consumer groups of households, offices, administrations, industrial locations, village settlements and offices, and municipal buildings. Water consumption of subscribers is recorded and invoiced by online meter readings conducted monthly.[67]

Table 15 - Financing of Services and Performance in İstanbul, Turkey

Parameter	Data	Date
Total Budget	TRY 7.1 billion (Expense Budget Realization)	2019
CAPEX	TRY 3.5 billion (49%)	2019
Expenditures for purchase of goods and services	TRY 2.2 billion (31%)	2019
Total Investment (Investment Budget Realization)	3.5 billion	2019
Total Revenues Realized	TRY 6.2 billion	2019
Tariff Revenues	TRY 5.0 billion	2019
Tax Revenues	TRY 0.64 billion	2019
Average residential tariff	including water and waste water charge 0.51 €/m^3 for (0-15 m3) and 0.76 €/m^3 (16 m^3 and over) Only waste water charge 0.17 €/m^3 (0-15 m3) and 0.25 €/m^3 (16 m^3 and over)	2019

Borrowing Procedure

Municipalities may borrow as a financing means where the apportionments from the state budget and own revenues are insufficient. Investments in the subway system, treatment facilities and other large infrastructure are usually financed by borrowing. Municipalities may issue bonds to finance the projects in the investment program.

A municipality is barred from borrowing more than the total of its revenues in the previous year (one and a half times the last year's revenues for metropolitan municipalities). However, no restriction applies to borrowing for an infrastructure project requiring advanced technology and considerable financial resources where the Council of Ministers approves the project.

Any borrowing of the municipality by any means or at any amount is subject to the municipal council's approval, and except for some instances, the approval of the central government is required in addition.

For borrowing by the municipality up to 10% of the previous year's revenues, the central government's approval is not required. For amounts exceeding this threshold, the consent of the Ministry of Interior is sought. Borrowing at rates exceeding the previous year's revenues of a municipality is possible only in the case of infrastructure investments and upon the Council of Ministers' approval.

Borrowing from foreign sources is similarly possible only in the case of infrastructure investments and upon the Council of Ministers' approval. For foreign borrowing, the affirmative opinion of the Undersecretariat of Treasury is also sought.

Borrowing Procedure (cont)

[67] https://www.iski.istanbul/web/en-US/kurumsal

Borrowing in violation of these limits and procedures results in the financial liability of the relevant officials.

Of municipal revenues	Type of borrowing	Approval required from
Up to 10%	Domestic borrowing	-
10% to 100%	Domestic borrowing	Ministry of Interior
Exceeding 100%	Domestic borrowing (for infrastructure)	Council of Ministers
	Foreign borrowing (for infrastructure)	Council of Ministers

DOMESTİC BORROWİNG		FOREİGN BORROWİNG	BOND ISSUE
Council resolution	Simple majority of full membership of council	Council resolution	Council resolution
	Approval by Ministry of Interior	Approval by Undersecretariat of Treasury	Approval by Undersecretariat of Treasury

3.4. Zagreb

The city of Zagreb is the capital and the most populated city of Croatia, with over 800,000 inhabitants, representing 16% of the total population of Croatia. Zagreb is the key financial centre of Croatia, with a total GDP of EUR 16.9 billion and per capita of EUR 21,019.

Geographically, Zagreb is located at the banks of the transboundary Sava River. It lies on pebble alluvial deposits of the Sava River, which contain large amounts of groundwater that is naturally filtered.

In order to cover an area that communicates most intensely and to establish a more effective dialogue as the basis for joint planning of sustainable and integrated development, in accordance with the Act on the Regional Development of the Republic of Croatia, the City of Zagreb started the procedure of strategic planning of sustainable urban development by establishing the Zagreb Urban Agglomeration in 2017. It enables the country to mobilize EU funds more efficiently, for e.g., through the Mechanism of Integrated Territorial Investments (ITIs). The surface area of the Agglomeration is 2,911.3 km^2. It is home to 1,086,528 inhabitants, and it is the largest and most important urban area in Croatia. [68]

Table 16 - Socioeconomic Data, Zagreb, Croatia

Parameter	Data	Date
Population (Person)	807,254	2019(estimate)[69]
Share of urban population [%]	100 %	2019
Total Area (km^2)	641 km^2	2011
Population Density (km^2/population)	1,232	2011
Total GDP ($)	EUR16.9 billion	2017
Per Capita GDP ($)	EUR 21,019	2017
Consumption of Electricity per capita (kWh)	3,383 kWh per capita	2019
Average Size of Households (Person)	2.57	2011

3.4.1. Administrative Structure and Organization of Services

Zagreb's waterworks company *Vodoopskrba i odvodnja Ltd.* (ViO) is established as an independent company in 2013. Historically, city waterworks were officially opened in 1878.

The main activities of the ViO company are pumping, quality control, distribution and delivery of safe water, drainage and monitoring of wastewater quality, sewerage control, and construction and renovation of water supply sewerage systems and all facilities for water supply and drainage.

ViO provides public water supply and drainage services for the area of the City of Zagreb, as well as conducting water supply services in the areas of Samobor, Sveta Nedelja i Stupnik municipality and sewerage services in the area of Sveta Nedelja and Stupnik municipality. [70]

Zagrebačke otpadne vode d.o.o. (ZOV)/ *Zagreb wastewater Ltd.* is responsible for the Central wastewater treatment plant's operation Zagreb and related infrastructure. ZOV is owned by a consortium consisting of WTE Wassertechnik GmbH from Essen (48.5%), innogy Aqua GmbH from Mülheim (48.5%) and city company Vodoprivreda Zagreb d.d. (3%).

Table 17 - Administrative Structure and Organization of Services in Zagreb, Croatia

[68] Zagreb Urban Agglomeration Development Strategy for the period up to 2020, 2018, City of Zagreb, https://www.zagreb.hr/UserDocsImages/gu%20za%20strategijsko%20planiranje/SRUAZ%202020%20_layout_ENG_digital.pdf
[69] Official estimate by Croatian Bureau of Statistics, based on the last census in 2011.
[70] https://www.vio.hr

Parameter	Data
No. of local government units [municipalities]	4
Number of personnel of the relevant bodies in Municipality	520 (estimate[71]) in public utility company 161 in city administration
Dominant service provider type	Local utility company (*Vodoopskrba i odvodnja* – ViO, https://www.vio.hr/)
Service scope	Public water supply and wastewater collection, transportation of wastewater to the central WWTF
Ownership	City of Zagreb
Geographic scope of the services	Zagreb metropolitan area, 2 neighbouring towns Samobor and Sveta Nedelja, and Stupnik municipality
Regulatory agency	Council for Water Services
Utility performance indicators publicly available	No
National utility association	Croatian Water Supply and Sanitation Group (Hrvatska grupacija vodovoda i kanalizacije, HGViK, http://www.hgvik.hr/)
Private sector participation	Only for construction and management of the wastewater treatment facility for the City of Zagreb– company *Zagrebačke otpadne vode (ZOV)* manages the WWTF based on a concession agreement with City of Zagreb until 2028.

3.4.2. Access to Services and Performance

In the City of Zagreb 99.26% of the population is served by a public water supply, managed by the ViO public utility company.

Collection of water is performed on seven water collection sites from 30 wells. The water supply network length is approximately 3,500 kilometers, and about 310,000 cubic meters of water per day is pumped. 95.05% of the population is connected to the sewerage network.

Monitoring of drinking water safety is carried out on a national level according to the Monitoring Plan issued by the Minister of Health on a proposal of the Croatian Institute of Public Health (HZJZ) as a co-ordinating body.

The monitoring plan is carried out by institutes of public health in Croatian counties and the City of Zagreb, respectively, according to their local authority and financial resources provided by their respective local authorities.

As a result of legal requirements to reduce water pollution, particularly in the Sava River, the City of Zagreb and Croatian Waters tendered the Central Waste Water Treatment Plant Zagreb (CWWTP Zagreb) to WTE Group on a Build Operate Transfer (BOT) basis for 28 years. The operation started in 2004 with the first phase (mechanical treatment), and in 2007 the completion of the plant was spurred on by the successive implementation of single biological stages (25–50–75–100%).[72]

CWWTP Zagreb plant was built for an operational capacity of 1.2 m PE, with the potential for expansion to 1.5 m PE. The plant is sized for peak hour demand of 30,510 m^3 in the rainy season and to the biological BOD5 load of 72,000 kg/day, respectively, in the final phase for peak hour demand of 37,790 m^3 in the rainy season and biological BOD5 load of 90,000 kg/day. [73]

Based on the Bankwatch Study, the central WWTP project is marked as "overpriced and underwritten." It does not include a full final treatment and disposal for the sewage sludge

[71] https://www.iawd.at//files/File/library/vod/SoS_ES-2018_CRO.PDF- estimate by author, based on labour productivity data in water sector
[72] https://www.wte.de/WTE/Referenzen/Ausgewahlte-Projekte/Zentralklaranlage-Zagreb.aspx?lang=en-US
[73] https://www.zov-zagreb.hr/en/

resulting from the treatment process. Although anaerobic digesters are part of the project, these have been built so as not to be sufficient to completely process all of the sludge.[74]

Table 18 - Access to Services and Performance in Zagreb, Croatia

Parameter	Explanation	Data
Population Served	Over 900,000 inhabitants	2019
Number of customers	101,639 connections to water supply system 75,037 connections to the sewage system	2019
Water Consumption (per capita)	5 - 7 m^3 / month	2020
Water Served	57,313,909 m^3	2019
Sources of Water Served	Surface water (1.8 %), groundwater (92.6%), water purchased from town of Velika Gorica (through water service coop. agreement) – 5.6% [75]	2019
Drinking Water Supply Network	Area coverage of cca 800 km^2	2019
Drinking Water Transmission Line Length	3,212 km of water mains and distribution pipelines	2019
Waste Water Collection Network	2,174 km	2019
Storm Water Collection Network	55,800 street drainage canals for waste and atmospheric water	2019
Water Treatment Plants		
Waste Water Treatment Plants	ZOV operates the central wastewater treatment plant for the City of Zagreb that receives all wastewater from the public sewage network. There are ongoing (re)construction works to achieve 100% connectivity to public sewage network as well as to connect the remaining parts of the current sewage network to the central WWTF.	2021
Water Elevation Stations	30 groundwater wells in 7water pumping zones	2020
Waste Water Elevation Stations	n/a	
Capacity of Water Treatment Plants	1,200,000 IE(expandable to 1,500,000 IE)[76]	2017
Waste Water Treated	125,799,000 m^3/year	2019
Water coverage	99.26% of the population served by the public water supply	2019
Sewerage coverage	95.05% of the population connected to the sewerage network	2019
Wastewater treatment Coverage	Currently the central WWTF serves cca 883,500 IE[77] which includes commercial sector (there are no separate WWT facilities for industry) [78]	2019
Municipal Wastewater Collection level	37,650,000 m^3/year	2019
Industrial wastewater	13,089,000 m^3/year	2019
Stormwater Coverage	n/a	
SCADA Coverage	61 remote monitoring stations have been installed for Zagreb sewage system[79]; another 170 stations planned to be installed in stage 2, which is still pending.[80]	2016
Electricity Consumption	217,550 GJ	2019

[74] https://bankwatch.org/public-private-partnerships/case-studies/zagreb-wastewater-treatment-plant-cupovz-croatia
[75] Zagreb Holding Group, Sustainability report 2019, https://www.zgh.hr/UserDocsImages/Marketing/DOP/HOLDING%20izvjesce%20o%20odrzivosti%202019.pdf
[76] https://mingor.gov.hr/UserDocsImages/UPRAVA-ZA-PROCJENU-UTJECAJA-NA-OKOLIS-ODRZIVO-GOSPODARENJE-OTPADOM/Opuo/22_01_2019_Elaborat_Projekt_Zagreb_2018.pdf
[77] https://mingor.gov.hr/UserDocsImages/UPRAVA-ZA-PROCJENU-UTJECAJA-NA-OKOLIS-ODRZIVO-GOSPODARENJE-OTPADOM/Opuo/22_01_2019_Elaborat_Projekt_Zagreb_2018.pdf
[78] https://www.voda.hr/sites/default/files/pdf_clanka/hv_69-70_2009_241-250_tusar-et-al.pdf
[79] https://www.voda.hr/sites/default/files/izvrsenje_plana_2016.pdf
[80] https://www.proning-dhi.hr/SCADA%20kanalizacijskog%20sustava%20grada%20Zagreba.html

Parameter	Explanation	Data
Electricity Produced (Cogeneration)	n/a	
Water loss rate	48.7 %	2019
Nonrevenue water [%]	57,700,000 m3/yr due to leakages	2019
Water supply continuity	24 h/day	
Water stress	Estimated as low (under 50%). Groundwater abstraction which exceeds renewable groundwater reserves[81]is recovered from large permanent groundwater reserves; however, due to the continuous lowering of groundwater levels and pollution pressures from industry, a better understanding of the groundwater protection measures will be needed for Zagreb aquifer area[82].	2019

3.4.3. Financing of Services

Croatia is committed to implementing the EU water directives by 2023, which requires substantial investments to extend and upgrade the existing ageing water supply and sanitation infrastructure. The government has been striving to raise Croatia's competitiveness to compete in the large EU market and maximize the opportunities that membership brings, especially the absorption of a large amount of EU Structural Funds.

The total estimated investments in water utility infrastructure projects from 2014 – 2023 amount to HRK 28 billion (EUR 3.8 billion), out of which 23% are investments in public water supply and 77% in the public sewer system and waste water treatment. The investment programme will be implemented through: 1) EU structural instruments, 2) IFI loans and 3) national financing mechanisms. The estimated investment needs (reported by Croatia under Article 17 of the UWWTD Directive) to reach full compliance with the UWWTD are EUR 2880 million (EC, 2017), i.e., EUR 700 / capita.

The primary sources of financing of water related services are: 65% EU funds, 13% State Budget, 13% Croatian Waters, and 9% public providers of water services. The distribution of the total amount of national co-financing depends on the development index of local governments.

Water service costs are fully recovered through tariffs. This might become a challenge in the future with the tariff increase. Construction and operation of new infrastructure to comply with EU environmental *acquis* will likely require substantial tariff increases and will influence the affordability of the tariffs.

[81] Croatian Geological Survey: *Assessment of status and risks for groundwater bodies in the Pannonia part of Croatia*, 2009 (report in Croatian)
https://www.voda.hr/sites/default/files/dokumenti/ocjena_stanja_i_rizika_cjelina_podzemnih_voda_u_panonskom_dijelu_rh_.pdf
[82] Nakić et al.: Conceptual model for groundwater status and risk assessment – case study of the Zagreb aquifer system, Geologia Croatica: Journal of the Croatian Geological Survey and the Croatian Geological Society, 66(2013), 1; 55-77 doi:10.4154/gc.2013.05, https://www.bib.irb.hr/615334

Table 19 - Financing of Services in Zagreb, Croatia

Parameter	Explanation	Date
Total Budget	HRK 700 million (estimate[83]) (≈ MEur 95)	2019
CAPEX	HRK 223.7 million (MEur 30.2)	2019
Expenditures for purchase of goods and services	HRK 40 million (estimate[84]) (MEur5.4)	2019
Total Investment	HRK 223.7 million (MEur 30.2)	2019
Total Revenues	HRK 460,000,000 (estimate[85]) (≈ MEur 62)	2019
Tariff Revenues	HRK 420 million	2019
Tax Revenues	n/a	
Average residential tariff	Calculated as a combination of fixed price for water system operation &maintenance (2.5 EUR/mth per household), and the variable part ranging from 1.2 - 2.0 EUR/m^3 depending on household's social status and sewage connectivity.[86]	2020
Unit cost	2.5 EUR/mth per household (Operation and maintenance unit cost)	2020
Operating cost coverage	100% through tariffs, mainly due to cross-subsidization from industrial to residential users.	2019

Zagreb Wastewater Treatment Plant

[83]Estimate based on limited data available through consolidated Zagreb Holding Group's annual financial report (https://www.zgh.hr/o-nama/izvjesca/19). Detailed financial reports by individual business segments of the Zagreb Holding Group are not published.
[84]See previous.
[85]See previous.
[86]Variable part of water price includes taxable basic market price of services (water supply and wastewater collection & treatment), water use and pollution charges, and development surcharge (participation in infrastructure investment costs).

4. CITY LEVEL SDG6 DATA TARGETS

4.1. SDG6 Targets Evaluation for the Cities

This section presents the city-specific SDG6 targets and indicators. Due to the nature of the SDGs, some of the data are not accessible at the city level.

The cities are more successful in terms of reaching the below goals:

- 6.1.1 Proportion of population using safely managed drinking water services
- 6.2.1 Proportion of population using safely managed sanitation service

According to the available data, the cities will need to invest and integrate their policies for the below targets:

- 6.3.1 Proportion of domestic and industrial wastewater flows safely treated
    - safely treated domestic wastewater flows
    - safely treated industrial wastewater flows
- 6.3.2 Proportion of bodies of water with good ambient water quality
    - River water bodies with good ambient water quality
    - open water bodies with good ambient water quality
    - groundwater bodies with good ambient water quality

The cities do not have a good quality of data in:

- 6.4.1 Change in water-use efficiency over time
- 6.5.1 Degree of integrated water resources management
- 6.5.2 Proportion of transboundary basin area with an operational arrangement for water cooperation
- 6.6.1 Change in the extent of water-related ecosystems over time
- 6.a.1 Amount of water- and sanitation-related official development assistance that is part of a government-coordinated spending plan
- 6.b.1 Proportion of local administrative units with established and operational policies and procedures for participation of local communities in water and sanitation management

The next sections detail the level of alignment with the SDG6 target in the selected cities.

4.2. Bucharest SDG 6 Table

Table 20 - SDG6 Table for Bucharest

SDG 6 Indicators	Value
6.1.1 - Proportion of population using safely managed drinking water services	
Proportion of population using safely managed drinking water services	97.2%
6.2.1 - Proportion of population using safely managed sanitation service	
Proportion of population using safely managed sanitation services	97.2%
6.3.1 Proportion of domestic and industrial wastewater flows safely treated	
Proportion of safely treated domestic wastewater flows (%)	60%
6.3.2 Proportion of bodies of water with good ambient water quality	
Proportion of river water bodies with good ambient water quality (%)	0%
Proportion of open water bodies with good ambient water quality (%)	0%
Proportion of groundwater bodies with good ambient water quality (%)	0%
6.4.1 Change in water-use efficiency over time	
Water Use Efficiency (United States dollars per cubic meter)	25[87]
6.4.2 Level of water stress: freshwater withdrawal as a proportion of available freshwater resources	
Level of water stress: freshwater withdrawal as a proportion of available freshwater resources (%)	4,4%[88]
6.5.1 Degree of integrated water resources management	72[89]
Enabling environment	96
Institutions and participation	65
Management instruments	84
Financing	44
6.5.2 Proportion of transboundary basin area with an operational arrangement for water cooperation	
Proportion of transboundary aquifers with an operational arrangement for water cooperation (%)	100%
Proportion of transboundary river and lake basins with an operational arrangement for water cooperation (%)	100%
Proportion of transboundary basins (river and lake basins and aquifers) with an operational arrangement for water cooperation (%)	100%
6.6.1 Change in the extent of water-related ecosystems over time	+1%[90]
Change in quantity of open water bodies (million of cubic meters per annum)	475
Change in quantity of rivers (millions of cubic meters per annum)	0
Change in quantity of groundwater (millions of cubic meters per annum)	9,600
Change in Water body extent (permanent) (square kilometers) compared to last 10 or 20 years	17
Change in the extent of rivers (square kilometers) compared to last 10 or 20 years	NA
6.a.1 Amount of water- and sanitation-related official development assistance that is part of a government-coordinated spending plan	
Total official development assistance (gross disbursement) for water supply and sanitation, by recipient countries (millions of constant 2018 United States dollars)	Not applicable
6.b.1 Proportion of local administrative units with established and operational policies and procedures for participation of local communities in water and sanitation management	
Communities participating in planning programs in rural drinking-water supply, by level of participation (3 = High; 2 = Moderate; 1 = Low; 0 = NA)	Not applicable
Procedures in law or policy for participation by service users/communities in planning program in rural drinking-water supply, by level of definition in procedures (10 = Clearly defined; 5 = Not clearly defined ; 0 = NA)	Not applicable
Users/communities participating in planning programs in water resources planning and management, by level of participation (10 = Clearly defined; 5 = Not clearly defined ; 0 = NA)	Not applicable
Procedures in law or policy for participation by service users/communities in planning program in water resources planning and management, by level of definition in procedures (10 = Clearly defined; 5 = Not clearly defined ; 0 = NA)	Not applicable

[87]Percentage valid for Romania for year 2015, no specific information for Bucharest: https://www.sdg6data.org/country-or-area/Romania#anchor_6.4.1
[88]Percentage valid for Romania for year 2017, no specific information for Bucharest: https://www.eea.europa.eu/data-and-maps/indicators/use-of-freshwater-resources-3/assessment-4
[89]Percentage valid for Romania for year 2017, no specific information for Bucharest: https://sdg6data.org/indicator/6.5.1
[90]Percentage valid for Romania for year 2016, no specific information for Bucharest: https://www.sdg6data.org/country-or-area/Romania#anchor_6.6.1

4.3. Belgrade SDG 6 Table

Table 21 - SDG6 Table for Belgrade

SDG 6 Indicators	Value
6.1.1 - Proportion of population using safely managed drinking water services	
Proportion of population using safely managed drinking water services	92.7 %
6.2.1 - Proportion of population using safely managed sanitation service	
Proportion of population using safely managed sanitation services	87 %
6.3.1 Proportion of domestic and industrial wastewater flows safely treated	
Proportion of safely treated domestic wastewater flows (%)	0 %
6.3.2 Proportion of bodies of water with good ambient water quality	
Proportion of river water bodies with good ambient water quality (%)	0%
Proportion of open water bodies with good ambient water quality (%)	0%
Proportion of groundwater bodies with good ambient water quality (%)	0%
6.4.1 Change in water-use efficiency over time	
Water Use Efficiency (United States dollars per cubic meter)	N/A
6.4.2 Level of water stress: freshwater withdrawal as a proportion of available freshwater resources	
Level of water stress: freshwater withdrawal as a proportion of available freshwater resources (%)	6[91]
6.5.1 Degree of integrated water resources management	30[92]
Enabling environment	33
Institutions and participation	25
Management instruments	37
Financing	24
6.5.2 Proportion of transboundary basin area with an operational arrangement for water cooperation	
Proportion of transboundary aquifers with an operational arrangement for water cooperation (%)	100%
Proportion of transboundary river and lake basins with an operational arrangement for water cooperation (%)	100%
Proportion of transboundary basins (river and lake basins and aquifers) with an operational arrangement for water cooperation (%)	100%
6.6.1 Change in the extent of water-related ecosystems over time	+2 %[93]
Change in quantity of open water bodies (million of cubic meters per annum)	NA
Change in quantity of rivers (million of cubic meters per annum)	NA
Change in quantity of groundwater (million of cubic meters per annum)	NA
Change in Water body extent (permanent) (square kilometers) compared to last 10 or 20 years	566
Change in the extent of rivers (square kilometers) compared to last 10 or 20 years	9
6.a.1 Amount of water- and sanitation-related official development assistance that is part of a government-coordinated spending plan	
Total official development assistance (gross disbursement) for water supply and sanitation, by recipient countries (millions of constant 2018 United States dollars)	38[94]
6.b.1 Proportion of local administrative units with established and operational policies and procedures for participation of local communities in water and sanitation management	
Communities participating in planning programs in rural drinking-water supply, by level of participation (3 = High; 2 = Moderate; 1 = Low; 0 = NA)	3
Procedures in law or policy for participation by service users/communities in planning program in rural drinking-water supply, by level of definition in procedures (10 = Clearly defined; 5 = Not clearly defined ; 0 = NA)	Existing[95]
Users/communities participating in planning programs in water resources planning and management, by level of participation (10 = Clearly defined; 5 = Not clearly defined ; 0 = NA)	3
Procedures in law or policy for participation by service users/communities in planning program in water resources planning and management, by level of definition in procedures (10 = Clearly defined; 5 = Not clearly defined ; 0 = NA)	Existing

[91]Percentage valid for Serbia for year 2017, no specific information for Belgrade: https://www.sdg6data.org/country-or-area/Serbia#anchor_6.4.2
[92]Percentage valid for Serbia for year 2017, no specific information for Belgrade: https://sdg6data.org/indicator/6.5.1
[93]Percentage valid for Serbia for year 2016, no specific information for Belgrade: https://www.sdg6data.org/country-or-area/Serbia#anchor_6.4.2
[94]Percentage valid for Serbia for year 2018, no specific information for Belgrade: https://www.sdg6data.org/country-or-area/Serbia#anchor_6.4.2
[95]Percentage valid for Serbia for year 2017,only existence of procedures evaluated, not the level of definition https://www.sdg6data.org/country-or-area/Serbia#anchor_6.4.2

4.4. İstanbul SDG 6 Table

Table 22 - SDG6 Table for İstanbul

SDG 6 Indicators	Value
6.1.1 - Proportion of population using safely managed drinking water services	100%
Proportion of population using safely managed drinking water services	
6.2.1 - Proportion of population using safely managed sanitation service	100%
Proportion of population using safely managed sanitation services	
6.3.1 Proportion of domestic and industrial wastewater flows safely treated	
Proportion of safely treated domestic wastewater flows (%)	99.6%
Proportion of safely treated industrial wastewater flows (%)	73%
6.3.2 Proportion of bodies of water with good ambient water quality	
Proportion of river water bodies with good ambient water quality (%)	No data
Proportion of open water bodies with good ambient water quality (%)	No data
Proportion of groundwater bodies with good ambient water quality (%)	No data
6.4.1 Change in water-use efficiency over time	
Water Use Efficiency (United States dollars per cubic meter)	0.124[96]
6.4.2 Level of water stress: freshwater withdrawal as a proportion of available freshwater resources	
Level of water stress: freshwater withdrawal as a proportion of available freshwater resources (%)	64%
6.5.1 Degree of integrated water resources management	72%
Enabling environment	78%
Institutions and participation	75%
Management instruments	73%
Financing	62%
6.5.2 Proportion of transboundary basin area with an operational arrangement for water cooperation	
Proportion of transboundary aquifers with an operational arrangement for water cooperation (%)	n.a
Proportion of transboundary river and lake basins with an operational arrangement for water cooperation (%)	n.a
Proportion of transboundary basins (river and lake basins and aquifers) with an operational arrangement for water cooperation (%)	n.a
6.6.1 Change in the extent of water-related ecosystems over time	
Change in quantity of open water bodies (million of cubic meters per annum)	No data
Change in quantity of rivers(million of cubic meters per annum)	No data
Change in quantity of groundwater (million of cubic meters per annum)	No data
Change in Water body extent (permanent) (square kilometers) compared to last 10 or 20 years	No data
Change in the extent of rivers (square kilometers) compared to last 10 or 20 years	
6.a.1 Amount of water- and sanitation-related official development assistance that is part of a government-coordinated spending plan	
Total official development assistance (gross disbursement) for water supply and sanitation, by recipient countries (millions of constant 2018 United States dollars)	n.a
6.b.1 Proportion of local administrative units with established and operational policies and procedures for participation of local communities in water and sanitation management	
Communities participating in planning programs in rural drinking-water supply, by level of participation (3 = High; 2 = Moderate; 1 = Low; 0 = NA)	1
Procedures in law or policy for participation by service users/communities in planning program in rural drinking-water supply, by level of definition in procedures (10 = Clearly defined; 5 = Not clearly defined ; 0 = NA)	1
Users/communities participating in planning programs in water resources planning and management, by level of participation (10 = Clearly defined; 5 = Not clearly defined ; 0 = NA)	1
Procedures in law or policy for participation by service users/communities in planning program in water resources planning and management, by level of definition in procedures (10 = Clearly defined; 5 = Not clearly defined; 0 = NA)	1

[96] National level data.

4.5. Zagreb SDG 6 Table

Table 23 - SDG6 Table for Zagreb

SDG 6 Indicators	Value
6.1.1 - Proportion of population using safely managed drinking water services	
Proportion of population using safely managed drinking water services	99.26%
6.2.1 - Proportion of population using safely managed sanitation service	
Proportion of population using safely managed sanitation services	95.05%
6.3.1 Proportion of domestic and industrial wastewater flows safely treated	
Proportion of safely treated domestic wastewater flows (%)	60%[97]
6.3.2 Proportion of bodies of water with good ambient water quality	
Proportion of river water bodies with good ambient water quality (%) Proportion of open water bodies with good ambient water quality (%) Proportion of groundwater bodies with good ambient water quality (%)	56%[98]
6.4.1 Change in water-use efficiency over time	
Water Use Efficiency (United States dollars per cubic meter)	59[99]
6.4.2 Level of water stress: freshwater withdrawal as a proportion of available freshwater resources	
Level of water stress: freshwater withdrawal as a proportion of available freshwater resources (%)	
6.5.1 Degree of integrated water resources management	90[100]
Enabling environment	97
Institutions and participation	98
Management instruments	84
Financing	80
6.5.2 Proportion of transboundary basin area with an operational arrangement for water cooperation	
Proportion of transboundary aquifers with an operational arrangement for water cooperation (%) Proportion of transboundary river and lake basins with an operational arrangement for water cooperation (%)	100% 100%
Proportion of transboundary basins (river and lake basins and aquifers) with an operational arrangement for water cooperation (%)	100%[101]
6.6.1 Change in the extent of water-related ecosystems over time	-0.1%
Change in quantity of open water bodies (million of cubic meters per annum)	NA
Change in quantity of rivers(million of cubic meters per annum)	NA
Change in quantity of groundwater (million of cubic meters per annum)	NA
Change in Water body extent (permanent) (square kilometers) compared to last 10 or 20 years Change in the extent of rivers (square kilometers) compared to last 10 or 20 years	630[102]
6.a.1 Amount of water- and sanitation-related official development assistance that is part of a government-coordinated spending plan	
Total official development assistance (gross disbursement) for water supply and sanitation, by recipient countries (millions of constant 2018 United States dollars)	NA
6.b.1 Proportion of local administrative units with established and operational policies and procedures for participation of local communities in water and sanitation management	
Communities participating in planning programs in rural drinking-water supply, by level of participation (3 = High; 2 = Moderate; 1 = Low; 0 = NA)	NA
Procedures in law or policy for participation by service users/communities in planning program in rural drinking-water supply, by level of definition in procedures (10 = Clearly defined; 5 = Not clearly defined ; 0 = NA)	NA
Users/communities participating in planning programs in water resources planning and management, by level of participation (10 = Clearly defined; 5 = Not clearly defined ; 0 = NA)	NA
Procedures in law or policy for participation by service users/communities in planning program in water resources planning and management, by level of definition in procedures (10 = Clearly defined; 5 = Not clearly defined ; 0 = NA)	NA

[97]Data available for the Country,2015, SDG 6.3.1, https://sdg6data.org/
[98]Data available for the Country,2020, https://sdg6data.org/
[99]Data available for the Country, 2017, https://sdg6data.org/
[100]Data available for the Country, 2020, https://sdg6data.org/
[101]https://sdg6data.org/country-or-area/Croatia#anchor_6.5.2
[102]https://sdg6data.org/country-or-area/Croatia#anchor_6.6.1

5. Market Needs and Opportunities

5.1. Market Roadmap for Belgrade

5.1.1. Needed competencies/products/services

In the water and wastewater sector, the key objectives of the City of Belgrade are to increase available clean water, reduce water losses and increase the number of connections to the public water supply system, improve water quality overall, upgrade existing WT plants, build WWT plant and relevant communal infrastructure, as well as to rehabilitate and upgrade the existing water supply distribution network and wastewater network.

Improvement of the flood protection of the City is also listed among strategic goals.

More specifically, among many competencies, products, and services that could support the ongoing efforts of the City and its PUC BVK, several are highlighted as follows:

- Repair and expansion of the existing water treatment facilities and supply networks (including regionalization of water supply planned) with the use of associated technologies
- Construction of wastewater treatment plant and relevant wastewater collection network
- Construction of the sludge treatment facilities
- Expansion of the existing sewage networks/use of associated technologies
- Design and manufacture of needed equipment for wastewater treatment
- Building, rehabilitation and/or replacement of the necessary pumping stations and relevant equipment to support water supply and sewer networks
- Manufacture and/or supply of water meters
- Design, manufacture, or supply of equipment for water testing and monitoring
- Design, manufacture, or supply of pipes, valves, filters, etc.
- Exploring the potential of membrane technology use for water treatment plants
- Smart Water and Waste Water Systems for products and services that improve water and wastewater efficiency
    - Automation and control sectors,
    - Smart Water Infrastructure,
    - Design and Engineering Services,
    - ICT, Software and Analytics,
- Flood protection improvements
- Energy Consumption reductions
- Consultancy for feasibility studies, other technical reports
- Institutional capacity building.

5.1.2. Opportunities at City Level.

Serbia signed a Free Trade Agreement with European Free Trade Agreement (EFTA) Countries in 2009 and has a signed agreement with the Eurasian Economic Union (EAEU) since 2019.

Water, sanitation, and wastewater treatment continue to be among the underdeveloped parts of the country's water sector, including its capital city, and the investment needs are high. The number of connections to the public water supply system needs to be further increased with losses reduced; water treatment plants and pipeline network need to be upgraded and expanded; severe problems with industrial water pollution and wastewater management are to be tackled in the near future.

The improvement of these areas is hampered by ongoing economic uncertainty, so the country is looking to foreign companies and governments for the loans and expertise to meet these challenges. Therefore, strong government support and efforts are present to obtain funding for upgrades and modernizations of water networks and water treatment facilities, including the flood protection measures, following the severe flooding in recent years, which damaged the existing water and irrigation infrastructure.

Strategy for restructuring public utility companies (PUC) in Serbia has been drafted in 2011 to gradually transform PUC's, which are the responsibility of local governments into financially sustainable, market-oriented companies that provide high-quality services clients[103].

EBRD's Belgrade Water project is ongoing since 2017 with up to EUR 14.5 million loan to the Public Utility Company Belgrade Waterworks and Sewerage expected in two tranches. The proceeds of Tranche 1 are being used to finance improvements in the water supply system, more specifically for:

i. construction of a dual pipeline for transferring raw water from the Sava River to a water treatment plant;
ii. removal of excess sedimentation from the natural water reservoir; and
iii. construction of a pipeline for transferring water from the water treatment plant to the water supply network.

The proceeds of Tranche 2 would be used for refurbishment of water treatment plan ("WTP") Jezero. Provision of additional EUR 1.5 million to support the Company in financing the full scope of WTP Jezero refurbishment, which has been estimated at EUR 6 million following further due diligence[104].

Belgrade also joined EBRD Green Cities in August 2018 to develop a Green City Action Plan (GCAP) and related green city investments, aiming to take a systematic approach to address its urban environmental challenges, including water, air, and soil issues. The Government of Japan supports Belgrade's GCAP, and at the moment, the draft GCAP is open for public comments.[105] Among its 16 strategic goals, in the water sector, the following is specified:

- S.O.W1 Reduction of the network losses to achieve savings and water reuse
- S.O.W2 Further protection of the city from flood risks
- S.O.W3 Wastewater collection and treatment.

The latest developments in efforts to improve communal infrastructure in Serbia took place in February 2021. Based on the Memorandum of Understanding signed between Serbia and China's governments, a commercial contract for the initial phase is signed with China Machinery Engineering Corporation (CMEC) this Feb (2021)[106].

[103] http://www.misp-serbia.rs/wp-content/uploads/2010/05/Strategy-for-Restructuring-the-PUC-Draft.pdf
[104] https://www.ebrd.com/work-with-us/projects/psd/belgrade-water.html
[105] https://www.beograd.rs/images/file/741ccefb8afef0372f993fee441c847f_9117346413.pdf
[106]https://balkangreenenergynews.com/serbia-inks-eur-3-2-billion-deal-with-chinas-crbc-for-wastewater-projects-landfills/

This 3.2 billion EUR deal enables many municipalities and cities to overcome long-lasting infrastructure issues and is currently the biggest planned investment in the country. According to the statement, the contracts open the way for building wastewater treatment units and pumping stations and sewer networks in 65 municipal units, with 73 projects overall, together with the rehabilitation or the construction of six regional landfills.

Ambitious deadlines are set: the overall projects must be finished within five years from the construction license date[107].

[107] https://www.mgsi.gov.rs/lat/aktuelnosti/momirovic-najznacajniji-projekat-izgradnje-komunalne-infrastrukture-u-srbiji

5.2. Bucharest - City Data

5.2.1. Needed competencies/products/services

The areas where Danish companies can offer their products, services and competencies are related to the city's priorities, which are described in chapter 5.2.2. These competencies cover diverse needs and go in different directions, as the list below highlights them:

- Construction of wastewater treatment facilities/use of associated technologies
- Construction of sewage networks/use of associated technologies
- Design and manufacture of water supply/wastewater treatment equipment
- Water testing and monitoring services
- Design, manufacture or supply of equipment for water testing and monitoring
- Design, manufacture or supply of pipes, valves, filters and pumps
- Smart Water and Waste Water Systems for products and services
- Smart Water and Waste Water Systems for products and services that improve water and wastewater efficiency
    - Automation and control sectors,
    - Smart Water Infrastructure,
    - Design and Engineering Services,
    - ICT, Software and Analytics.
- Energy Consumption
- Digitalisation of all activities within the water company
- Consultancy for feasibility studies, other technical reports

5.2.2. Opportunities at City Level

According to the 2019 water supply and wastewater Masterplan for Bucharest and the 2019 Yearly Report of the Bucharest water operator Apa Nova, the following priorities will be tackled in the next years:

a. Use of underground water

There is no strategic underground source for water supply in Bucharest in case of major surface water pollution. The old wells have not been used in a long time, and they are now at risk of generating pollution to the underground water sources. It is recommended to close those wells and to build 35 new wells in Bucharest for water supply in case of force majeure.

b. Water supply

- Replacement of the chlorination channel at Rosu water plant with an electrochlorination system
- Construction of a closed box/pipe type channel to supply the Arcuda water plant
- Resizing the oversized distribution network
- Replacement of asbestos-cement pipes
- Expansion of the water supply network
- Construction of a pollution alert station on the Dambovita river
- Construction of a new single stage pumping station in the eastern part of the city
- Rehabilitation of water treatment and pumping stations

c. Wastewater

Extension of the wastewater treatment plant at Glina in the Bucharest-Ilfov area is the most urgent priority when it comes to wastewater. The second phase of renovations to the main sewerage collection system running beneath the course of the Dâmbovița river is also being carried out as part of the project.

Under phase two of the project, improvements are to be made to 51 km of main sewerage collection pipes and 30 km of secondary sewerage pipes. Work, which began under phase one, to reduce fluid infiltration levels into the sewerage system and consequent dilution of the sewerage, is to be completed.

Finalisation of the Glina wastewater treatment plant includes upgrades to its sludge treatment facilities, notably through a sludge incinerator's construction.

Streamlining the biogas line at the Glina treatment plant, which will increase the treatment plant's energy autonomy, is also being planned.

The infrastructure covered by the project provides wastewater collection and treatment services for Bucharest and the surrounding localities.

Thanks to work, the area will have a sustainable wastewater collection and treatment system. The quality of effluent flowing into water bodies such as the Dâmbovița and Arges rivers will be improved, as will that of the management of sludge produced during wastewater treatment at the Glina plant. Consequently, the risk of uncontrolled discharge of untreated wastewater will be minimised, with positive effects on underground and surface water's cleanliness.

A total of in excess of EUR 390 million is to be spent on the second phase of the project, of which some EUR 196.5 million is supplied by the EU. EU funding for the first phase amounted to about EUR 6.6 million.

Other wastewater priorities

- Resizing of the network, which is undersized by reference to the technical regulations in force;
- Construction of new collector line/repair of collector lines;
- Construction of retention basins;
- Rehabilitation and extension of the sewerage network;
- Separation of wastewater and rainwater collection systems;
- Promotion of stormwater control solutions at the source.

d. Other priorities

- continuous reduction of the exploitation and use of depletable natural resources (water and energy);
- renewal of meters, the extension of the automatic reading systems;
- deep digitalization of as many activities within Apa Nova, integrating technology in all operational processes and e-learning and training tools.

5.3. İstanbul - City Data

5.3.1. Needed competencies/products/services

Due to the increasing climate and population pressures, Istanbul is expected to have a severe water supply problem. The service continuity is threatened due to the adverse effects of seasonal changes and changing climate (precipitation patterns) on raw water resources.

The city has already been transferring many water resources from the outer region (Melen Basin). ISKI has been investing in the water and waste water infrastructures in the Melen Basin to ensure the quality of the drinking water supplies.

Istanbul is dependent on the surface water resource, and a huge volume of water evaporates annually. Therefore, the application of evaporation reducing products and services may be required soon.

The current water loss rate is still so high (%22.3). There is a lot of to-do for reducing the loss, with more than TRY 200 million investment planned for 2021. The number of smart meters is still deficient (total 14,770 in 2019).

The frequency and magnitude of the heavy rainfall are expected to increase, leading to more flash floods. The improvement of stormwater network and green/blue infrastructures to adapt to climate is still at its first steps. The city needs to decrease the vulnerable population to climatic extremes and prevent physical damages (Most of the damages are covered by the individuals).

In summary, the city has to enhance the climate resilience of its water and waste water infrastructures and relevant systems. Developing demand-side management in water is also an important task to complement with other measures.

Istanbul city is still expanding its residential areas and therefore, new infrastructure investments are always needed. Considering the equipment and network elements' age, there is always a need to renew the existing infrastructure and equipment (For example, the particular amount of electronic and mechanical equipment has completed their life, long-term energy-efficient technologies are needed here as well.).

According to ISKI's strategic report, the below services and products will be on-demand in order to achieve the overall objectives of the water and waste water management sector:

- Development of demand-side management and water efficiency projects/programs
- Construction and maintenance of water and wastewater treatment facilities/use of associated technologies
- Construction and maintenance of water and sewage networks/use of associated technologies
- Rehabilitation of water streams and river basins
- Digitalisation of all services in upstream and downstream
- Increasing the share of renewable energy and investment renewables energy plants
- Consultancy for technical training programs and feasibility studies

5.3.2. Opportunities at City Level.

ISKI has a comparatively sufficient budget for its scheduled investments[108] in its strategic plan. ISKI invests over TRY 3-4 billion annually for water and waste water services.

[108] https://www.iski.istanbul/web/tr-TR/kurumsal/devam-eden-yatirimlar1

Currently, the majority of the investment is spent on network infrastructures, stream rehabilitation works, construction of new plants, pumping stations and equipment.

Treatment Plants

By 2020, there are 21 Water Treatment Plants and 89 of Waste Water Treatment Plants operated by İSKİ. Ozoning system is mainly used in water treatment plans to enable the provision of water with potable standards.

Regarding the waste water treatment technology, the Bosphorus coasts are installed with pre-treatment plants, while biological and advanced biological treatment processes are used for locations along the Marmara Sea. The pre-treatment plants treat around %40 of all treated waste water. A certain amount of waste water treated by advanced biological wastewater treatment plants is used for irrigation purposes in recreational areas and industrial water.

Current water treatment plants are working with overcapacity. There is a need for new water treatment plants.

By 2025, ISKI aims to increase advanced biological treatment level from %40 to 72%. At the same time, reused waste water rate is planned to reach 13% by 2025.

Digitalization of the services

ISKI aims to make the completion rate of digital water and wastewater management 100% by 2022. İSKİ controls the SCADA systems for water and waste water operations. The SCADA controlled activities nearly cover all water supply services, and for the waste water services, its share needs to be increased. In addition to SCADA systems, robotic technologies (camera robots) are employed to repair and maintain maintenance works. The ISKI is planning to invest in Information Technology Infrastructure and smart systems and their maintenance (around TRY 200 million/year).

ISKI aims to increase the use of smart meters. In order to make our subscribers' water consumption more precisely and accurately, defective or over ten years old meters are replaced.

Increasing Renewables in the energy mix

Due to the increase in the determined energy tariffs, İSKİ plans to save on energy costs.

ISKI aims to increase the share of renewable energy in total energy consumption from 0.25 to 6.5% and double the percentage of biogas in total energy consumption (25%).

The majority of the electricity consumed annually belongs to water services (raw water pumping stations and drinking water pumping stations). The electrical energy consumed in 2019 was 1,450,417,551 kWh, while electric consumption cost was TRY 0.75 billion. There are 117 potable water pumping stations with 395.994 kVA installed capacity.

Only 9.5% of the consumed electricity is provided by cogeneration and solar energy plants of ISKI. There is an increasing electrical energy consumption trend and at the same time increasing costs (in terms of TRY) for the last five years. The ISKI aims to increase the share of renewable energy in total energy consumption to 6.52%.

Chemical Use

ISKI uses a relatively large amount of chemicals during the operation of the city water cycle. Therefore, more efficient and sustainable products are always welcomed by the organisation.

5.4. Zagreb - City Data (Same as above)

5.4.1. Needed competencies/products/services

Reconstruction and further development of the water supply and sewerage system (with the support of the EU/investment funds) is needed for the City of Zagreb, encompassing the expansion of the public water supply and public sewerage to the areas not yet connected thereof, as well as the recovery of deteriorated pipelines and ducts in order to control and reduce the water loss, including the reduction of unrecorded/illegal consumption. Needed competencies cover diverse needs, as the list below highlights it:

- (Re)construction and expansion of sewage networks/use of associated technologies
- (Re)construction of water supply networks/use of associated technologies
- Expansion of the wastewater collection network
- Design and manufacture of water supply treatment equipment
- Water testing and monitoring services
- Design, manufacture or supply of equipment for water testing and monitoring
- Design, manufacture or supply of pipes, valves, filters and pumps
- Smart Water and Waste Water Systems for products and services that improve water and wastewater efficiency
    - Automation and control sectors,
    - Smart Water Infrastructure,
    - Design and Engineering Services,
    - ICT, Software and Analytics.
- Energy Consumption
- Digitalisation of all activities within the water company
- Consultancy for feasibility studies, other technical reports
- Institutional capacity building.

5.4.2. Opportunities at City Level.

Several projects are initiated in the City of Zagreb related to the improvement of the water and wastewater services, where potential collaboration opportunities might lie, e.g.:

- since 2018, there is an ongoing project "Water in every household" jointly implemented with the City of Zagreb, Zagreb Holding and ViO, covering the municipalities of Črnomerec, Brezovica, Gornja Dubrava, Maksimir, Novi Zagreb – West, Podsljeme, Podsused Vrapče, Sesvete, Stenjevec i Trešnjevka south. The intensive (re)construction of the water supply network is planned in 2021.
- in 2019 the construction of the Dubravica collector (sections 1 and 3) began, including the construction of two additional collection channels (695 m and 302 m in length). Improvements in the public sewerage system and the drainage network are ongoing, and the efforts will also enable the rehabilitation of the Kostanjek landslide.
- Hrvatske vode (Croatia Waters) also financially supports ViO (HRK 46,614,820 in 2019) for infrastructure projects, i.e. investments in the water supply network (construction of the network and main pipelines, reconstruction and design of the water supply network) and investments in the drainage network (construction and reconstruction, design and construction of collectors and drainage channels).
- Preparation of a feasibility study, environmental impact study and application for the project "*Project Zagreb 2018*" aiming to further improve water and communal infrastructure is submitted for co-financing from EU funds. It is a comprehensive project of upgrading and reconstruction of the water supply and sewerage network of the city of Zagreb and surrounding cities and municipalities. The purpose is to comply with the Urban Wastewater

Treatment Directive and the Water Quality Directive. In the scope of the project, the investments are planned to expand the wastewater collection network, i.e. in the construction of canals and collectors in a total length of about 220 km, and reconstruction of about 50 km. The ultimate goal is to increase the population's connection to the public sewerage system, wastewater treatment and to optimize the system. Within the water supply component, the introduction of the "Zero Zone" is planned, to optimize the costs of operation and maintenance of the system, reduce losses in the system, expanding the distribution network with new connections and users and reconstruction of the existing water supply network, which will result in the reduction of water losses and ensure uninterrupted delivery to end users. The realization of the project is planned with the financial support from the EU Cohesion Fund. The estimated value of the project is around HRK 1.81 billion.

- The development of a conceptual solution for the water supply of the City of Zagreb is launched. The development of a detailed mathematical model of the current and future state of development of the water supply system and a feasibility study is planned. One of the main purposes is the implementation of measures to reduce losses in the water supply system. Realization of this conceptual solution (hydraulic model), should determine the existing state of the system (analysis of existing measurements and implementation of additional measurements (flow and pressure), and calibration and development of hydraulic model of a future state. A new central IT system for managing services and service users and for the development of new digital communication channels is prepared.[109]
- Established Zagreb Urban Agglomeration in 2017, with a surface area of 2,911.3 km^2 and home to 1,086,528 inhabitants, is the largest and most important in the country, modelled on examples from numerous European states. It also supports the mobilization of EU funds more efficiently, e.g., through the Mechanism of Integrated Territorial Investments (ITIs).

[109] https://www.zgh.hr/UserDocsImages/Marketing/DOP/HOLDING%20izvjesce%20o%20odrzivosti%202019.pdf

6. CONCLUSIONS and RECOMMENDATIONS

6.1. Market Map Matrix for each city

	Belgrade	Bucharest	Istanbul	Zagreb
Expansion of the water supply networks				
Expansion of the sewage networks				
Expansion of the existing stormwater collection networks				
Repair and expansion of the existing water treatment facilities				
Repair and expansion of the existing urban WWT facilities				
Construction of new urban WWT and associated infrastructures				
Construction of new industrial waste water treatment plants and associated infrastructures				
Construction of the sludge treatment facilities and associated infrastructures				
Replacement of the existing water supply networks				
Replacement of the existing stormwater collection networks				
Replacement of the existing sewage collection networks				
Building, rehabilitation and/or replacement of the necessary water pumping stations				
Building, rehabilitation and/or replacement of the necessary waste water pumping stations				
Manufacture and/or supply of water meters				
Renewal of meters and extension of the automatic reading systems				
Design, manufacture, or supply of equipment for water treatment, testing and monitoring				
Design and manufacture of equipment for urban WWT, testing and monitoring				
Design and manufacture of equipment for industrial WWT, testing and monitoring				
Design, manufacture, or supply of pipes, valves, filters, etc.				
Membrane technology use for water treatment plants				
Smart Water Systems for products and services that improve water treatment efficiency				
Smart Waste Water Systems for products and services that improve WWT efficiency				
Urban flash flood protection and urban sewage overflows improvements				
Energy consumption reductions and energy efficiency measures				
Digitalisation of all activities within the water company				
SCADA for water operations				
SCADA for waste water operations				
Products and services reuse of waste water				
Consultancy for feasibility studies and other technical reports				
Institutional capacity building for water treatment				
Institutional capacity building for waste water treatment				
Institutional capacity building for access to financing				

High :red Intermediate: orange Low: blue

6.2. Final Remarks and Recommendations

6.2.1. Serbia/Belgrade

Serbia/Belgrade's objectives are to increase available clean water, reduce water losses and increase the number of connections to the public water supply system, improve water quality overall and construct new WT and WWT plants, as well as to upgrade the existing WT ones and the relevant network for water supply and wastewater collection.

At the moment, in the City of Belgrade, 92.7% of its population is having access to BVK services and using safely managed drinking water, while 87% of the population is using safely managed sanitation service. Around 145.5 million m^3 of water per annum is being served, sourced from

surface water (63 %) and groundwater (37 %). The construction of the wastewater treatment plant for the City of Belgrade is finally about to start.

The fundamental reason for the existing problems in the water and wastewater sector in Serbia/Belgrade is a wide gap between financial demand and actual investment in this area. However, there are some indications that the situation is about to change, such as the existing *EBRD loan No.46465 "Belgrade Water"* to BVK, and the newly signed contract with the Chinese company CMEC opening the way for building wastewater treatment units, pumping stations and sewer networks in 65 municipal units in Serbia, with 73 projects overall.

In addition, reducing water losses and self-financing in the area of water management based on economic service rates, i.e. price and fees, are among key issues for future water resources management. According to the plans, Belgrade's future wastewater treatment plant in Velika Selo will cover an area of 1.5 million inhabitants. When put into operation, it will reduce the direct sewage influx into the Danube and Sava by about 80%.[110]

Recommendations to investors

Enabling environment for development is present in the country, as Serbia's environmental policies and legal framework are strongly influenced by the EU accession negotiations. Therefore, Serbia needs to accelerate the process of finalization of the harmonization with EU water directives and, together with the investors' involvement, further develop: knowledge and skills, economic governance and water sector funding, build the adequate capacity of the administration, operators and service providers.

Furthermore, as a series of capital projects are planned or need to be prepared and implemented[111], along with the maintenance and upgrade of the water and wastewater services, all represent solid investment opportunities.

Belgrade also joined EBRD Green Cities in August 2018 to develop a Green City Action Plan (since Jan 2021 in the public consultation process; supported by The Government of Japan) and related green city investments.

6.2.2. Romania/Bucharest

Romania successfully transposed all the EU water legislation but has problems with its implementation. The degree of the population connected to water supply and wastewater networks are areas that are lagging behind, especially in the rural areas.

Another especially problematic area is the wastewater treatment: in 2020, 188 large agglomerations still did not conform with the urban wastewater collection obligations under EU law, while 192 large agglomerations did not comply with secondary treatment obligations and 193 large agglomerations with the strictest treatment. For this reason, the EU has started an infringement procedure against Romania, which is still on the role.

The water operator in Bucharest is the "Apa Nova" company, controlled by the French group Veolia Water (73,69%), the Apa Nova Employees Association (10%) and by the Bucharest Municipality Council (16,31%). Apa Nova manages the water and sewerage system, water treatment and distribution to consumers, wastewater and stormwater discharge from Bucharest, according to the Concession Agreement, which was renewed in 2020 for another 12 years, until 2037.

In 2019, Apa Nova served 135307 customers in Bucharest, covering 97.2% of the Bucharest population in terms of connectivity to water supply and wastewater networks.

[110]https://serbia-business.eu/belgrade-is-getting-wastewater-treatment-plant-signing-contract-with-chinese-company-cmec/
[111]https://waterquality.danube-region.eu/wp-content/uploads/sites/13/sites/13/2019/09/04_Serbian-Water-Management-Strategy-1.pdf

Apa Nova supplied approx. 123 million m3 of water and collected approx. 163 million m3 of wastewater in 2017. The wastewater can treat 100% of the wastewater mechanically on a dry weather flow. Only 60% is of the wastewater is biologically treated.

The company's energy consumption is still significant, but it managed to decrease it by 79% compared to 2000.

In the last 20 years since Apa Nova became the water operator for Bucharest, it invested more than 500 million EUR. In 2020, Apa Nova undertook to make investments of 367 million EUR and not to increase the tariff paid by Bucharest residents for water and sewer.

Recommendations to investors

Given the high range of water-related priorities in Bucharest, there is also a high range of competencies, products and services that will be sought after:

- The expansion of the water supply and wastewater network will be one of Apa Nova's focus areas.
- Extension of the wastewater treatment plant at Glina in the Bucharest-Ilfov area is the most urgent priority. The second phase of renovations to the main sewerage collection system running beneath the course of the Dâmbovița river is also being carried out as part of the project. Similarly, there is plan to replacement of the chlorination channel at Rosu water plant with an electrochlorination system.
- The resizing of the oversized water supply distribution network and the undersized wastewater network will be the main investment areas and separation of wastewater and rainwater collection systems.
- Deep digitalization is also promising, as many activities within Apa Nova, with the help of integrating technology in all operational processes, will be equipped with the use of associated technologies.

6.2.3. Turkey/İstanbul

ISKI has been working try to meet the ever-increasing drinking water demand (as a result of population increase and geographical expansion of service areas) from a long range of water basins extending from Tekirdağ on the European side to Düzce on the Asian side.

The city aims to integrate climate adaptation and mitigation in its water cycle. Financial support and technical consultancy will be needed in the more sustainable stream rehabilitation projects and use of nature-based solutions.

Recommendations to investors

The investors will be need to bring their supporting financial resources (IFIs and IOs) for large-scale master programs and investment activities. The administrative and technical capacity of Municipal Utility, ISKI is relatively high.

Due to the national economy's deteriorating conditions, the city and its residents are losing their purchasing capacity, particularly residents who have a limited expenditure budget. The investor should take into consideration of efficient but less expensive solutions.

6.2.4. Zagreb, Croatia

As an EU member since 2013, Croatia is committed to implementing the EU water directives by 2023. Based on the EC's Environmental Implementation Review 2019, Croatia will need to step up efforts if it is to meet the deadlines set out in its Accession Treaty related to water quality.[112]

Needed investments to extend and upgrade existing aging water supply and sanitation infrastructure are substantial: total estimated investments in water utility infrastructure projects

[112] http://ec.europa.eu/environment/eir/pdf/report_hr_en.pdf

until 2023 amounts to EUR 3.8 billion, out of which 23% are investments in public water supply, and 77% in public sewer system and waste water treatment.

General sources of funding for the period until 2023 include 65% EU funds, 13% State Budget, 13% Croatian Waters, and 9% public providers of water services. An issue can also be the low percentage of disbursement of available funds. In spite of the large amount of investment available, a bottleneck around the technical capacity persists to sustain and implement these investments. Some gaps remain in administration, project preparation and implementation, capacity of local utilities to access finance, therefore increasing local capacity is beneficial.

In the City of Zagreb, Vodoopskrba i odvodnja – ViO is operating the city's water supply and sewerage system, serving over 900,000 inhabitants (Zagreb's metropolitan area and two neighbouring towns). 99.26% of population of the city is served by public water supply and 95.05% of population is connected to the sewerage network.

Biological waste water treatment plant of the city of Zagreb is in operation since 2004, having an operational capacity of 1.2 m PE. Zagreb wastewater treatment Company (Zagrebačke otpadne vode – ZOV) is responsible for operation of the Central wastewater treatment plant Zagreb and related infrastructure. ZOV is owned by a consortium consisting of WTE Wassertechnik GmbH from Essen (48.5%), innogy Aqua GmbH from Mülheim (48.5%) and city company Vodoprivreda Zagreb d.d. (3%), based on a concession agreement valid until 2028.

Historically, the country was focused on affordable water for all, instead of the sector's efficiency. There are still high rates of nonrevenue water due to water leakage, reflecting the fact that the physical conditions of the water distribution networks are poor and require significant investments in rehabilitation. Finally, Croatia is hit regularly by flooding incidents, thus flood management investment needs are high.

Water service costs are currently fully recovered through tariffs. Full alignment with EU acquis will likely require substantial tariff increases and affordability remains an issue for poor households.

Recommendations to investors

Due to the lack of investments and a negative trend in the past 30 years, water losses in the public water supply system are an urgent problem. It results from poor compliance and enforcement, aging of the system, and unrecorded water consumption. Losses are planned to be reduced through the rehabilitation of the system, valve chambers, as well as by reconstructing water supply pipelines.

Short-term plans include the rehabilitation of supply pipelines, chambers, change of equipment at pumping stations. Medium-term plans cover the rehabilitation of the main pipelines, construction of new reservoir space (system stability), and rehabilitation of pumping stations. Finally, a change of water supply system concept through the reduction of high pressures in the system is indicated as a long term plan.[113]

The latest reporting by WHO and UNICEF indicates that substantial improvements are needed in water sanitation. While flood management investment needs are very high, the financing challenge can be considered less pressing than for water supply and sanitation.[114]

Although the investment opportunities for Zagreb/Croatia are available, the technical capacity in obtaining and implementing those investments can represent a bottleneck. Increasing local capacity is beneficial to bridge the gaps in the administration, project preparation, and implementation.

[113] https://www.zgh.hr/UserDocsImages/Marketing/DOP/HOLDING%20izvjesce%20o%20odrzivosti%202019.pdf
[114] https://www.oecd.org/environment/resources/financing-water-supply-sanitation-and-flood-protection-croatia-workshop.pdf

7. ANNEXES

Annex 1 Fact Sheet for Belgrade

Annex 2 Fact Sheet for Bucharest

Annex 3 Fact Sheet for Istanbul

Annex 4 Fact Sheet for Zagreb

Annex 1 - Fact Sheet for Belgrade

Water Treatment Plants and their technologies

Name	Start of Operation Date	Capacity (2019)
WTP Banovo Brdo		36 mil m^3/year
WTP Bele Vode	1937	14 mil m^3/year
WTP Bezanija		35 mil m^3/year
WTP Makis *consisting of 2 plants: WTP Makis I and WTP Jezero	1892 established 1987 applied state-of-the-art technology (upgraded in 2015)	105 mil m^3/year
WTP Vinca	1931	2 mil m^3/year

In the City of Belgrade, there are five water treatment plants in operation, all operated by the BVK Public utility. WTP Makis is the largest water treatment plant. At Makis WTP a state of the art water treatment technology is applied. In addition to sand filtration and final disinfection with chlorine, ozonation and water filtration with activated carbon filters are being utilized.

At WTP Banovo Brdo, Bezanija and partly WTP BeleVode, groundwater is being treated. The following technologies are applied: aeration, retention, filtration and chlorination. The other part of WTP BeleVode, WTP Makis and WTP Vinca, all treat surface water.

Waste Water Treatment Plants and their technologies

At the moment, Waste Water Treatment Plant in Belgrade is in the planning phase. According to the plans, the Belgrade's future wastewater treatment plant in Velika Selo will cover an area of 1.5 million inhabitants and, when put into operation, will reduce the direct sewage influx into the Danube and Sava by about 80%.[115]

[115]https://serbia-business.eu/belgrade-is-getting-wastewater-treatment-plant-signing-contract-with-chinese-company-cmec/

Annex 2 - Fact Sheet for Bucharest

Water Treatment Plants and their technologies

Name	Start of Operation Date	Capacity (2019)
Rosu	1970	520.000 m3/day
Arcuda	1892	650.000 m3/day
Crivina	2006	260.000 m3/zi

All water plants in Bucharest treat surface water. Rosu and Arcuda's water treatment technologies include sand filtration and final disinfection with chlorine, water filtration with activated carbon filters. In addition, ozonation is applied in Crivina water plant.

Waste Water Treatment Plants and their technologies

The Treatment Plant cleans household wastewater, storm water and pre-treated industrial water coming from the urban agglomeration. The water line contains the following stages:

- Mechanical treatment by coarse and fine screens, grit removal channels and primary settlement tanks.
- The biological treatment involves the insurance of the nitrification/denitrification conditions of the mixture of primary effluent with activated sludge, recycled and regenerated in sequential aeration/mixing cycles and the final settlement of the effluent. In the biological stage, the phosphorus removal also takes place, both biologically and chemically.

The sludge line contains the following stages: The concentration of the sludge by thickening, anaerobic digestion and the digested sludge dewatering.

The gas reuse facility

Following the digestion process, biogas is produced, which is stored in two gasholders (30), 3000 m' each, and then it is purified and dried at the desulphurization unit for further use. At the cogeneration plant (27), there are two gas motors in operation, 2 MWh each, which produce electricity and heat.

Extension of the waste water treatment plant at Glina in the Bucharest-Ilfov area is underway with EU support. The enlargement and improvement of the WWTP is carried out while the current installations continue to operate. The work includes reforming the biological reaction lines, adapting 48 secondary clarifiers, building 24 new ones and the reconversion of the sludge line.

There are works for building a plant for the re-use of the sludge from the WWTP with a treatment capacity of 173 tonnes of dry material daily. This plant will significantly reduce the total volume of sludge produced in the WWTP, using incineration technology and a process for recovering the energy generated as part of the electricity consumed in the process.

Name	Start of Operation Date	Treatment Type	Capacity (m3/year)	Discharge (m3/year)
Glina Waste Water Treatment Plant	2011 – phase 1	Mechanical, biological	315 million m3/year	160 million m3/year mechanical treatment 96 million m3/year biological and tertiary treatment

Annex 3 - Fact Sheet for İstanbul

Water Treatment Plants[116]

Name		Year Opened	Capacity (m3/day)
Ömerli Potable Water Treatment Plant	Orhaniye Potable Water Treatment Plant	1977	1.550.000
	Muradiye Potable Water T.P.	1995	
	Osmaniye Potable Water T.P.	1997	
	Yavuz S. Selim WTP	2001	
Cumhuriyet Potable Water Treatment Plant		2012	720.000
Kağıthane Potable Water Treatment Plant	Çelebi M. Han Potable WTP	1972	728.000
	Yıldırım B. Han Potable WTP	1956	
Elmalı Potable Water Treatment Plant		1994	50.000
İkitelli Potable Water Treatment Plant	Fatih Sultan Mehmet WTP	1998	800.000
	2. Beyazıt Potable WTP	2004	
Taşoluk Potable Water Treatment Plant		2007	50.000
Şile Potable Water Treatment Plant		1994	11.000
Esenceli Potable Water Treatment Plant		2017	260
Ağva Potable Water Treatment Plant		2008	17.000
Bıçkıdere Potable Water Treatment Plant		2009	4.320
Hacı Osman Potable Water Treatment Plant		1975	6.000
Büyükçekmece Potable Water T.P.		1989	400.000
Yalıköy Potable Water Treatment Plant		2010	8.640
Danamandra Potable Water Treatment Plant		2003	12.000
İhsaniye Potable Water Treatment		2018	11.00
Hallaçlı Potable Water Treatment		2018	22.00
Total			**4.390.000**

[116] https://www.iski.istanbul/web/tr-TR/kurumsal/iski-hakkinda1/aritma-tesisleri11/atik-su-aritma-tesisleri3

Waste Water Treatment Plants and their technologies [117]

Name	Start of Operation Date	Treatment Type	Capacity (m3/year)
Ambarlı Ww. Advanced Biological Treatment Plant	2012	Biological Treatment	400.000
Ataköy Ww. Advanced Biological Treatment Plant	2010	Advanced Biological Treatment Plant	600.000
Arnavutköy Ww. Advanced Biological Treatment Plant	2000	Advanced Biological Treatment Plant	1.730
Çanta Advanced Biological Ww. Treatment Plant	2016	Advanced Biological Treatment Plant	52.000
Silivri Advanced Biological Ww. Treatment Plant	2016	Advanced Biological Treatment Plant	36.500
B.Çekmece Advanced Biological Ww. Treatment Plant	2016	Advanced Biological Treatment Plant	132.500
Selimpaşa Advanced Biological Ww. Treatment Plant	2016	Advanced Biological Treatment Plant	70.000
Silivri Gümüşkaya Biological Ww. Treatment Plant	2007	Biological Treatment	3.300
Çatalca Akalan Wastewater Biological Treatment Plant	2008	Biological Treatment	400
Çatalca Belgrat Wastewater Biological Treatment Plant	2008	Biological Treatment	120
Çatalca Kestanelik Wastewater Biological Treatment Plant	2010	Biological Treatment	500
Çatalca Örcünlü Wastewater Biological Treatment Plant	2010	Biological Treatment	250
Çatalca Yazlık Biological Treatment Plant	2012	Biological Treatment	250
Çatalca Subaşı Wastewater Biological Treatment Plant	2012	Biological Treatment	500
Çatalca Çanakça Wastewater Biological Treatment Plant	2010	Biological Treatment	500
Çatalca İzzettin Wastewater Biological Treatment Plant	2010	Biological Treatment	500
Çatalca Oklalı Biological Treatment Plant	2011	Biological Treatment	500
Arnavutköy Boyalık Biological Treatment Plant	2011	Biological Treatment	250
Çatalca İhsaniye Wastewater Biological Treatment Plant	2011	Biological Treatment	500
Çatalca Başakköy Wastewater Biological Treatment Plant	2010	Biological Treatment	250
SilivriBeyciler Biological Ww. Treatment Plant	2013	Biological Treatment	1.000
Çatalca Binkılıç Wastewater Biological Treatment Plant	2014	Biological Treatment	1.000
Çatalca Çiftlik Wastewater Biological Treatment Plant	2014	Biological Treatment	1.000
Arnavutköy Karaburun Biological Treatment Plant	2014	Biological Treatment	2.000
Çatalca Karaca Wastewater Biological Treatment Plant	2014	Biological Treatment	1.000
Çatalca Yalı Wastewater Biological Treatment Plant	2014	Biological Treatment	1.000

[117] https://www.iski.istanbul/web/tr-TR/kurumsal/iski-hakkinda1/aritma-tesisleri11/atik-su-aritma-tesisleri3

Name	Start of Operation Date	Treatment Type	Capacity (m3/year)
Silivri Değirmenköy Biological Ww. Treatment Plant	2014	Biological Treatment	2.000
Silivri Sayalar Biological Ww. Treatment Plant	2014	Biological Treatment	500
Silivri Çayırdere Biological Ww. Treatment Plant	2014	Biological Treatment	500
Çatalca Hallaçlı Biological Treatment Plant	2014	Biological Treatment	500
Silivri Büyükçavuşlu Biological Ww. Treatment Plant	2018	Biological Treatment	1.000
Silivri Kadıköy Biological Ww. Treatment Plant	2018	Biological Treatment	800
Silivri Danamandıra Biological Ww. Treatment Plant	2014	Biological Treatment	500
Çatalca Aydınlar Biological Treatment Plant	2014	Biological Treatment	500
Çatalca Gümüşpınar Biological Treatment Plant	2014	Biological Treatment	500
Çatalca Karamandere Wastewater Biological Treatment Plant	2014	Biological Treatment	500
Sarıyer Zekeriyaköy Biological Ww. Treatment Plant	2016	Biological Treatment	4.000
Çatalca Çakıl Wastewater Biological Treatment Plant	2016	Biological Treatment	1.000
Çatalca İnceğiz Wastewater Biological Treatment Plant	2016	Biological Treatment	1.000
Arnavutköy Dursunköy Biological Treatment Plant	2016	Biological Treatment	500
Çatalca Dağyenice Biological Ww. Treatment Plant	2016	Biological Treatment	500
Çatalca Hisarbeyli Biological Treatment Plant	2016	Biological Treatment	500
Çatalca Örencik Biological Treatment Plant	2016	Biological Treatment	500
Çatalca Gökçeali Biological Treatment Plant	2016	Biological Treatment	500
Çatalca Elbasan Biological Treatment Plant	2016	Biological Treatment	500
Çatalca Ovayenice Wastewater Biological Treatment Plant	2016	Biological Treatment	500
Çatalca Ormanlı Wastewater Biological Treatment Plant	2020	Biological Treatment	250
Arnavutköy Yassıören Biological Treatment Plant	2018	Biological Treatment	250
ArnavutköyBaklalı Biological Treatment Plant	2018	Biological Treatment	250
Silivri Akören Biological Ww. Treatment Plant	2016	Biological Treatment	500
Silivri Cezaevi Biological Ww. Treatment Plant	2018	Biological Treatment	6.000
Eyüpsultan Akpınar Biological Ww. Treatment Plant	2018	Biological Treatment	250
Yenikapı Wastewater Pretreatment Plant	1988	Pretreatment	864.000

Name	Start of Operation Date	Treatment Type	Capacity (m3/year)
Baltalimanı Wastewater Pretreatment Plant	1997	Pretreatment	625.000
Küçükçekmece Wastewater Pretreatment Plant	2003	Pretreatment	354.000
Terkos Ww. Advanced Biological Ww. Treatment Plant	2000	Advanced Biological Treatment Plant	1.730
Tuzla Advanced Biological Ww. Treatment Plant	1998	Advanced Biological Treatment Plant	1.730
Paşaköy Ww. Advanced Biological Treatment Plant	2000	Advanced Biological Treatment Plant	1.730
Şile Geredeli Village Biological Ww. Treatment Plant	2013	Biological Treatment	250
Şile Kabakoz Village Biological Ww. Treatment Plant	2013	Biological Treatment	250
Şile Sofular Village Biological Ww. Treatment Plant	2013	Biological Treatment	250
Şile Alacalı Village Biological Ww. Treatment Plant	2013	Biological Treatment	250
Şile Doğancalı Village Biological Ww. Treatment Plant	2013	Biological Treatment	500
Şile Kurnaköy Village Biological Ww. Treatment Plant	2013	Biological Treatment	250
Beykoz Cumhuriyet Village Biological Ww. Treatment Plant	2013	Biological Treatment	500
Şile Üvezli Village Biological Ww. Treatment Plant	2013	Biological Treatment	250
Şile Satmazlı Village Biological Ww. Treatment Plant	2013	Biological Treatment	500
Şile Şuayipli Village Biological Ww. Treatment Plant	2013	Biological Treatment	250
Şile Değirmençayırı Village Biological Ww. Treatment Plant	2013	Biological Treatment	250
Çekmeköy Ömerli Biological Treatment Plant	2008	Biological Treatment	500
Şile Ağva Advanced Biological Ww. Treatment Plant	2010	Advanced Biological Treatment Plant	8.000
Şile Kömürlük Village Biological Ww. Treatment Plant	2008	Biological Treatment	125
Şile Sahilköy Village Biological Ww. Treatment Plant	2011	Biological Treatment	500
Şile İmrenli Village Biological Ww. Treatment Plant	2012	Biological Treatment	250
Şile Karakiraz Village Biological Ww. Treatment Plant	2012	Biological Treatment	250
Çekmeköy Koçullu Biological Treatment Plant	2012	Biological Treatment	500
Şile Kervansaray Biological Ww. Treatment Plant	2012	Biological Treatment	500
Şile Yeniköy Biological pack Wastewater Treatment Plant	2008	Biological Treatment	200
Beykoz Öğümce Biological pack Wastewater Treatment Plant	2010	Biological pack Wastewater Treatment	200
Şile Oruçoğlu Artificial Wetland Treatment Plant	2009	Wetland Treatment	125
Çekmeköy Hüseyinli Biological Treatment Plant	2013	Biological Treatment	2.000

Name	Start of Operation Date	Treatment Type	Capacity (m3/year)
Çekmeköy Reşadiye Village Biological Treatment Plant	2013	Biological Treatment	2.000
Beykoz PoyrazKöy Biological pack Wastewater Treatment Plant	2017	Biological pack Wastewater Treatment	250
Küçüksu Wastewater Pretreatment Plant	2004	Pretreatment	640.000
Şile Kumbaba Wastewater Pretreatment Plant	2008	Pretreatment	46.000
Kadıköy Wastewater Pretreatment Plant	2003	Pretreatment	833.000
Üsküdar Wastewater Pretreatment Plant	1992	Pretreatment	77.760
Paşabahçe Wastewater Pretreatment Plant	2009	Pretreatment	575.000
Sırapınar Biological pack Wastewater Treatment Plant	2021	Biological pack Wastewater Treatment	1000

Annex 4 - Fact Sheet for Zagreb

Water Treatment Plants and their technologies

Name	Capacity (2019)
Slapnica-Lipovac	2,179,865 m^3
Mala Mlaka	112,316,425 m^3
Petruševec	
Strmec	
Sašnak	
Zaprude	
Žitnjak	

WTP Slapnica-Lipovac is processing surface water, while groundwater is sourced at Mala Mlaka, Petruševec, Strmec, Sašnak, Zaprude and Žitnjak. [118]

Waste Water Treatment Plants and their technologies

Name	Start of Operation Date	Treatment Type	Capacity (m3/year)	Discharge (m3/year)	Total Electricity use
Central WWTP	2004	Biological with sludge fermentation	Average m^3/d 488,160 1.2 million PE	174,589,224[119]	

The biological waste water treatment plant of the city of Zagreb successfully started the operation in 2004 (1st stage, mechanical). By September 2007, the completion of the plant was spurred on by successive implementation of single biological stages (25–50–75–100 %). The plant was completed while under full operation of the respective stages.

Besides the biological technology for water treatment, the plant provides sludge fermentation for the purpose of biogas generation and a combined heat and power station for the generation of electricity to minimise energy costs and residual materials. The scope of performance comprised – beside the central treatment plant for 1.2 million inhabitants, involving an extension design to 1.5 million inhabitants, if required – the alteration and upgrading of the old town sewer, being several miles long, the construction of the new town sewer of double the length, as well as the connection of the sewage plant to the infrastructure by means of road and bridge construction.[120]

[118] https://www.zgh.hr/UserDocsImages/Marketing/DOP/HOLDING%20izvjesce%20o%20odrzivosti%202019.pdf
[119] as above
[120] https://www.wte.de/WTE/Referenzen/Ausgewahlte-Projekte/Zentralklaranlage-Zagreb.aspx?lang=en-US

8. REFERENCES

- Belgrade Waterworks and Sewerage, **2020**, *Annual Report 2019*. https://www.bvk.rs/wp-content/uploads/2020/09/Izvestaj-o-poslovanju-Odluka-NO-min_2019.pdf
- D. Dimkić, M. Milovanović, M. Dimkić, S. Milojković, **2020,** *Current and Economic Price of Water in Serbia*, Environ. Sci. Proc. 2020, 2, 45, https://www.mdpi.com/2673-4931/2/1/45
- Japan International Cooperation Agency, **2013**, *Preparatory survey report on the sewerage system improvement project for the city of Belgrade in Republic of Serbia*, The City of Belgrade, Belgrade Land Development Public Agency, Belgrade Waterworks and Sewerage
- https://openjicareport.jica.go.jp/pdf/12120606.pdf
- *National Strategy for Water Management in the Republic of Serbia up to 2034*, **2017**, Of. Gaz. of the RS, 3/2017. Available online: http://www.rdvode.gov.rs/doc/Strategija_FINAL.pdf
- National Strategy for Restructuring the Public Utility Companies, Draft, **2011**, http://www.misp-serbia.rs/wp-content/uploads/2010/05/Strategy-for-Restructuring-the-PUC-Draft.pdf
- Republic of Serbia, **2019**, Statistical Office of the Republic of Serbia, Eco-bulletin 2018, Belgrade 2019, https://publikacije.stat.gov.rs/G2019/Pdf/G20195651.pdf
- The City of Belgrade, *Draft Action Plan for the Green City,* **2021**, Mott MacDonald Limited, EBRD and Government of Japan, https://www.beograd.rs/images/file/741ccefb8afef0372f993fee441c847f_9117346413.pdf
- UN-Water SDG6 Data Portal, SDG6data.org, last accessed on the 17th of February 2021
- International Bank for Reconstruction and Development / The World Bank, *Water and wastewater services in the Danube region - A state of the sector 2018 update*, **2019**, https://sos2018.danubis.org/
- Coalition 27, *Walking in the Mist - Shadow Report on Chapter 27*, **2020,** https://rs.boell.org/en/2020/10/08/walking-mist-coalition-27-shadow-report-2020
- Ministry of the Environmental Protection/Environmental Protection Agency, ENVIRONMENT IN SERBIA: 2004 – 2019 | Extended summary, **2019,** www.sepa.gov.rs/download/ENG_FIN_JubilarnaPublikacija.pdf
- Romanian National Environmental Protection Agency, 2020 – Report regarding state of Environment in 2019, last accessed on the 25th of January 2021 at http://www-old.anpm.ro/upload/150386_ANPM-PC_RSM%202019.pdf
- European Commission, 2019 - The Environmental Implementation Review 2019 Country Report Romania, last accessed on the 25th of January 2021 at https://ec.europa.eu/environment/eir/pdf/report_ro_en.pdf
- Romanian Ministry of Environment, 2012 – Calitateaapei, last accessed on the 25th of January 2021 at http://www.mmediu.ro/beta/wp-content/uploads/2012/05/2012-05-14_directive_ue_calitateaapei.pdf
- Romanian National Institute of Statistics, 2020 - Distribuțiaapeişievacuareaapeloruzate, înanul 2019, last accessed on the 25th of January 2021 at https://insse.ro/cms/sites/default/files/field/publicatii/distributia_apei_si_evacuarea_apelor_uzate_in_anul_2019_0.pdf
- Transelectrica, 2019 - Planul de Dezvoltare a RET perioada 2018 – 2027, last accessed on the 25th of January 2021 at https://www.transelectrica.ro/documents/10179/9406678/completare+Plan+Dezvoltare+2018-2027_Septembrie_clean_final_CTES_CCh_DB_clean.pdf/b4084b29-9a71-41c8-92ea-c70da0d5db2e
- WorldData.info - Energy Consumption in Romania, last accessed on the 25th of January 2021 at https://www.worlddata.info/europe/romania/energy-consumption.php
- UN Water https://www.sdg6data.org/country-or-area/Romania, last accessed on the 29th of January 2021
- Apa Nova Bucuresti – Raport Anual Contractual 2019

- Master Planul Serviciului de Alimentare cu Apă si Canalizare pentru municipiul Bucuresti, 2019
- Romanian Ministry of Environment, 2018 – Transformation towards a sustainable and resilient Romania. Romania's Voluntary National Review 2018
- World Bank Group 2018 - Romania Water Diagnostic Report
- Romanian National Environmental Protection Agency, 2020 – Raport Privind starea Mediului
- Regional Statistical Division of Bucharest Municipality, 2020 – Anuarul Statistic al Regiunii Bucureşti – Ilfov 2019
- Rodica-Mihaela Frîncu, 2020 – Evoluția principalilor parametri fizico-chimici de calitate a apei din Dunăre pe teritoriul României în perioada 1996-2017; Universitatea Tehnică Bucuresti
- Arcadis, 2017 – Bucharest Glina WWTP Phase 2, non-technical summary
- Arges Vedea River Basin Administration, 2014 – Fise de Gospodărirea Apelor, Bucuresti si Judetul Ilfov
- Arges Vedea River Basin Administration, 2016 – Planul de Management Actualizat al Spatiului Hidrografic Arges Vedea
- Environmental Protection Agency Bucharest, 2020 – Raport anual privind starea mediului în Bucuresti în 2019
- Bucharest Local Council Decision no. 339/2009 which regulates Public Services and approves the statute, the chart the number of employees, salaries of these Public Insitutions
- European Environmental Agency, https://www.eea.europa.eu/data-and-maps/indicators/use-of-freshwater-resources-3/assessment-4
- https://lege5.ro/Firma/apa-nova-bucuresti-sa-12276949, last accessed on the 29th of January 2021
- https://bucuresti.insse.ro/despre-bucuresti/, last accessed on the 29th of January 2021
- https://www.zf.ro/eveniment/pib-ul-bucurestiului-a-crescut-de-patru-ori-in-ultimii-15-ani-pib-pe-cap-de-locuitor-s-a-triplat-insa-acum-incepe-sa-piarda-din-viteza-18700617, last accessed on the 29th of January 2021
- https://www.mediafax.ro/economic/cum-a-ajuns-ghimbav-nr-1-in-romania-peste-bucuresti-si-cluj-in-clasamentul-bogatiei-topul-oraselor-dupa-pib-ul-per-cap-de-locuitor-19131941, last accessed on the 29th of January 2021
- https://www.zf.ro/eveniment/apa-nova-anul-trecut-un-bucurestean-consuma-in-medie-145-de-litri-de-apa-pe-zi-media-europeana-este-de-120-de-litri-de-apa-pe-zi-17503057, last accessed on the 29th of January 2021
- https://www.apanovabucuresti.ro/despre-noi, last accessed on the 29th of January 2021
- https://www.profit.ro/povesti-cu-profit/energie/apa-nova-finalizarea-statiei-epurare-apelor-uzate-glina-unul-dintre-cele-ample-proiecte-ecologizare-dezvoltat-nivelul-europei-acest-moment-realiza-epurarea-integrala-apelor-uzate-deversate-19408600, last accessed on the 29th of January 2021
- https://www.news.ro/social/reportaj-circuitul-apei-din-dambovita-si-arges-pana-in-casele-bucurestenilor-35-de-kilometri-si-sase-tipuri-de-operatiuni-de-la-statia-crivina-la-robinet-19224000200020190209189089 56, last accessed on the 29th of January 2021
- https://www.green-report.ro/adevarul-cum-ajunge-apa-din-raul-arges-buna-de-baut-pentru-bucuresteni/, last accessed on the 29th of January 2021
- https://www.profit.ro/povesti-cu-profit/energie/apa-nova-si-a-majorat-profitul-pentru-al-doilea-an-consecutiv-si-s-a-apropiat-de-recordul-all-times-19000341, last accessed on the 29th of January 2021
- https://ec.europa.eu/regional_policy/en/projects/Romania/cleaner-waste-water-collection-and-treatment-in-bucharest-ilfov, last accessed on the 29th of January 2021
- https://sdg6data.org last accessed on the 29th of January 2021

- Observatorio de los ServiciosPúblicos, ERL-Universidad Complutense de Madrid, 2005 – Watertime Bucharest http://www.watertime.net/docs/WP2/D15_Bucharest.doc, last accessed on February 13th
- https://www.infoquick.ro/verificare-firme/apa-nova-bucuresti-sa-12276949last accessed on February 13th
- https://www.hotnews.ro/stiri-administratie_locala-24174370-primaria-capitalei-prelungi-contractul-concesiune-apa-nova-inca-12-ani-pana-2037-ciceala-decizia-ridica-serioase-semne-intrebare.htm last accessed on February 15th
- https://www.profit.ro/povesti-cu-profit/energie/apa-nova-si-a-majorat-profitul-pentru-al-doilea-an-consecutiv-si-s-a-apropiat-de-recordul-all-times-19000341 last accessed on February 26th
- https://www.profit.ro/povesti-cu-profit/energie/apa-nova-si-a-majorat-profitul-pentru-al-doilea-an-consecutiv-si-s-a-apropiat-de-recordul-all-times-19000341 last accessed on February 26th
- https://www.apanovabucuresti.ro/apa-ta/proiecte.php last accessed on February 26th
- https://www.apanovabucuresti.ro/despre-noi/vezi-media/media/semnarea-contractului-de-concesiune last accessed on February 26th
- https://www.geopolitic.ro/2018/11/dezvoltarea-si-evolutia-orasului-bucuresti-conditionata-si-favorizata-de-amenajarea-resurselor-de-apa-din-zona/ last accessed on March 18th
- https://www.news.ro/social/reportaj-circuitul-apei-din-dambovita-si-arges-pana-in-casele-bucurestenilor-35-de-kilometri-si-sase-tipuri-de-operatiuni-de-la-statia-crivina-la-robinet-19224000200020190209189089 56, last accessed on March 18th Glina Waste Water Treatment Plant https://www.veolia.ro/sites/g/files/dvc2956/files/document/2015/04/Pliant_Glina_eng.pdf last accessed on March 23rd
- https://energyindustryreview.com/construction/fcc-group-to-modernise-the-glina-wastewater-treatment-plant/, last accessed on March 23rd
- Croatia – Country report, Financing Compliance towards EU Water *Acquis* Workshop, OECD, **2019,** https://www.oecd.org/environment/resources/financing-water-supply-sanitation-and-flood-protection-croatia-workshop.pdf
- Water and Wastewater Services in the Danube Region, Croatia Country Note, Danube Water Program (DWP), **2015**, http://sos.danubis.org/files/File/country_notes_pdf/SoS_Croatia.pdf
- European Commission, *EU Environmental Implementation Review Country Report – Croatia*, **2019**, http://ec.europa.eu/environment/eir/pdf/report_hr_en.pdf
- Nakić et al, *Conceptual model for groundwater status and risk assessment – case study of the Zagreb aquifer system*, Geologia Croatica: Journal of the Croatian Geological Survey and the Croatian Geological Society, 66(2013), 1; 55-77 doi:10.4154/gc.2013.05, https://www.bib.irb.hr/615334
- ViO Zagreb, *Quality Report for Water for Human Consumption*, **2019**,
- https://www.vio.hr/documents/reports/quality-report-for-water-for-human-consumption/1952
- Zagrebacki Holding, Izvjesce o odrzivosti/Sustainability Report, **2019**, https://www.zgh.hr/UserDocsImages/Marketing/DOP/HOLDING%20izvjesce%20o%20odrzivosti%202019.pdf
- City of Zagreb, *Zagreb Urban Agglomeration Development Strategy for the period up to 2020*, **2018**, https://www.zagreb.hr/UserDocsImages/gu%20za%20strategijsko%20planiranje/SRUAZ%202020%20_layout_ENG_digital.pdf
- WTE Group, Municipal WWTP Zagreb Croatia – Data Sheet, https://www.wte.de/CMSPages/GetFile.aspx?guid=af1d75ed-049d-4c9f-89e0-e7e8e7f800a4

- Stanislav Tedeschi, Davor Malus, Dražen Vouk, *Final treatment of wastewater sludge in the City of Zagreb*, GRAĐEVINAR 64 (**2012**) 2, 135-141,
- ISKI, Annual Report, 2019, https://www.iski.gov.tr/web/assets/SayfalarDocs/faaliyetraporlari/faaliyetraporu/pdf/2019-FAAL%C4%B0YET-RAPORU.pdf
- ISKI, Strategic Report 2021-2015 https://www.iski.gov.tr/web/assets/SayfalarDocs/faaliyetraporlari/faaliyetraporu/pdf/Stratejik%20Plan%20(2021-2025).pdf
- ISKI, Ongoing Investments 2020, https://www.iski.istanbul/web/tr-TR/kurumsal/devam-eden-yatirimlar1
- ISKI, 2020 Budget, 2019 https://www.iski.gov.tr/web/assets/SayfalarDocs/butce/2020%20Y%C4%B1l%C4%B1%20B%C3%BCt%C3%A7e%20Uygulama%20Sonu%C3%A7lar%C4%B1.pdf
- ISKI, Water Loss Reports, 2020, https://www.iski.istanbul/web/tr-TR/kurumsal/su-kayiplari-yillik-raporlari1
- ISKI, Performance Program 2021, https://www.iski.gov.tr/web/assets/SayfalarDocs/faaliyetraporlari/faaliyetraporu/pdf/2021%20Performans%20Program%C4%B1.pdf